MANAGER & INSPECTOR WORKSHOPS

Nairobi – 14-16 April 2026

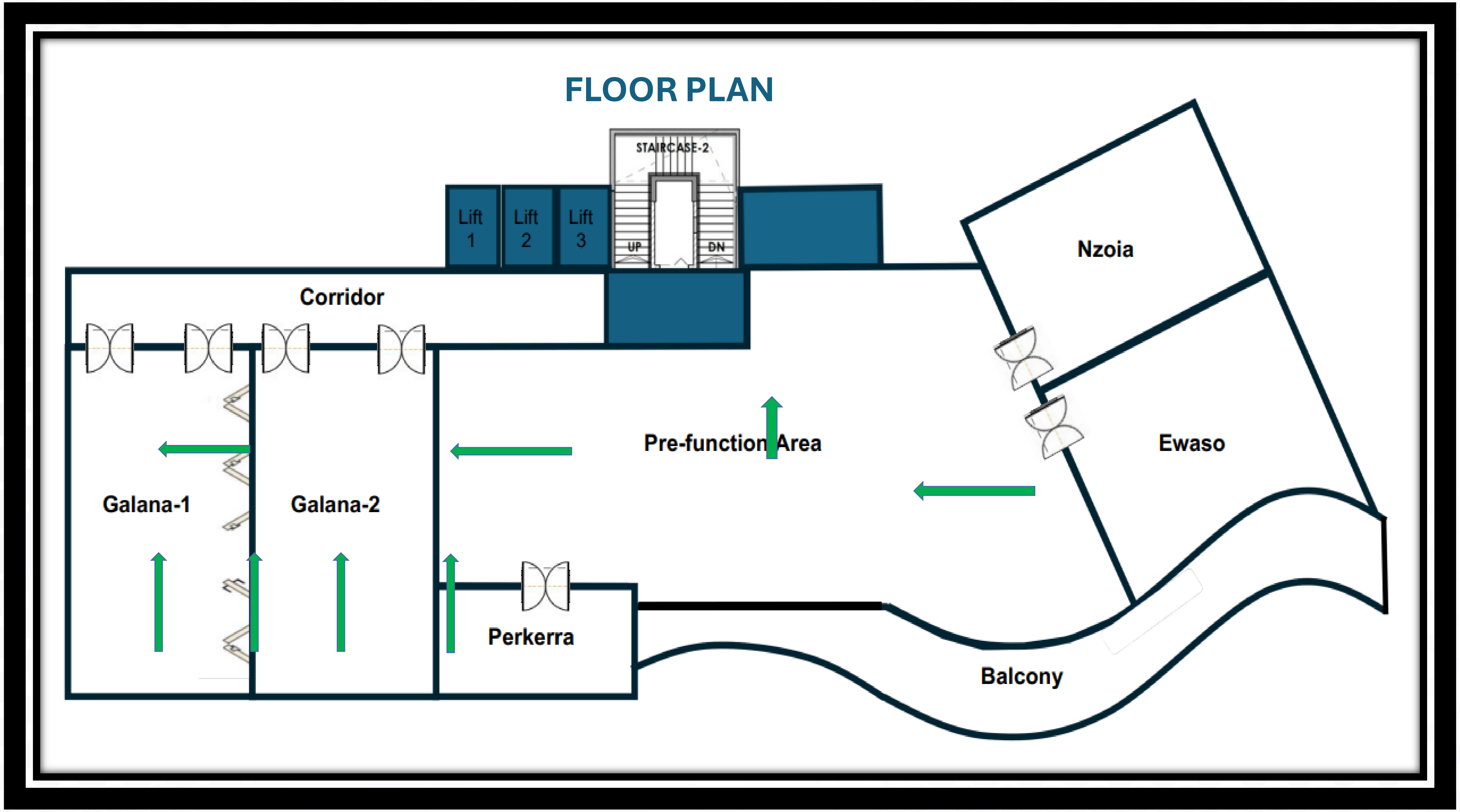
Competition Law

Some key principles for you to follow.

Please ensure that no sensitive information is discussed nor exchanged with representatives of other organisations unless that information is in the public domain. To ensure compliance, attendees should avoid discussion in certain areas, including but not limited to:

- **Market Share information:** related to specific services, intentions to enter or leave markets, commercial or bidding activities, allocation of customers.
- **Pricing and cost elements:** including company pricing to customers, cost breakdowns, operating margins, discounts, rebates, commissions and credit terms.
- **Future plans & Strategic business intentions:** including non-public investment plans, intentions to expand or reduce operating activity, plans for co-operation with other organisations.
- **Production and development plans:** including intentions to adjust capacity, new products or services, market supply and demand predictions, supply sources and supply routes.
- **Cost structures and fees:** including supply and distribution sources and costs, cost accounting methods, inventories and sales. Internal cost structures, cost by nature…
- **Other Sensitive Information defined within the JIG Core Principles** Any other types of information that are covered by the Core Principles and their equivalents in applicable Laws.

No fire alarm tests are planned



JOINT INSPECTION GROUP

Emergency Exits & Assembly Point

- When you hear fire the alarm:
  - Do not panic, evacuate the room calmly and **do not use the lifts**
- Exit through the clearly marked doors
- Follow the emergency evacuation signage / guided routes to the marked assembly points on the **Lower Ground Level**
- **Assembly points** are at the entrance of the hotel and will be **indicated by the hotel's emergency team**
- The **secondary assembly** point is **The Sarit Centre.**

Security Identification

- Keep personal belongings with you at all times

- **All attendees to wear their name badges at all times** during the event, enabling the hotel's security team to easily identify authorized individuals.

- Your cooperation is appreciated in maintaining a safe and secure meeting environment.

- Report any unattended items or suspicious behaviour to JIG / hotel staff immediately.

Welcome to Kenya !

Welcome to Nairobi !

Enkare Nairobi, meaning "cool waters"

Workshop Interactive sections

- Using the hotel WiFi connection, please open **slido.com** on your mobile phone browser or use the APP.

- Enter the 7-digit code to join

- Answer questions when they are made “live” by the presenter

JOINT INSPECTION GROUP

The JIG Team

Mark NEWSTEAD

GENERAL MANAGER

Member & Industry Partners
Development of Member Benefits
Company Governance & Oversight
Committee Co-ordination
Key Projects & Member Support Activities

Lee TAYLOR

INSPECTIONS & TRAINING MANAGER

Member Relations & Tech Questions
Inspection Programme & Policy
JIG Inspector Co-ordination
Manufacturer & External Entities Liaison
OPS, HSSE Committees

Ibon IBARROLA

TECHNICAL MANAGER

JIG Technical Strategy & Leadership
OPS, PQC Committees
Standards, Policies & Publications
Industry Committees
Joint Industry Field Trials

Andrea WIXEY

EVENTS, MARKETING & MEMBERSHIP COORDINATOR

Membership Enquiries
Events & Training
Communications & Marketing
Standards Sales & Licensing
Website Support

Luke HUTSON

ASSISTANT TECHNICAL MANAGER

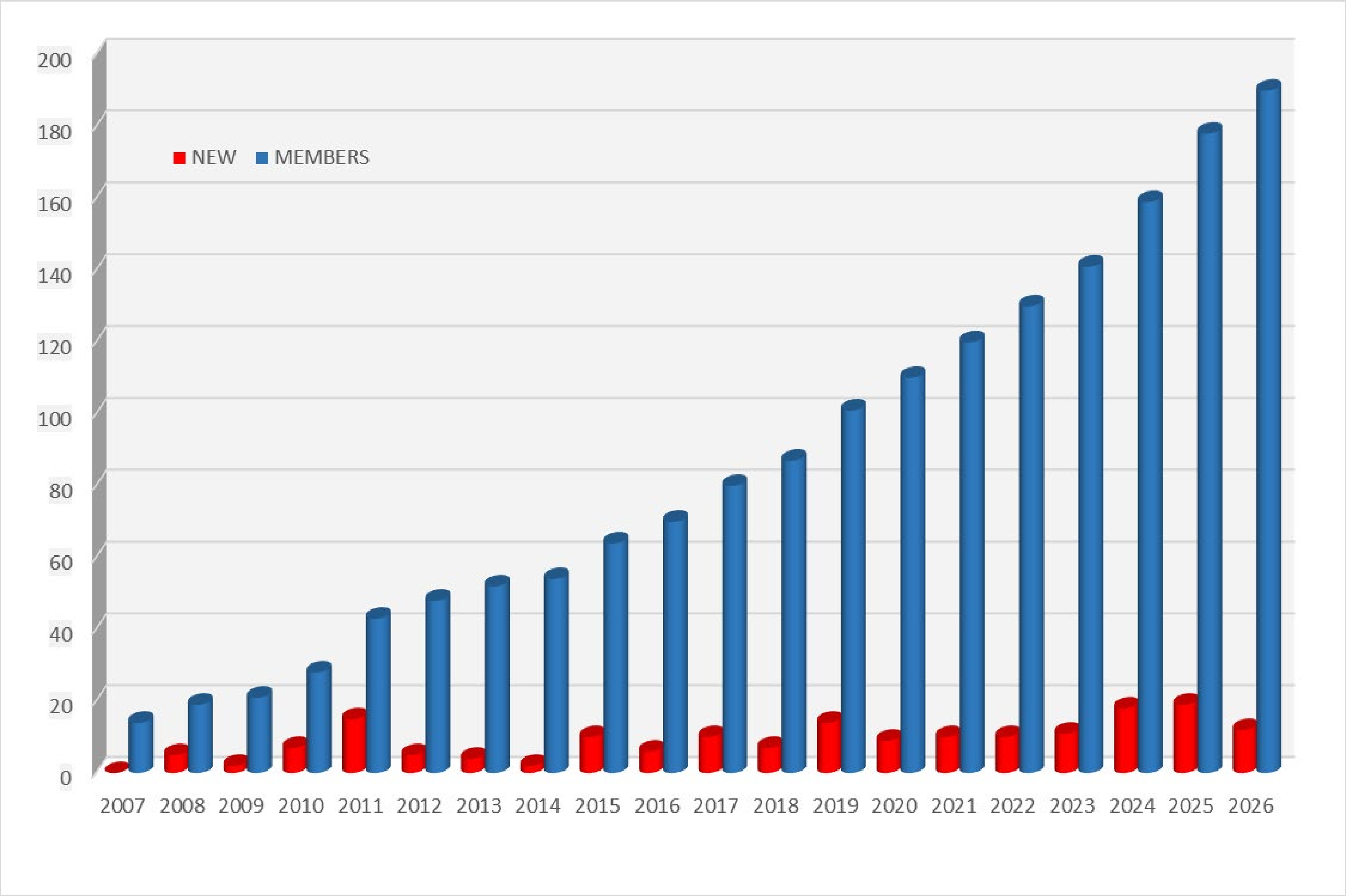
Support TM in all Technical Activities
HSSE, SWG, FWG, OPS, PQC
Standards Development, and Other Technical Documents
Technical Queries

Sam NEAL

SYSTEMS COORDINATOR

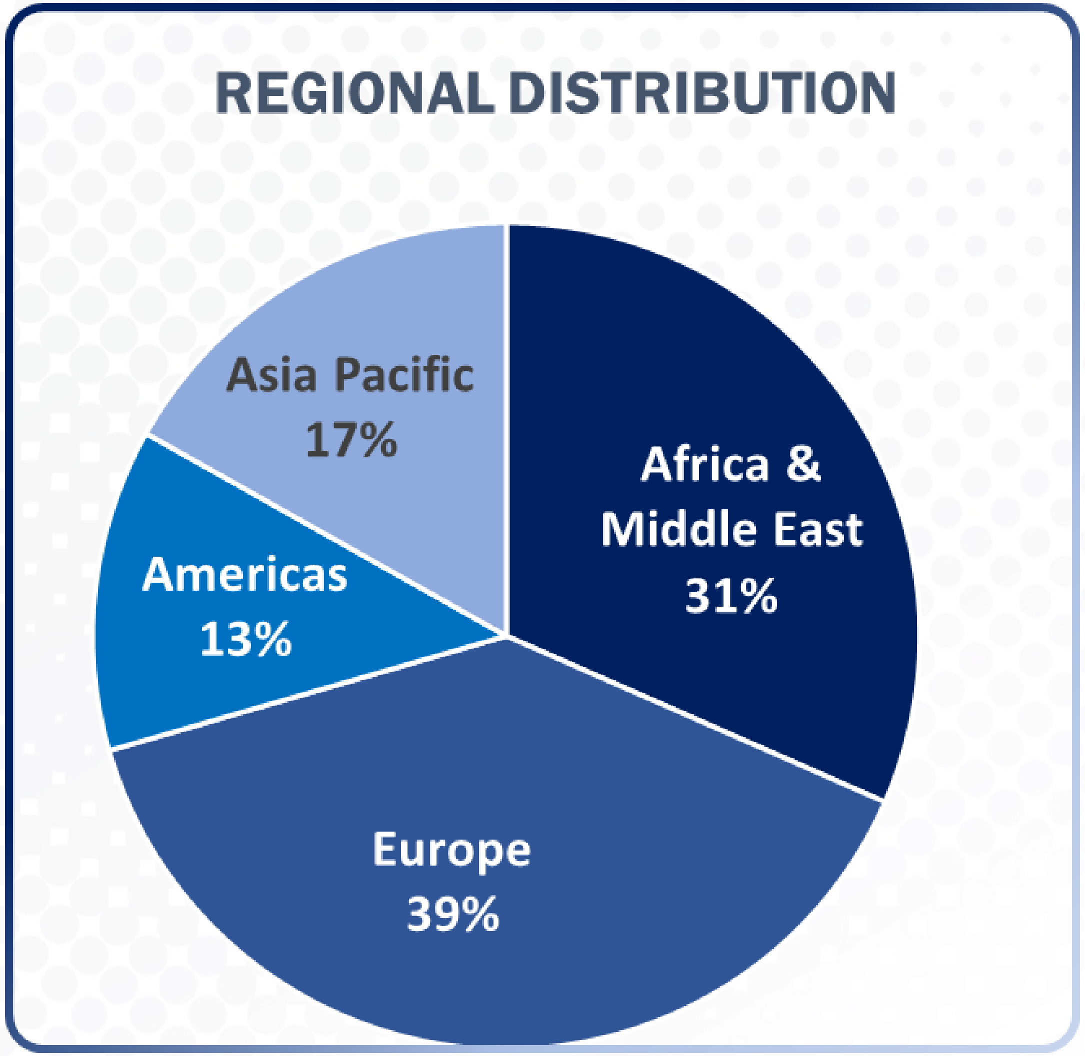
Operational Support for Inspection Schedule and JITS System
JIG Inspector Register
Site Awards Programme
Tarbox Site and HSSE Dashboard
Procurement

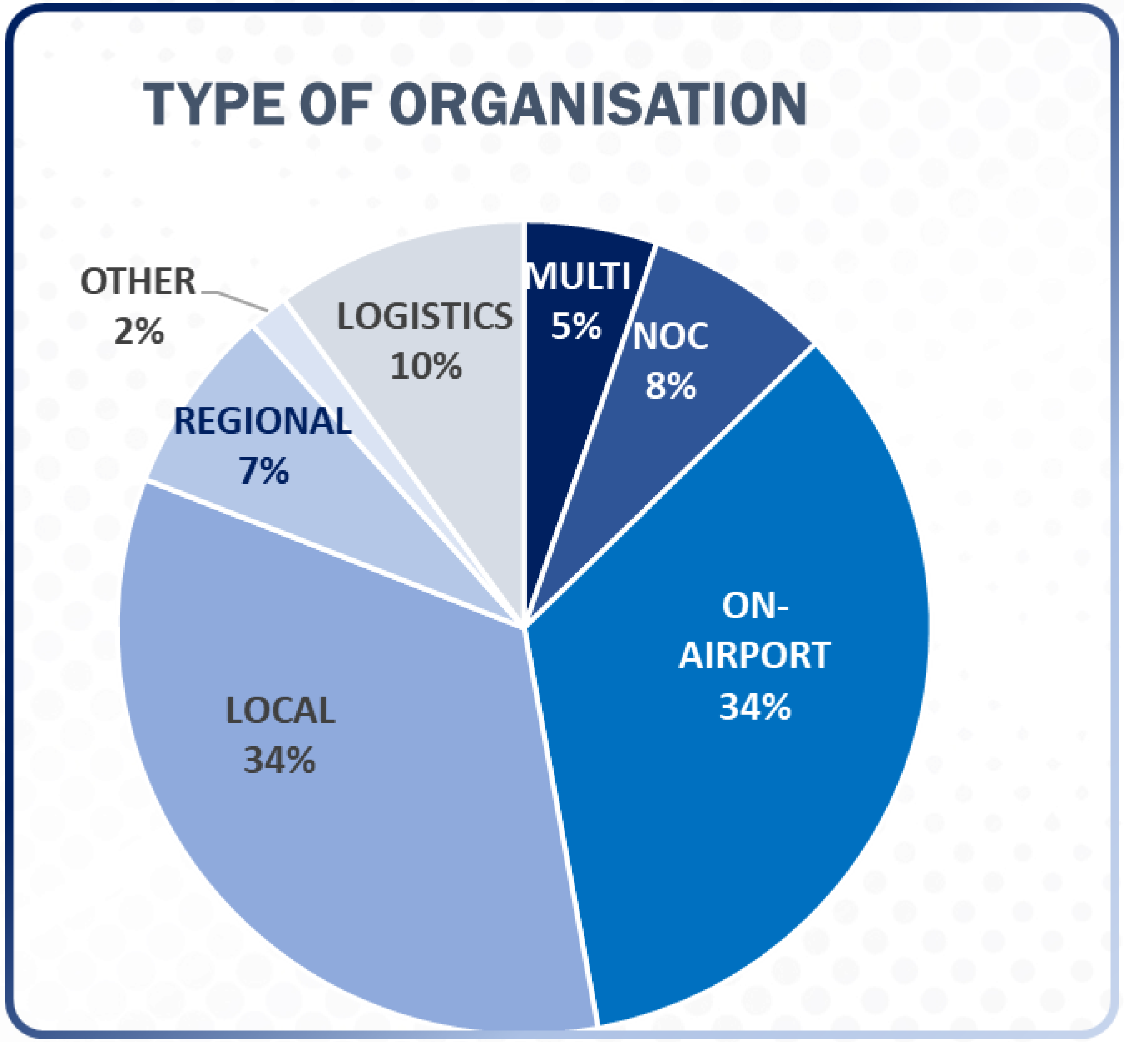
JIG Membership



190 members

JIG by Region and Activity





Where is your home or place of work?

Do not edit
How to change the design

What is your main job activity ?

ⓘ The Slido app must be installed on every computer you're presenting from

slido

Do not edit
How to change the design

How many JIG events have you attended before today?

JIG's role in a changing environment

OPERATIONAL EXCELLENCE

SAFETY
AND RISK

MARKET CHANGES
&
NEW TECHNOLOGIES

JIG's role in a changing environment

Standards and Inspection programme

Workshops & Learning from Operations

LFOs, HSSE MS, Safety Documents

Governance, BRA, Tarbox, Workshops

SBC, SSJF, SAF, E-Fuels and Regulations

Data, Electronics, Reliability

JIG's role in a changing environment

JOINT INSPECTION GROUP

Standards and Inspection programme

Workshops & Learning from Operations

LFOs, HSSE MS, Safety Documents

Governance, BRA, Tarbox, Workshops

SBC, SSJF, SAF, E-Fuels and Regulations

Data, Electronics, Reliability

Workshops and Learning

JOINT INSPECTION GROUP

SYDNEY
82
Delegates

ATIONAL EXCELLE

WARSAW
86
Delegates

Workshops & Learning
from Operations

SAFETY
AND RISK

NAIROBI
120+
Delegates

NEW TE

Operations


Vehicles
AVGAS 100LL
Workshops & Learning
from Operations
Hydrants
Hoses
JET A-1
Ship
Receipts
MBG

JIG's role in a changing environment

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Governance, BRA, Tarbox, Workshops

SBC, SSJF, SAF, E-Fuels and Regulations

Data, Electronics, Reliability

JIG's role in a changing environment

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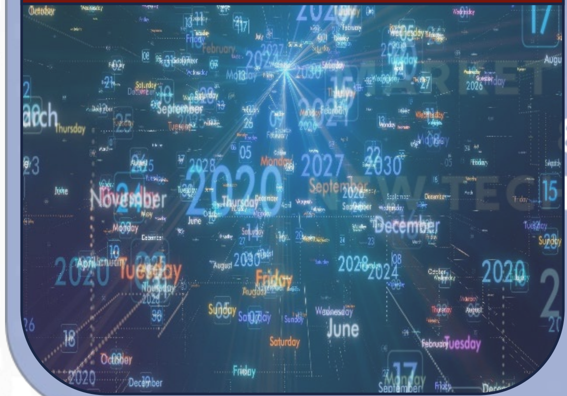
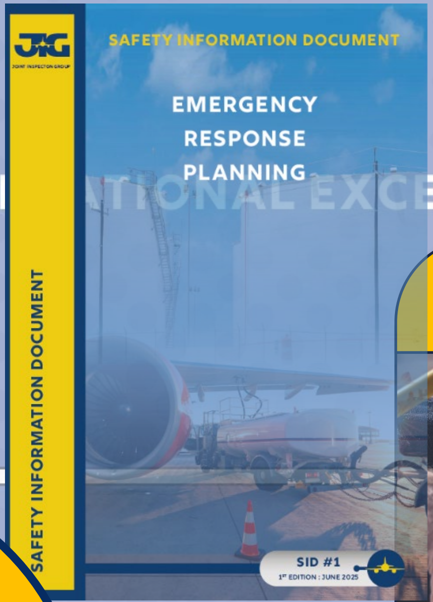


JIG's role in a changing environment

OP ATIONAL EXCELLENCE



LFOs, HSSE MS, Safety Documents

2nd

Safety Information Document

ARKET CHA GES

&

W TECHNOLOGIES

AFETY

ISK

JIG's role in a changing environment

Standards and Inspection programme

Workshops & Learning from Operations

LFOs, HSSE MS, Safety Documents

Governance, BRA, Tarbox, Workshops

SBC, SSJF, SAF, E-Fuels and Regulations

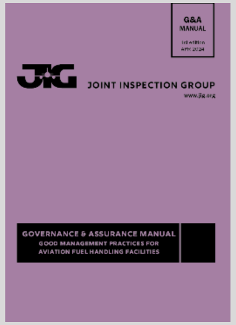
Data, Electronics, Reliability

JIG's role in a changing environment

EXCELLENCE

Governance, BRA, Tarbox, Workshops

GOVERNANCE



SAFETY AND RISK

MARKET CHANGES & NEW TECHNOLOGIES

JIG's role in a changing environment

Standards and Inspection programme

Workshops & Learning from Operations

LFOs, HSSE MS, Safety Documents

Governance, BRA, Tarbox, Workshops

SBC, SSJF, SAF, E-Fuels and Regulations

Data, Electronics, Reliability

JIG's role in a changing environment

JOINT INSPECTION GROUP

OPERATION

SBC, SSJF, SAF, E-Fuels and Regulations

EI/JIG 1530& 1533

SAFETY AND RISK

MARKET CHANGES
&
NEW TECHNOLOGIES

JIG's role in a changing environment

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SBC, SSJF, SAF, E-Fuels and Regulations

Data, Electronics, Reliability

JIG's role in a changing environment

OPERATIONAL EXCELLENCE

Data, Electronics, Reliability

&

NEW TECHNOLOGIES

SAFETY AND RISK

Successful Workshops….

All presentations will be available to delegates in 1-2 weeks time. You will receive a message when they are ready on the website.

THANK YOU

GRACIAS

MERCI

DANKE

GRAZIE

ありがとうございました

СПАСИБО

ΣΑΣ ΕΥΧΑΡΙΣΤΩ

謝謝你

DANK U

JOINT INSPECTION GROUP LTD

INFO@JIG.ORG

INSPECTED TO JIG STANDARDS (IJS) PROGRAMME & HOW IT WORKS

JIG Managers' Workshop – Nairobi 2026

Note: The procedures and practices presented in this document are best practice recommendations only. JOINT INSPECTION GROUP Ltd and/or the JIG Member presenting this document makes no claim or warranty whatsoever as to their completeness or suitability. JOINT INSPECTION GROUP Ltd and its Members shall have no liability to third parties in relation to following, or not following the recommendations contained herein.

Inspected to JIG Standards (IJS)

What is IJS?

- A rigorous process producing high quality Inspectors and inspections
- Requires participating locations to be inspected once a year by a qualified JIG Inspector
- Allows the location and operations management to track recommendations and ensure they are followed
- Inspection data - secure and confidential for each member
- This JIG Inspector Training Course was launched in 2014.
- All JIG Inspectors must pass this course and remain qualified.

Joint Inspection Group
Inspected to JIG Standards

INSPECTED TO JIG STANDARDS 2026

This is to certify that

Paldiski-PUMA:REF

has conducted an
Inspection to JIG Standards

On 20th February 2026, a JIG Inspector inspected this location to the JIG Inspection criteria

Mark Newstead	Olivia Stone
JIG General Manager	JIG Council Chair

Disclaimer Notice This certificate is not intended to provide advice on which you should rely. Joint Inspection Group Limited (**JIG**) did not carry out the inspection. The inspection was conducted by a third-party inspector. JIG excludes all implied conditions, warranties, representations or other terms that may apply to this certificate, including but not limited to the quality of the assessment carried out by the inspector into the location which has been inspected or the accuracy, completeness or up-to-date status of this certificate. This certificate is provided "as is" and "as available" without warranty of any kind. With the exception of any liability which cannot be excluded by law, JIG excludes all liability arising from any use of this certificate. Any use of this certificate and any claims arising out of or in connection with this certificate shall be governed by the laws of England and Wales and subject to the exclusive jurisdiction of the courts of England and Wales.

Inspected to JIG Standards (IJS)

JIG LEARNING
JIG INSPECTOR TRAINING

Why does JIG have an Inspection Programme?

- JIG was created to agree Standards and inspect Joint Ventures.
- The "Inspected to JIG Standards" scheme was developed to allow any JIG Member to inspect its own locations.
- Inspection is an important process in Aviation
  - Ensures passenger and airline safety
  - Checks the operations against the standards
  - Sets expectations for the future
  - Monitors compliance
  - Lowers operational risk and hence liability
  - Provides the opportunity for learning/upgrade

What are the Inspection rules?

- Sites inspected every year.
- Schedule and Reports submitted to JITS System.
- Inspector cannot work for site being evaluated.
- Must be a qualified JIG Inspector.
- Site/Company can use own inspector or independents.
- Inspected sites are eligible for site performance awards

Some Definitions

JIG INSPECTOR TRAINING

What is a JIG Inspection?

An inspection performed by a qualified JIG Inspector at a JIG or an IJS Location. Inspection reports shall be issued using the latest JIG Inspection Checklist and uploaded to the JITS system.

What is a location?

- JIG Location: usually a JV, inspected in rotation by various companies
- IJS Location: belongs to a JIG Member, inspected only by that company
- Member Location: belongs to a JIG Member following JIG compliant manual, inspections not loaded into JITS.

*All Locations operated in accordance with JIG Standards

Which companies are eligible to Inspect?

- Owners of the facilities.
- Part-owners of the facilities (usually joint venture partners).
- Throughputters (if agreed contractually with the location owners or part owners).
- Operators (if agreed by the owners or part-owners on behalf of whom they operate the location).

JIG LEARNING
JIG INSPECTOR TRAINING

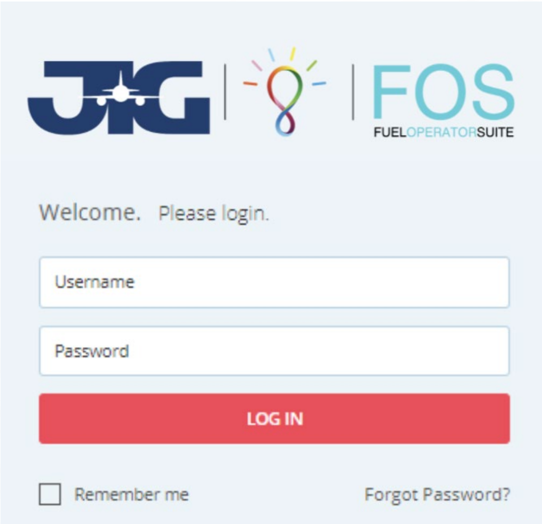
Some Definitions

What is JITS?

- JIG Inspection Tracking System
- Cloud-based system that schedules inspections, records recommendations and tracks locations' follow up actions.
- JITS is currently a service offered free of charge to JIG Members.
- Accessible to inspectors, site and area managers and JIG Member co-ordinators
- Inspection data - secure and confidential for each member

- Functions with a range of Web browsers
- Desktop and Tablet applications available

Google Chrome
Microsoft Edge
Firefox
Safari



The Inspection Report Structure

JIG LEARNING
JIG INSPECTOR TRAINING

What does the report look like?

Summary page is key to Management understanding quickly how well managed and reliable operations are.

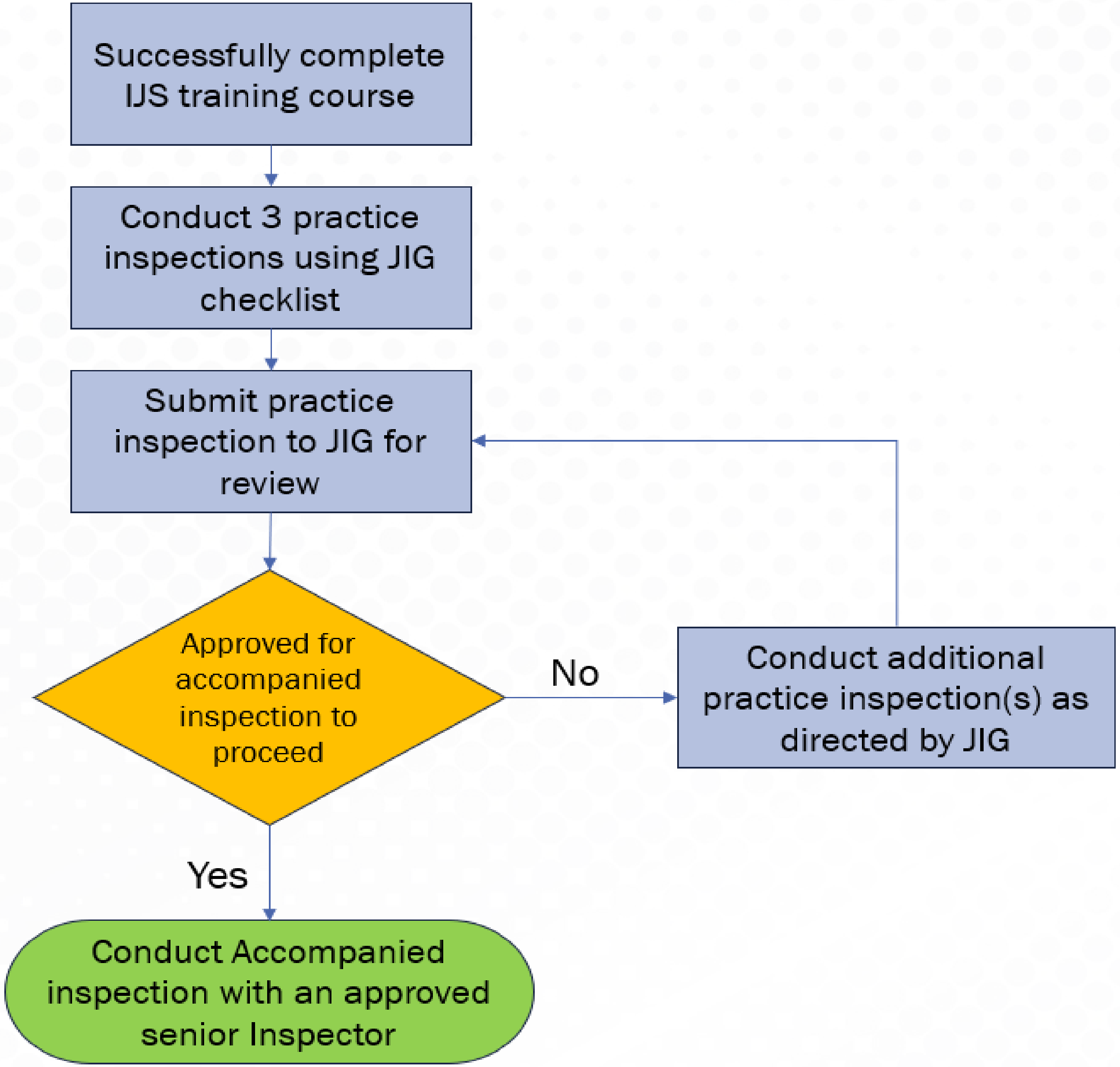
1. Summary of key findings and required actions.
   Short summary of the operation
   Highlights any areas of concern
   Identifies any outstanding High Priority recommendations
   States how many outstanding recommendations there are
   Where applicable, identifies why previous recommendations remain overdue
   Provides an overall assessment of the facility
2. Checklist of questions and Recommendations:
   - All questions to be witnessed if possible.
   - Any failings should be noted as a **Recommendation** or **Comment**
3. Recommendations are further qualified:
   - High or normal priority according to impact.
   - Overdue if still not closed from prior year
   - Assessment of underlying cause (lack of training, documentation, procedures etc.)
4. Site Assessment (noted at top of the summary)

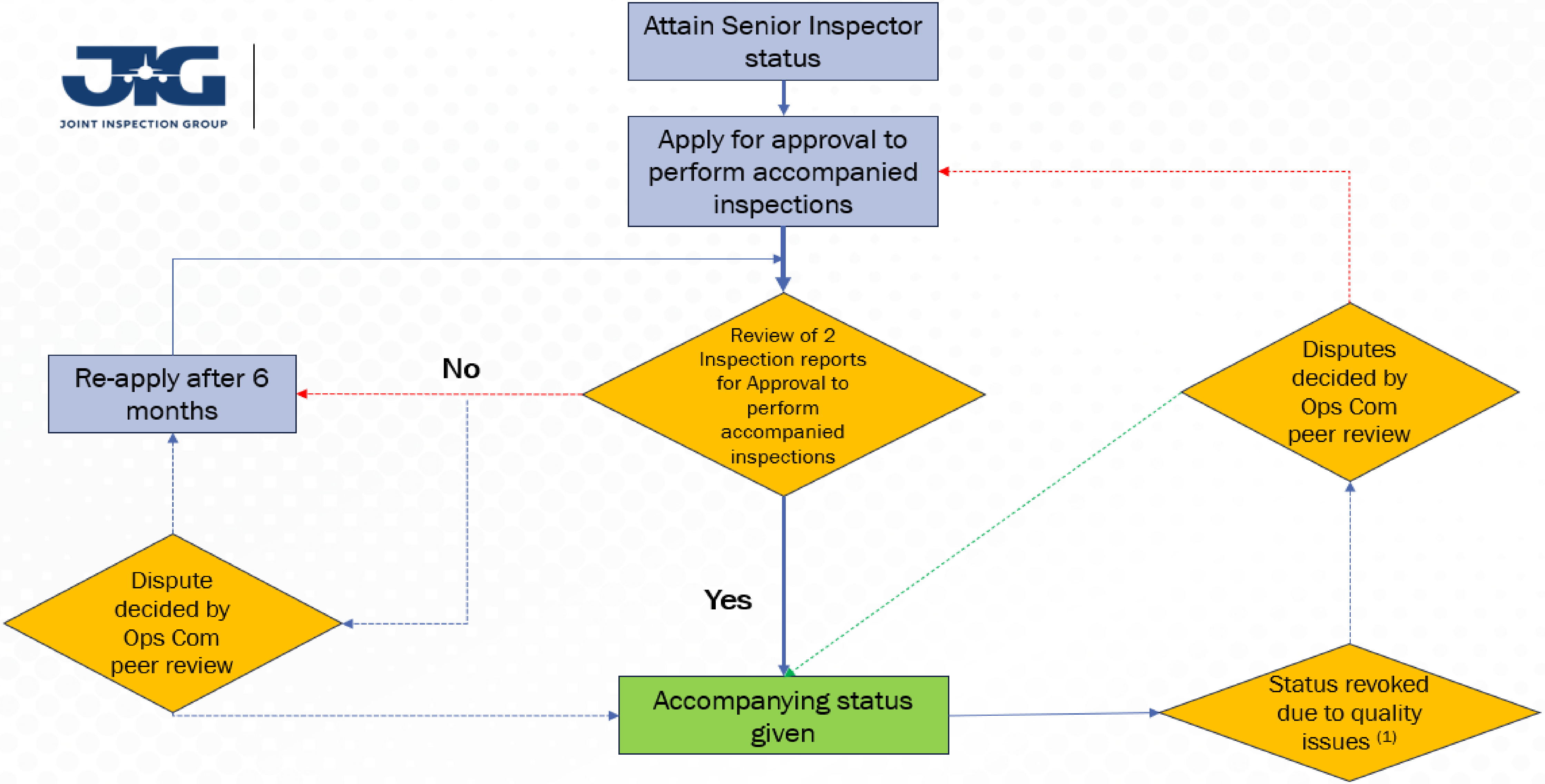
JIG LEARNING
JIG INSPECTOR TRAINING

2-3 JIG Inspector Training Courses per year



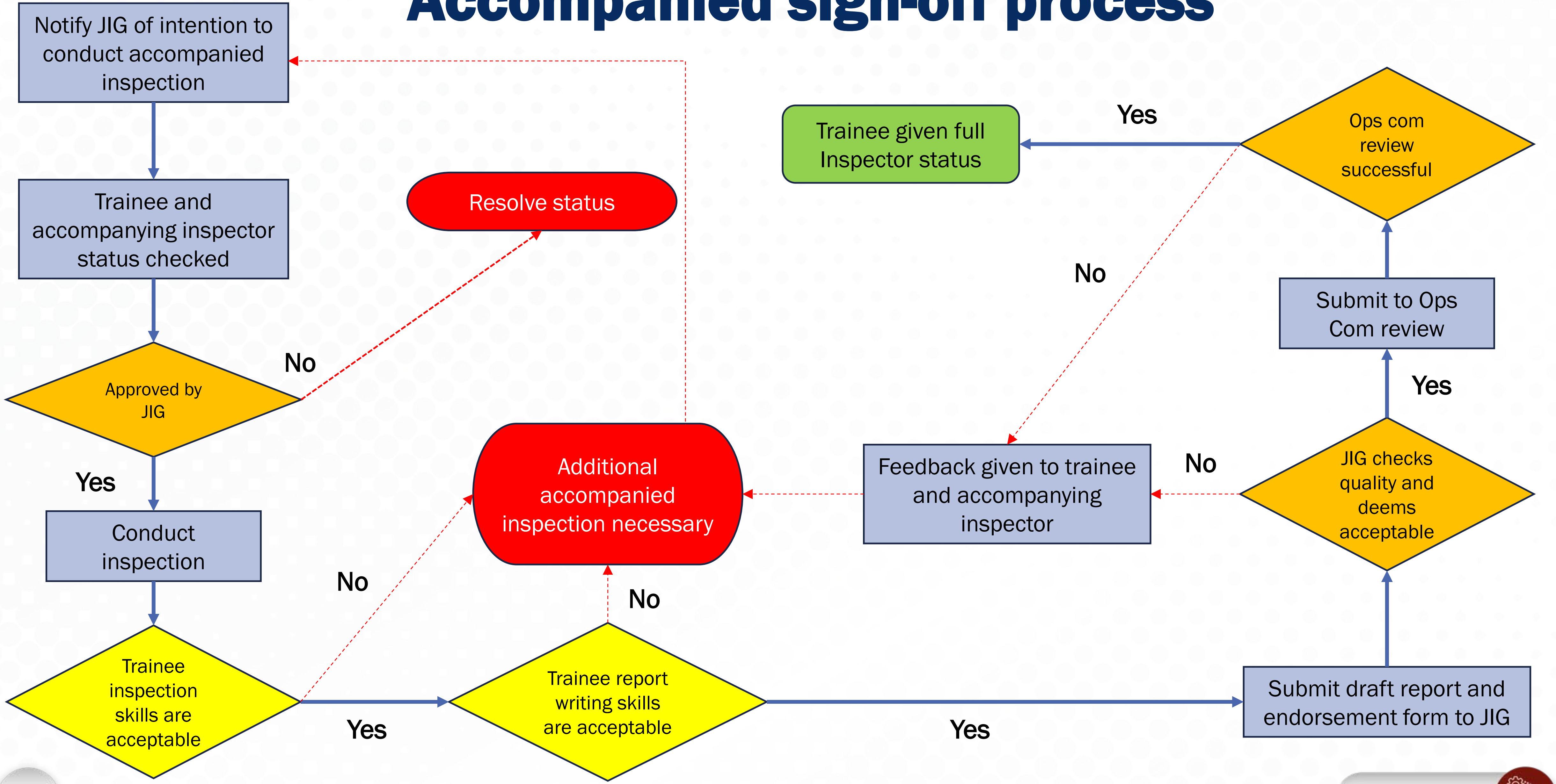




Successfully complete IJS training course
Conduct 3 practice inspections using JIG checklist
Submit practice inspection to JIG for review
Approved for accompanied inspection to proceed
No
Conduct additional practice inspection(s) as directed by JIG
Yes
Conduct Accompanied inspection with an approved senior Inspector



(1) *Quality issues identified during submission process of trainee inspector sign-off reports.*

Accompanied sign-off process



Inspection Process

Good organisation before the inspection saves time and improves the quality of the report

- JITS Set up / Admin preps
- Inspection dates agreed between site management and Inspector
- Adequate time* allocated and program agreed
- Expectations Communicated
  - List of tasks to witness
  - Ask site to arrange the required resource to be present (e.g. maintenance)
  - Clarify PPE requirements, logistics

***Suggested time allocation (# days)**

Airport	Small/Med	Large
AD or IP	1.5	2
ADIP	2	2.5
ADHIP	2.5	3
S&D	**Small/Med**	**Large**
TMNL	1.5-2	2
PIPE	1	1
REF	2	2-3

Additional time might be required based upon inspector's judgement, subject to agreement with the site mngmt, if e.g.

- long process to get the apron pass or clear security,
- EN is the second language at the location,
- facilities are not co-located / are far apart
- facility was found Less than Satisfactory at the previous inspection with a long list of recommendations

The Inspection & Checklist

What does the Inspector do?

Holds an opening meeting to:

- Re-confirm the program
- Sign any confidentiality agreements
- Receive site safety induction
- Review previous recommendations
- Review any Variances currently in place.

NOTE THAT:

- The Checklist covers all aspects of the applicable JIG standard*
- Also covers areas such as HSSE performance, operating manuals, Variances and records

*JIG1/2/4, EI/JIG1530

JIG STANDARDS Issue 13

INSPECTION OF AIRPORT DEPOT / HYDRANT / INTO-PLANE FACILITIES
IN ACCORDANCE WITH THE JIG INSPECTION PROGRAMME

Location	
Facility (Airport Depot, Hydrant or Into-Plane Service)	
Managing/Operating Company	
Name of inspector and company	
Date of visit	
Recommendations reviewed with	
Date of issue of this report	
Overall Assessment (see page 2 for definitions) Note if the assessment is Less than Satisfactory, the report shall be issued within 3 weeks of the inspection and a follow-up inspection shall be scheduled within the next 6 months or preferably sooner.	
Last JIG inspection (name of company and date visited)	
Has a Tier 3 non-disclosure agreement been signed by all inspecting parties (where applicable)?	
Have any items of a serious nature been communicated to all participants and the local manager without delay?	
Last external HSSE Management System Audit (by participant or consultant) (name of company and date visited)	
Date of last revision to local/site operating procedures	

This document is intended for the guidance of Members of the Joint Inspection Group (JIG) and companies affiliated with Members of the JIG. The contents contained within the completed document are confidential to Members of the JIG and Joint Venture participants and in the case of Throughput Locations confidential to through-putting companies and shall not be copied, re-distributed or passed to unauthorised parties.
Neither the JIG, its Members, nor the companies affiliated with its Members accept responsibility for the adoption of this document or for compliance with this document. Any party using this document in any way shall do so at its own risk.

This document shall be used for locations registered to JIG's Inspection Tracking System, known as "JITS". This document shall be deemed a sampling review to determine the overall rating of the operation and identify areas for improvement. It is not a compliance audit.

Ver.13.2, Jan 2023 Joint Inspection Group Page 1 of 44

UNCONTROLLED COPY – MASTER COPY HELD BY JIG

Site Assessment rating

Definitions of site assessment ratings.

GOOD:

- There are no open/overdue recommendations from the previous inspection reports that are within the control of the facility management; **and**
- There are no High Priority Recommendations in the current report; **and**
- Recommendations in the current report are of minor nature and do not reflect systemic(*) issues;
- **and** There is evidence of good HSSE performance for the inspection period

SATISFACTORY:

- There are no systemic(*) QC, technical, operational or HSSE issues, **and**
- The previous recommendations have been satisfactorily addressed with clear plans in place to close out any remaining open recommendations

LESS THAN SATISFACTORY:

- Signs of systemic(*) failure to meet QC, technical, operational or HSSE requirements, **and/or**
- Recommendations from the previous inspection have not been satisfactorily addressed
- Staff attitudes suggest that the operation is more likely to deteriorate than to improve

(*)Systemic=widespread issues, affecting or relating to a wider group of people or wider parts of the operation, with unaddressed underlying causes.

What does systemic failure look like ?

Repeated failure or non conformance in several possible areas:

- Risk Assessment and MOC
- Documentation
- Maintenance and Housekeeping Records
- Operators not following procedures (training ?)
- Poor design or equipment not working.

JIG LEARNING
JIG INSPECTOR TRAINING

Recommendation – a definition

What the Inspector saw.

Writes what the standards say.

Describes the actions needed to address the gap

1. List of gaps observed between the applicable JIG Standard(s) and the inspected facility's design and practice / locally prepared procedures (observed facts, not opinion)
2. References the applicable section of the standard / checklist
3. Provides a description of appropriate action(s) to address the gap identified and potential root cause(s) leading to the gap

Classifying Recommendations

Types of Recommendation.

<u>High Priority Recommendations</u>

- These are Recommendations concerning quality control, technical, operational or HSSE issues that may lead to a major incident or major disruption in airport operations, if they are not effectively addressed at the earliest possible opportunity.

<u>Recommendations</u>

- These are Recommendations concerning QC or Operational issues which need to be addressed within a mutually agreed timeframe

<u>Recommendations Overdue</u>

- These are Recommendations from previous Inspection Reports which have not been closed out by the due date or, in the opinion of the Inspector, have not been satisfactorily addressed.

The Inspector shall agree an implementation target date with the Facility Manager for all recommendations

Comments

Used as appropriate.

- The comments section allows much greater freehand than recommendations
- Comments are an opportunity to record useful information relating to the inspection visit
  - Data /information required in the checklist (expiry date of CWD, reference of inspected filter, type of aircraft refuelled, etc.) that will also help the next inspector
  - Any item not witnessed and the reasons why
  - Helpful advice outside of requirement for a "recommendation"
  - For inspections on the first year after a new issue of JIG (prior to the implementation date), report as comments any gaps against new standards - to support the transition/implementation process

Inspection Process - Close Out meeting

JIG INSPECTOR TRAINING

The Close out meeting is the start of the report. The discussion with the Site Manager will be the basis for the Summary and Recommendations

- A crucial part of the inspection
- Close-out meeting shall be performed before leaving the site
- Helps the manager understand the reasons behind the findings before receiving the written report.

The Inspector will:

- Invite the manager and any other key staff to the meeting
- Provide an overall summary of the inspection starting with what went well - commend good practices
- Give the overall assessment of the inspection (Good, Sat, LTS)
- Explain the inspection findings and recommended actions and agree the recommendations and closure dates
- Highlight any outstanding and high priority recommendations

JIG LEARNING
JIG INSPECTOR TRAINING

Inspection Culture : How is the visit perceived?

The reception an inspector receives from a site may not be what was expected

Why is this?

Cultural differences:

What does the Inspector expect from a site being inspected?

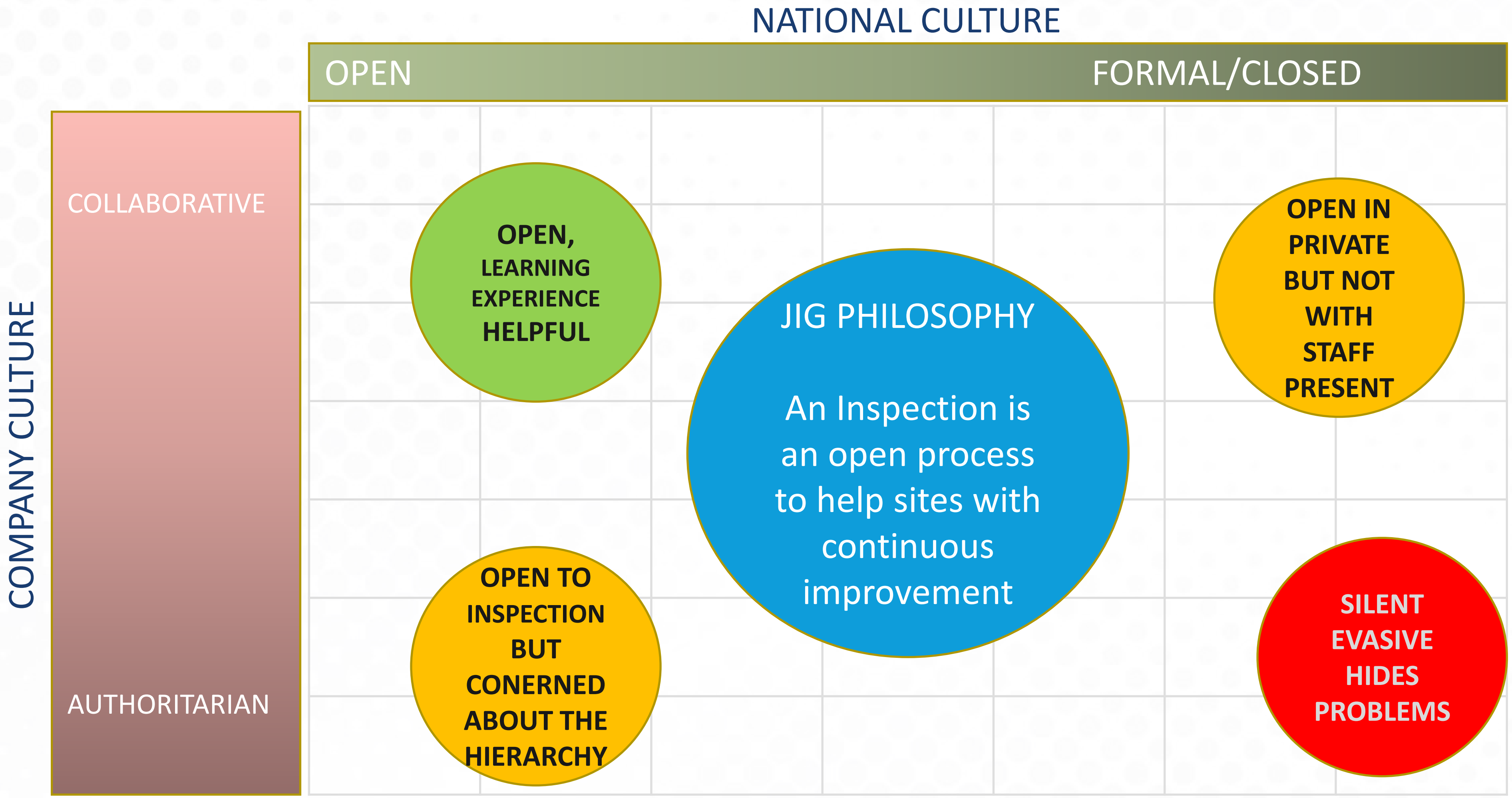
What does the site feel about being inspected?

Inspection Culture : Impact of Culture

JIG INSPECTOR TRAINING

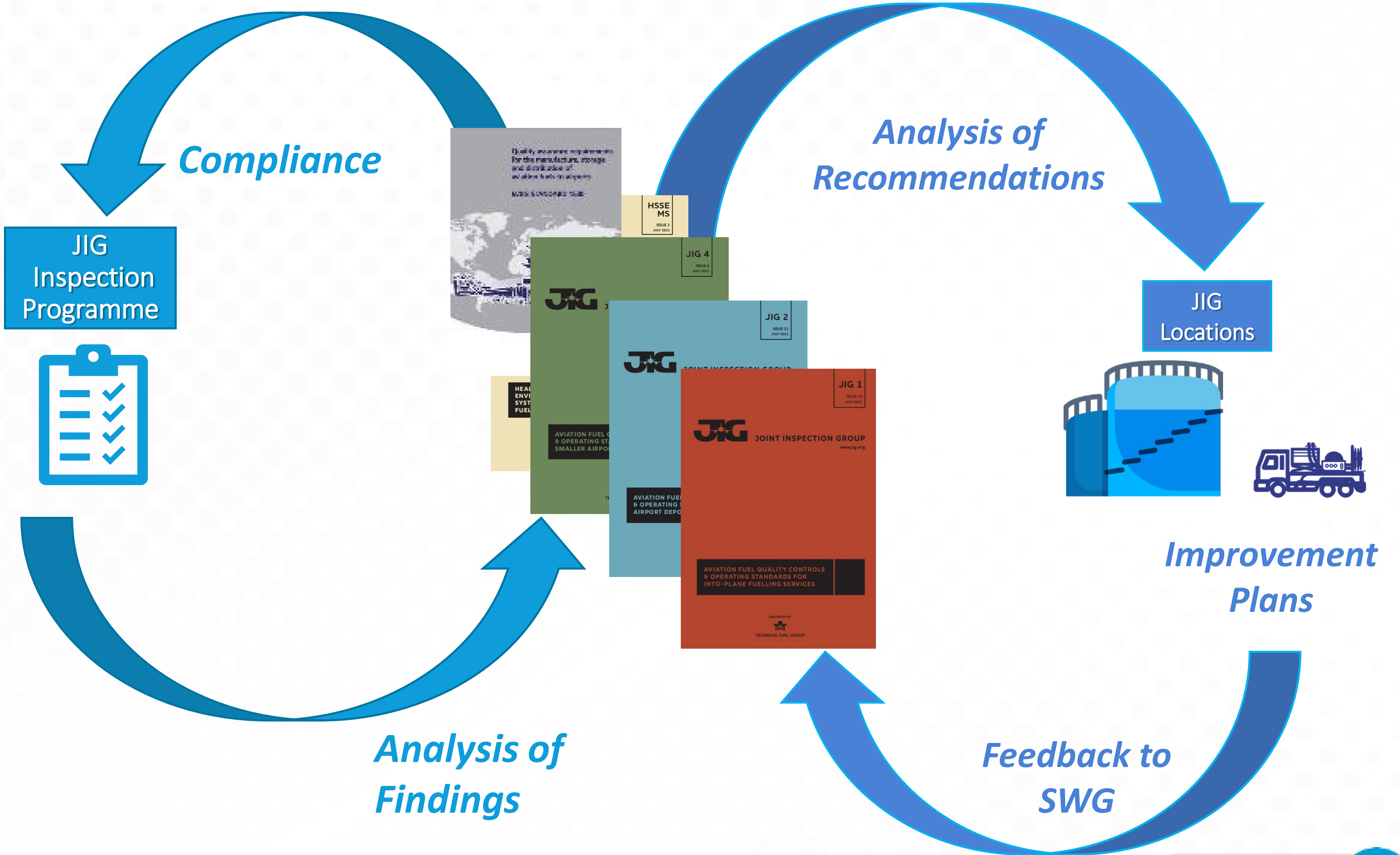
People may feel differently about the inspection.

This will likely depend on the company they work for as well as national norms of behaviour.

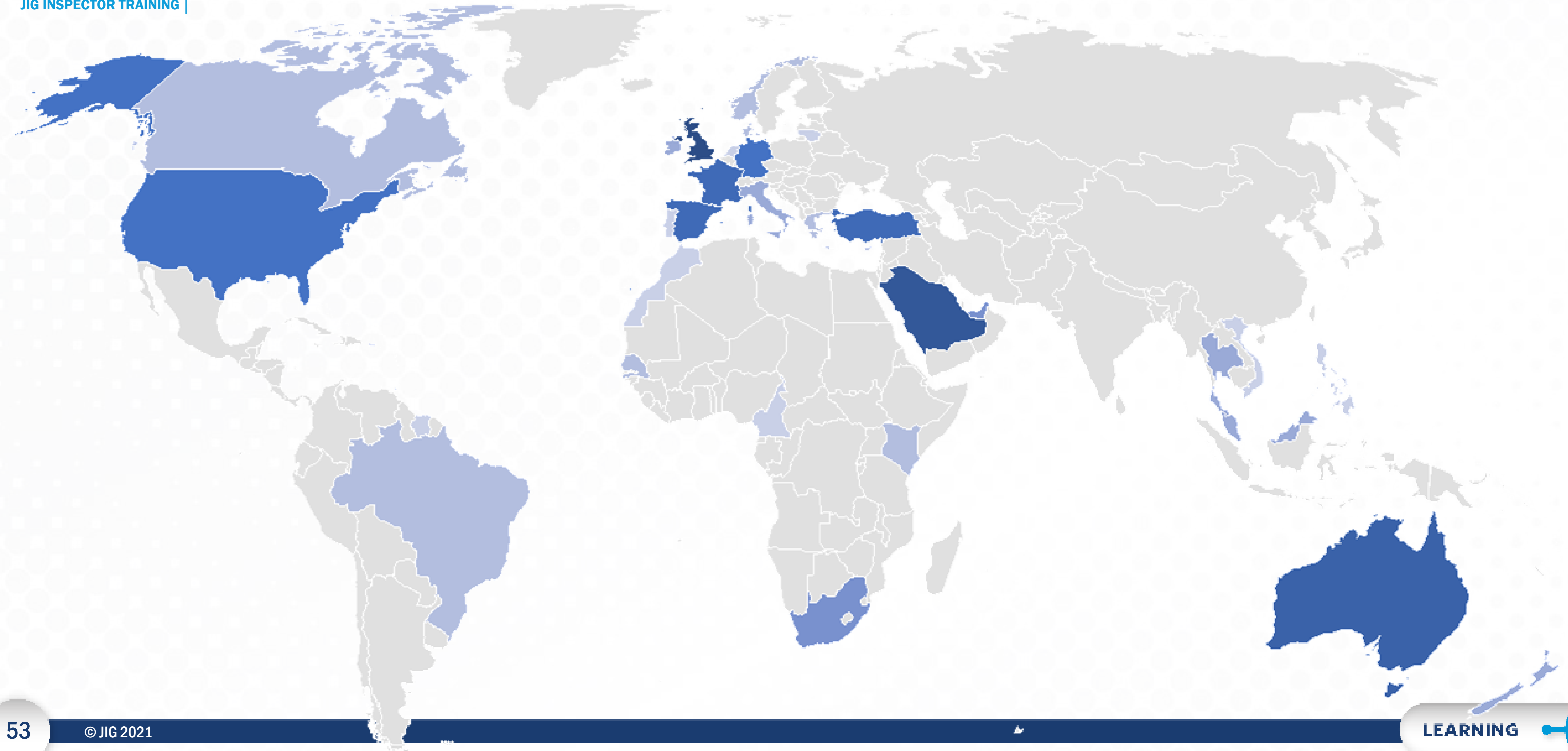


JIG Standards : Continuous Improvement

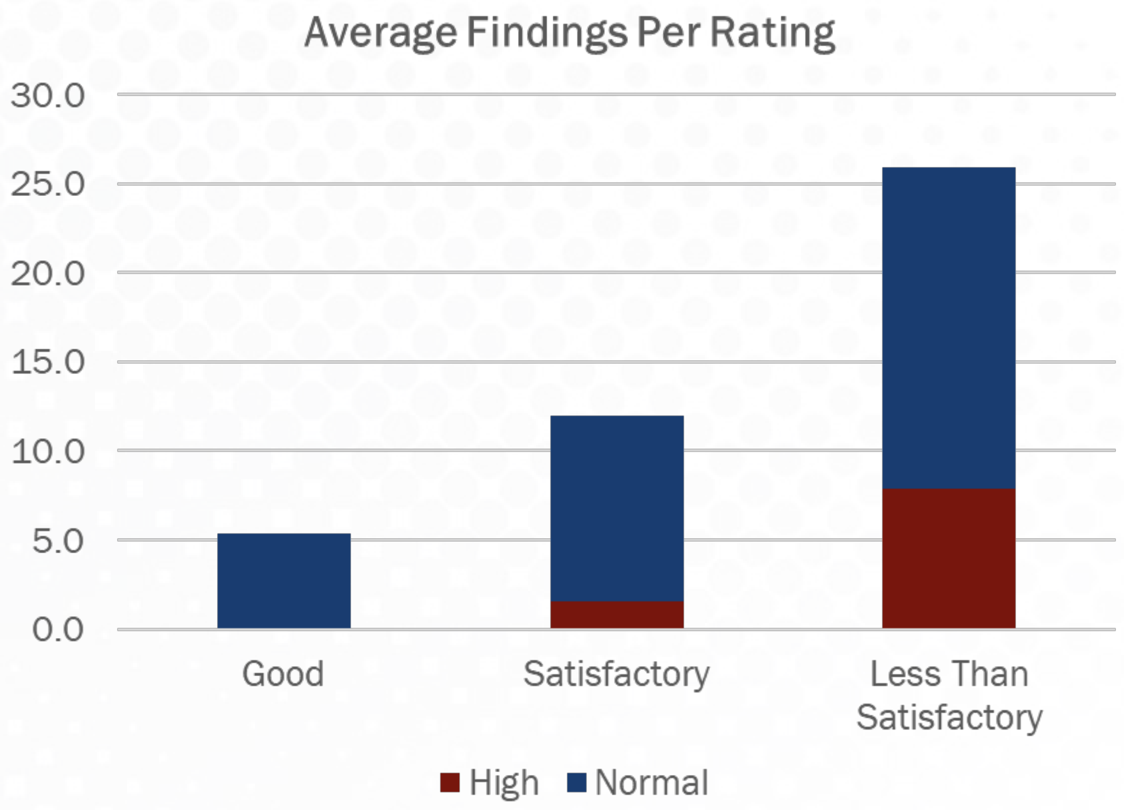
JIG Inspection Programme has a key role in the continuous improvement of JIG Standards

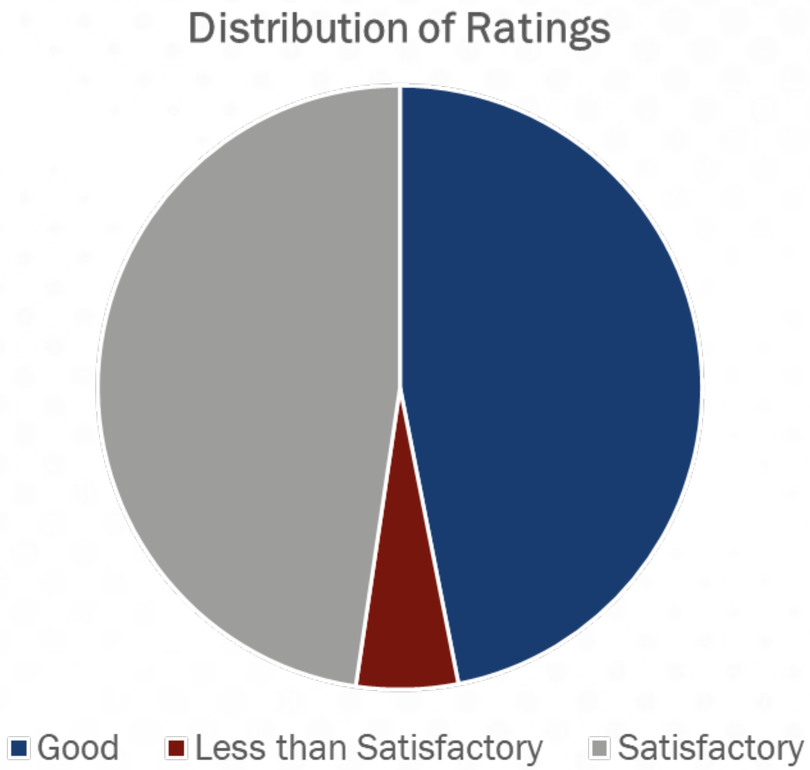


Inspectors Global Distribution



Some Data on Recommendations (2025 - Global)



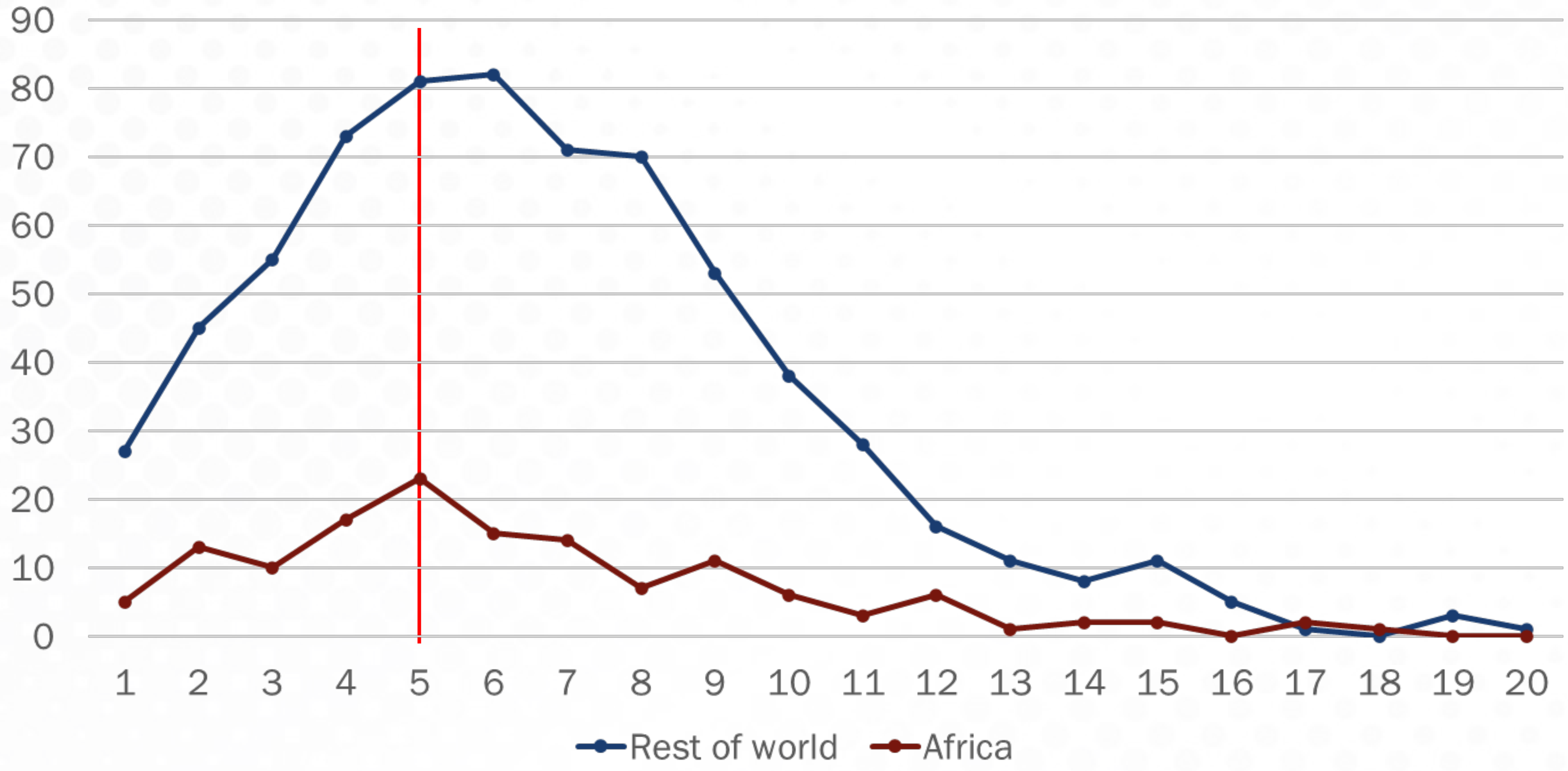


Good Ratings 2023-2025 – Distribution of # Recommendations

Globally:

817 inspections received "GOOD" ratings.

4415 Recommendations



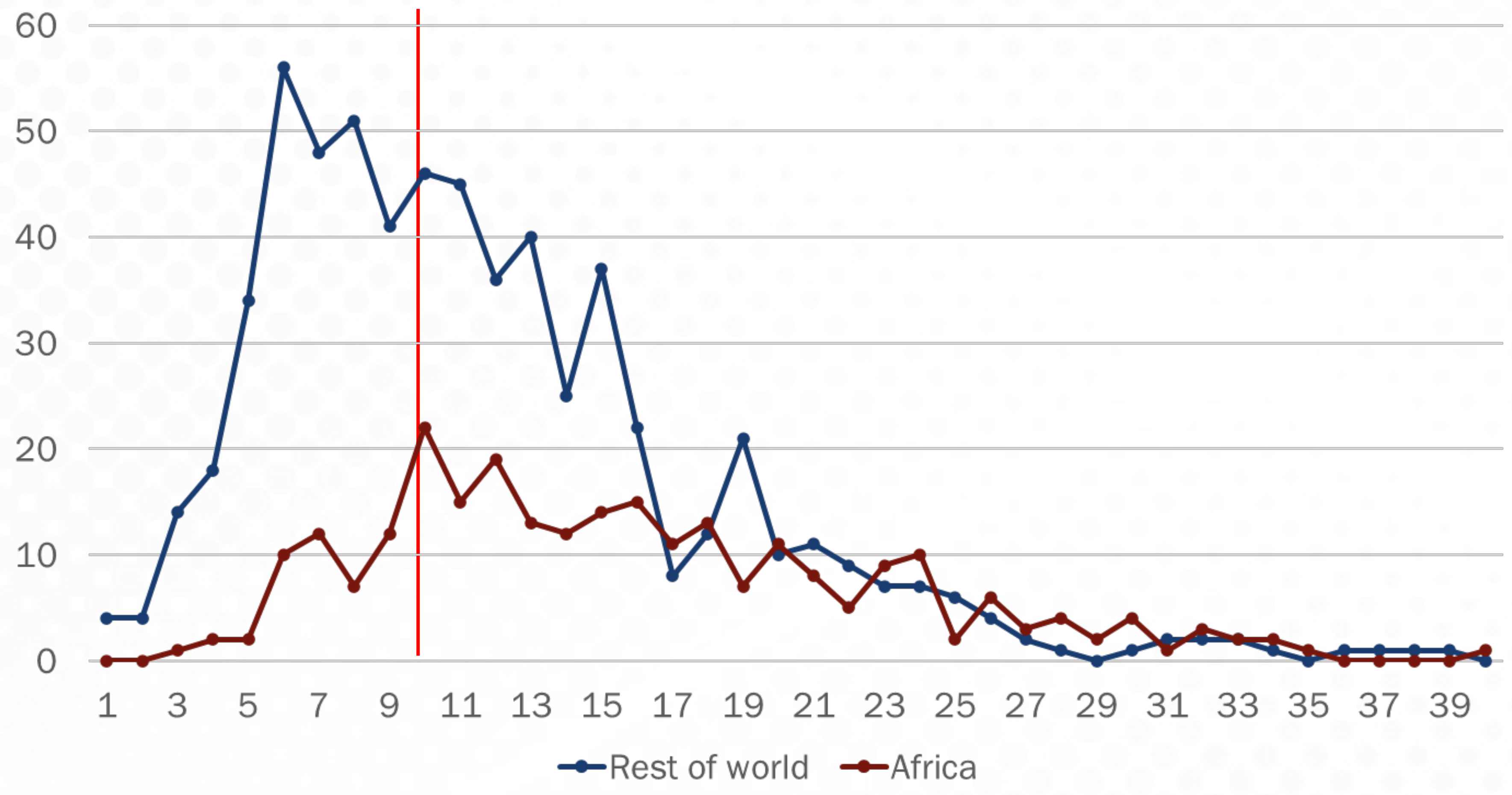
Satisfactory Ratings 2023-2025 – Distribution of # Recommendations

Globally:

892 inspections received "SATISFACTORY" ratings.

11414 Recommendations

1318 High priority



Less Than Satisfactory Ratings 2023-2025 – Distribution of # Recommendations

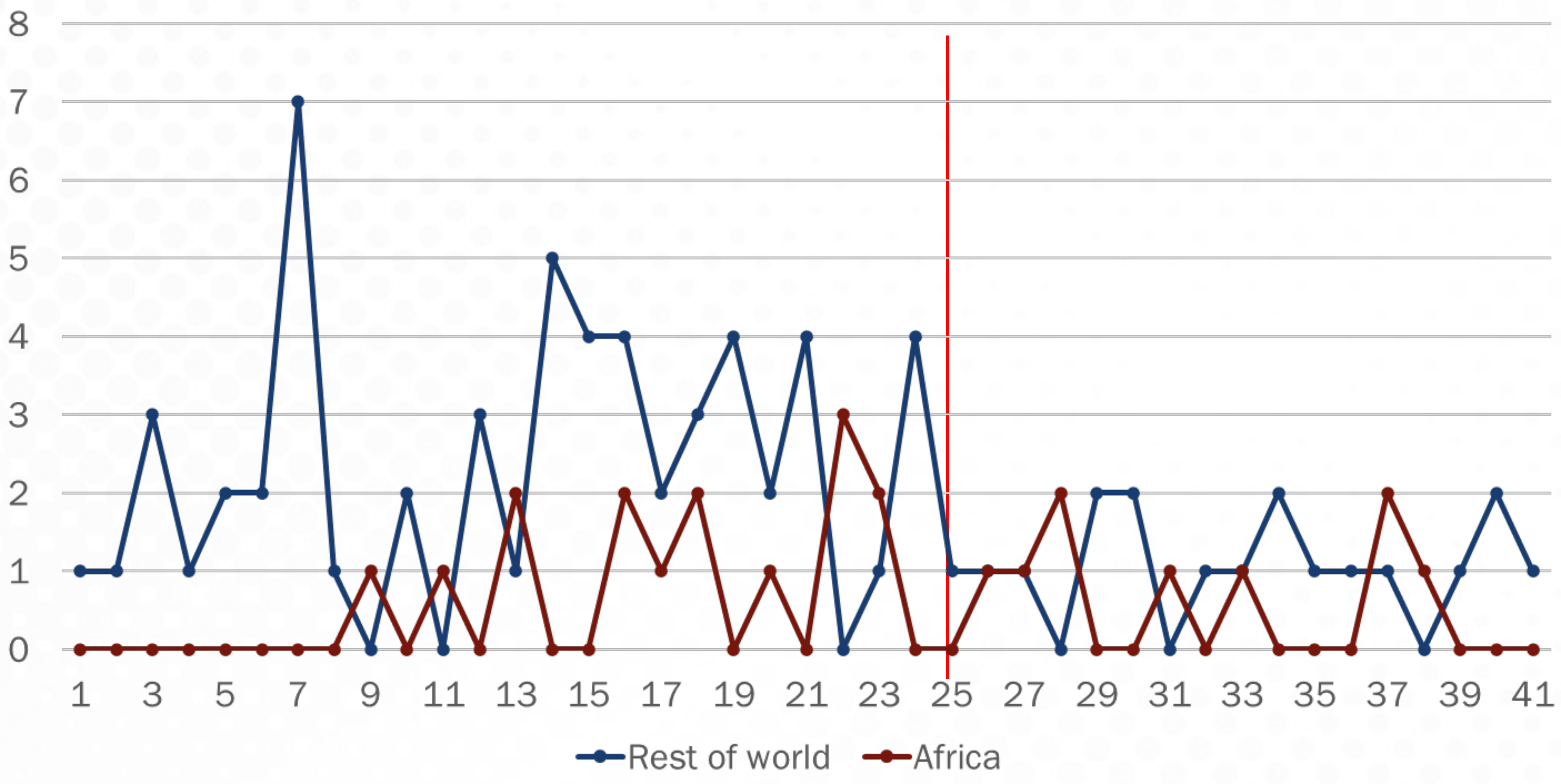
Globally:

99 inspections received “LTS” ratings.

2501 Recommendations

615 High priority

Data not so easy to interpret due to smaller sample size.



Questions?

Thank you

COFFEE BREAK

BEST PRACTICES FOR GETTING AND MAINTAINING A "GOOD" RATING: THE CASE OF GESTOCI

SOMMAIRE

I. DEPOTS - TPAV

GESTOCI has **3 depots** :

1. **TPAV** (Abidjan : 327 000 m3)
2. **Yamoussoukro** (60 000 m3)
3. **Bouaké** (inoperative)

I. DEPOTS - TPAV

TPAV:

- GESTOCI's main depot
- Built in 1983 on 33 hectares
- One of the largest depot in West Africa with a storage capacity of 327,000 m3
- Mission: maintain customers' products quality and quantity
- Gasoline, Gasoil, JET A-1

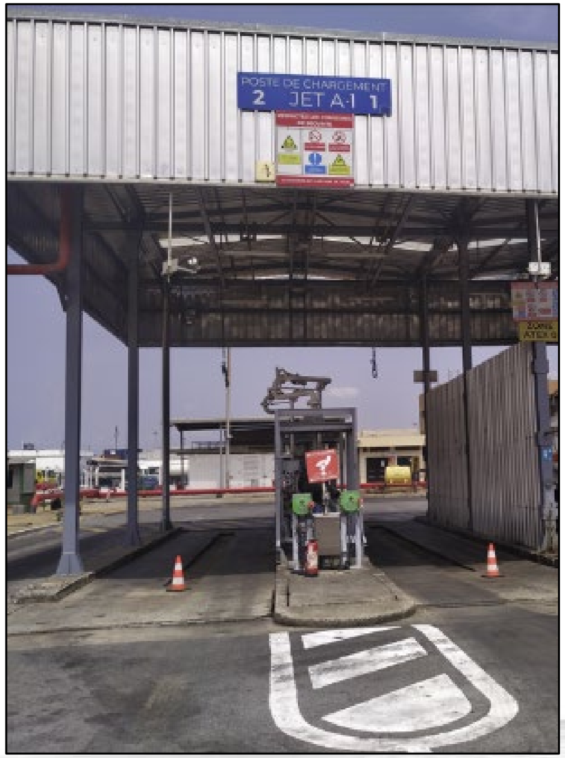
DDO, Fuel , LPG, Bitumen, Cut back

II. FACILITIES

- Receiving Products from several sources
- 22 storage tanks and spheres (327,000 m³)
- Shipment to Yamoussoukro depot via Pipeline
- 01 white products truck-loading rack with 06 gangways or 12 lanes
- 01 Black products Truck loading rack (4 lanes)
- Bunkering operation / Loading and unloading of vessels
- 01 butane truck loading rack (4 tracks)

II. FACILITIES

- 2 fixed-roof tanks with suction and floating screen dedicated to Jet A-1
- 01 Jet wagons loading rack dedicated to Jet A-1 (01 loading lane)
- 01 Jet truck loading rack dedicated to Jet A-1 (02 loading lanes)



III. RESULTS AND SUCCESS

- **Single grade pipeline for each**:
  - Receipt
  - loading

- **Automated loading system :**
  - Tank truck loading flow rate = 122 m³/h
  - Tank wagon loading flow rate = 90 m³/h
  - Loading of approximately 300 tank trucks/day
- **Connection to the docks**
  - (flow rate of 750 m3/h, 12,500 liters/min): 24 hours to unload 10,000 m3 from a ship
- **Triple certification: ISO 9001, ISO 45001, and ISO 14001**
- **“GOOD” rating during JIG inspection since 2022**

IV. JIG HISTORY AT GESTOCI

FROM 2013

- Development of the BCP in the aviation HRS depot of multinational companies (CORLAY, OLA ENERGY, TOTALENERGIES, VIVO ENERGY).
- The TPAV is seen as an alternative to SPCI's depots for supplying the airport, in case of emergency

FROM 2017

- **Annual visit of TPAV** by JIG inspectors
- inspectors' sensitization for best practices relating to JET A-1 operations

IV. JIG HISTORY AT GESTOCI

DATE	RATING	NUMBER OF PRIORITY		
		High	Normal	Total
14/11/2017	LESS THAN SATISFACTORY	04	23	27
19/06/2018	LESS THAN SATISFACTORY	00	50	50
19/03/2019	LESS THAN SATISFACTORY	03	56	59

V. JIG HISTORY AT GESTOCI

03/19/2019 JIG INSPECTION REPORT

DATE	RATING	NUMBER OF PRIORITY		
		High	Normal	Total
19/03/2019	Less than Satisfactory	**03**	**56**	59

59 recommendations, 3 of which were deemed Critical (High Priority)
The recommendations ranged from the **most basic**: registration on the JIG platform, purchase of the JIG /1530 EI Manual, EI1542 identification on the lines, absence of deadman's valve, emergency stop, analysis and comparison during acceptance, team training, archiving and keeping of records, etc.)
To the most critical (high and very high level alarms with control valves, the 3rd Edition separator filter decommissioned in 2008, failure to highlight explosivity control during hot work).

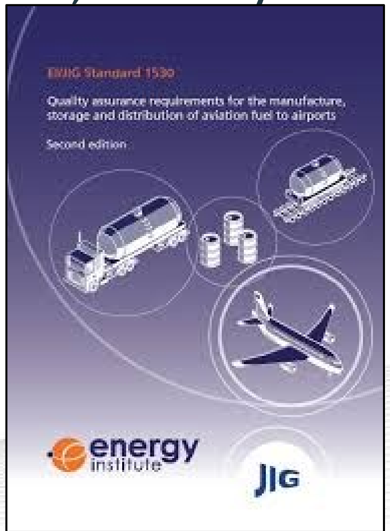
V. BEST PRACTICES

How did TPAV go from a "LESS THAN SATISFACTORY"rating to "GOOD"?

How did TPAV maintain its "GOOD " rating for the fourth consecutive time?

STRATEGY IN PLACE

- Commitment and involvement of the General Management (effective presence at monitoring meetings and systematic release of requested budgets).
- Designation of a JIG Coordinator (Operational responsibility: Head of depot)
- Application to register for JITS (JIG Inspection Tracking System) platform
- Purchase of the EI/JIG 1530 manual (the companion)
- Benchmarking with Ivorian Major (OLA, TOTAL , VIVO, HRSS)
- Creation of a multidisciplinary team (Technical, Operations, Safety and Environment, Internal Control Audit, etc.)
- Assignment of recommendations to responsible entities.
- Definition of action plans and evaluation of related budgets
- Determining the timeframe for implementation



STRATEGY IN PLACE

- Weekly follow-up meeting (Thursday)
- systematic release of requested budgets).
- Conducted a practice JIG inspection (04 October 2019): preparation and consideration of recommendations not retained during previous inspection.
- Regular field visits with hierarchy to assess the progress of the implementation of the recommendations (every 2 weeks)
- All recommendations are closed except those that were not under our control (customer action) or required long lead times for action (show evidence of consideration and outstanding orders).

JIG INSPECTION REVIEW 24/10/2019

DATE	NOTE	NUMBER OF RECOMMENDATIONS		
		Review	Normal	Total
24/10/2019	Satisfactory	01	16	17

RATING : SATISFACTORY

Reduced from 59 recommendations to 17, **a reduction of 71.19%** with only one Critical recommendation relating to high and very high level alarms (mitigation solution: definition of safety height and ongoing action)

16 minor recommendations (archiving procedure, testing equipotential connections, maximum flow test with 2 trucks, loading hose, Gap assessement, procedure for continuity plan, PLC connection, single tank truck,...)

STRATEGY IN PLACE

- Regular exchange with the inspectors who visited us
- Assignment of recommendations to responsible entities and Weekly follow-up meeting (Thursday evening)
- Commitment and involvement of the General Management (Regular field visits to assess progress in implementing recommendations
- Implementation of MOC
- Working session with FACET experts
- Application to customers of the requirements of EI/JIG 1530 2nd Edition
- All recommendations closed

SELF ASSESSMENT JIG 26/05/2021 / - GESTOCI

DATE	NOTE	NUMBER OF RECOMMENDATIONS		
		Review	Normal	Total
26/05/2021	**No Rating**	00	12	12

In view of the health crisis, a remote inspection was carried out to ensure that the implementation of the recommendations was followed up.

We have identified 12 recommendations, all of them minor.

JIG INSPECTION REPORT 15/06/2022

DATE	NOTE	NUMBER OF RECOMMENDATIONS		
		Review	Normal	Total
15/06/2022	GOOD	00	08	08

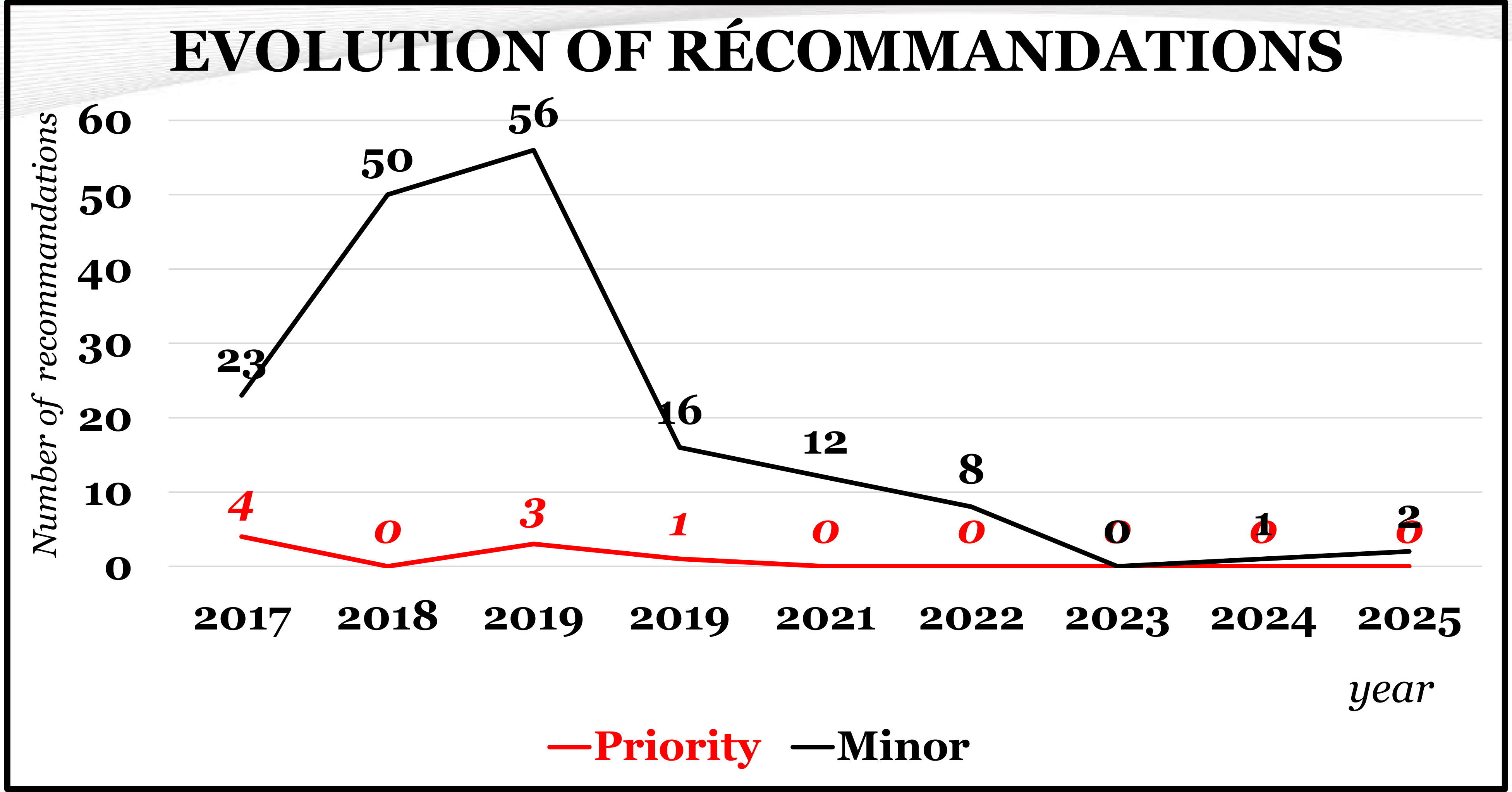
RATING : GOOD

08 recommendations in all, all minor.

For the first time in our history we have a GOOD rating

INSPECTION JIG GESTOCI 2017 to 2025

DATE	RATING	NUMBER DE RECOMMANDATIONS		
		CRITICAL	MINOR	Total
2017	Less than Satisfactory	04	23	27
2018	Less than Satisfactory	00	50	50
2019	Less than Satisfactory	03	56	59
2019	Satisfactory	01	16	17
2021	Self assessment	00	12	12
2022	GOOD	00	08	08
2023	GOOD	00	00	00
2024	GOOD	00	01	01
2025	GOOD	00	02	02



LESS THAN SATISFACTORY(S)	S	GOOD

VI. EI/JIG 1530 IMPLEMENTATION BENEFITS

SOME RESULTS

TRIPLE ISO CERTIFICATIONS

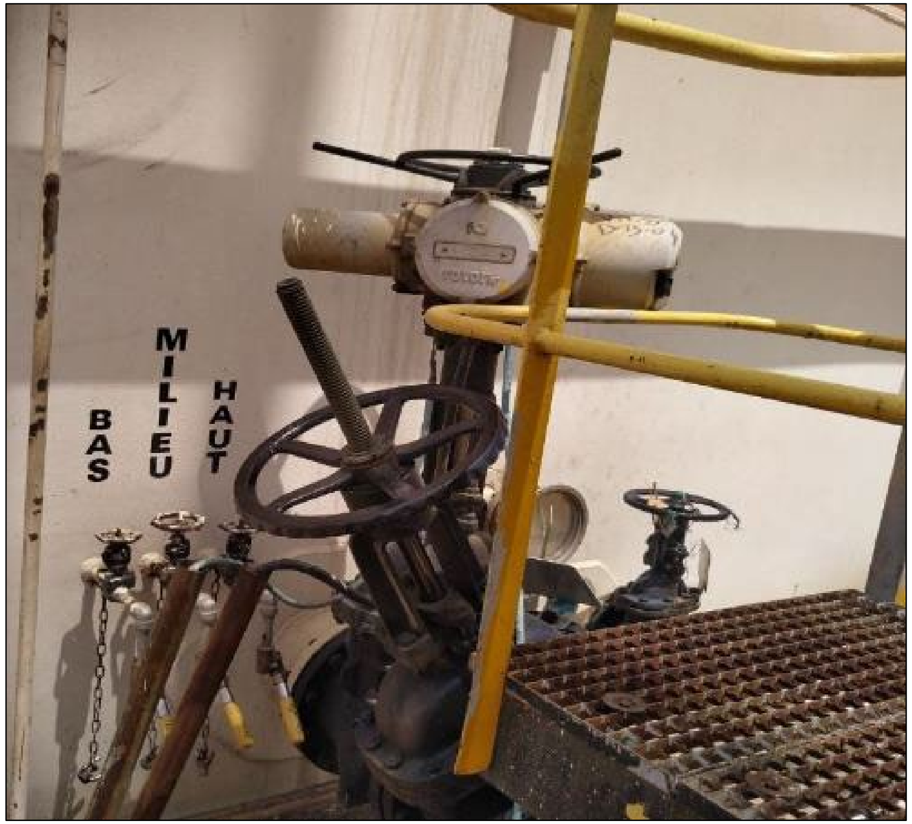
SUSTAINED PERFORMANCE AWARD

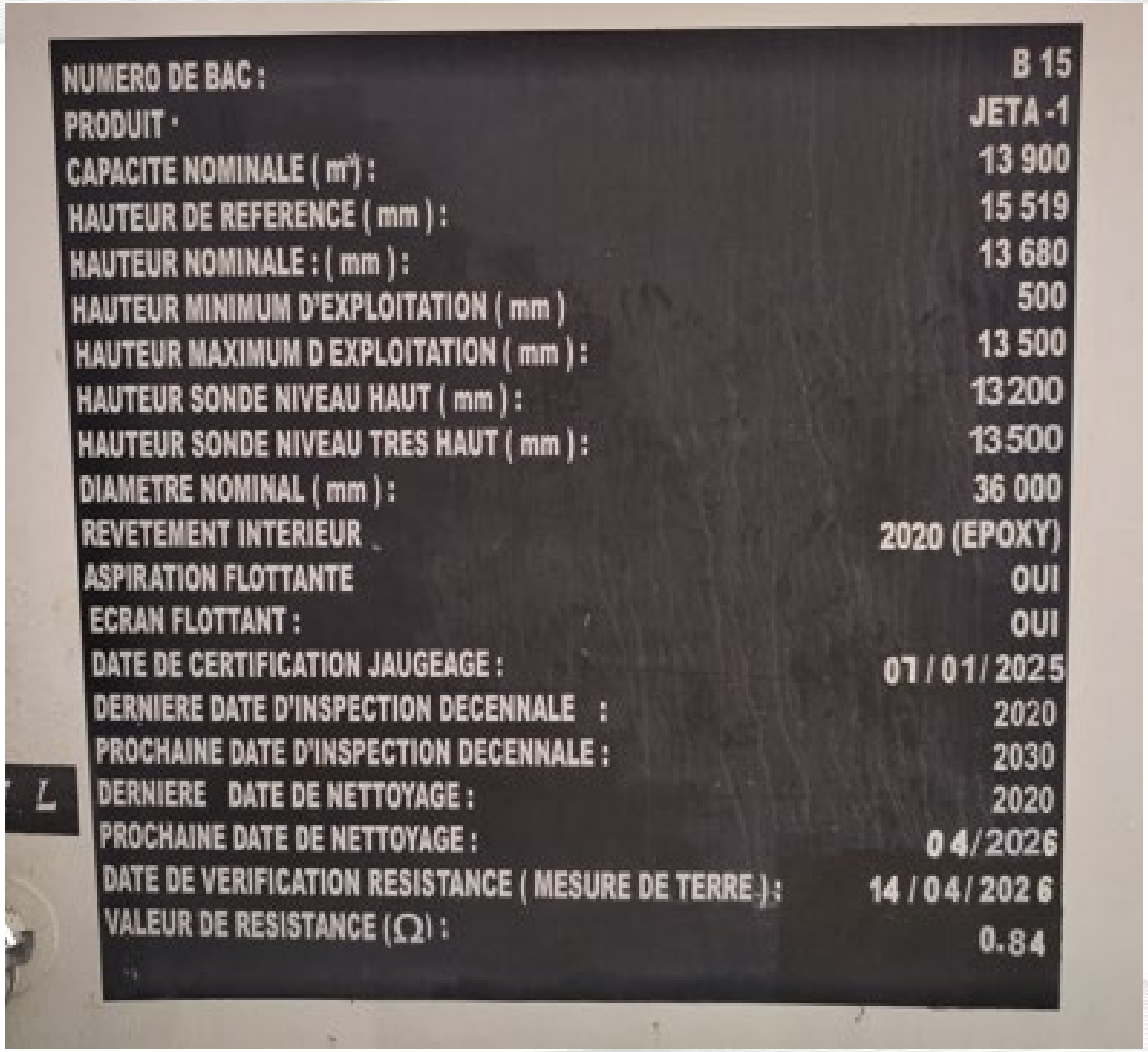
SOME RESULTS

- National Award of Excellence for the Best Oil Facility in Côte d'Ivoire
- JET A-1 fuel supply to the national airport
- Improved HSSE managementAttractive depot appearance (housekeeping/signage)
- Reputation, increased market share, and competitiveness

Below are some images of the current facilities (TPAV)


JETA-1
B15
SERVICE
JET A-1


BAS
MILIEU
HAUT


NUMERO DE BAC : B 15
PRODUIT : JETA-1
CAPACITE NOMINALE (m³) : 13 900
HAUTEUR DE REFERENCE (mm) : 15 519
HAUTEUR NOMINALE : (mm) : 13 680
HAUTEUR MINIMUM D'EXPLOITATION (mm) 500
HAUTEUR MAXIMUM D EXPLOITATION (mm) : 13 500
HAUTEUR SONDE NIVEAU HAUT (mm) : 13200
HAUTEUR SONDE NIVEAU TRES HAUT (mm) : 13500
DIAMETRE NOMINAL (mm) : 36 000
REVETEMENT INTERIEUR 2020 (EPOXY)
ASPIRATION FLOTTANTE OUI
ECRAN FLOTTANT : OUI
DATE DE CERTIFICATION JAUGEAGE : 07 / 01 / 2025
DERNIERE DATE D'INSPECTION DECENNALE : 2020
PROCHAINE DATE D'INSPECTION DECENNALE : 2030
DERNIERE DATE DE NETTOYAGE : 2020
PROCHAINE DATE DE NETTOYAGE : 04/2026
DATE DE VERIFICATION RESISTANCE (MESURE DE TERRE) : 14 / 04 / 2026
VALEUR DE RESISTANCE (Ω) : 0.84


JET A-1

SOCIÉTÉ DE GESTION DES STOCKS PÉTROLIERS DE CÔTE D'IVOIRE

GESTOCI

MERCI DE VOTRE ATTENTION

THANK YOU for your attention.

HSSE COMMITTEE

Luke Hutson

HSSE COM – Your Members

HSSE COMMITTEE

ROBERT FINCH - CHAIR

Q8 Aviation

ALEXANDER QUELLE

Shell Aviation

SHARJIL REHAN

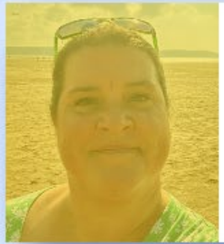
Chevron

MICHELINE BRIVAL-AGAT

TotalEnergies

LAURA FORNASIERO

Levorato Marcevaggi



SARAH WEEDON

Air BP

GIOVANNI ALLEGRETTA

Enilive S.p.A.

MUHAMMAD AZAM SIDDIQUI

APSCO

JENNY BROMPTON

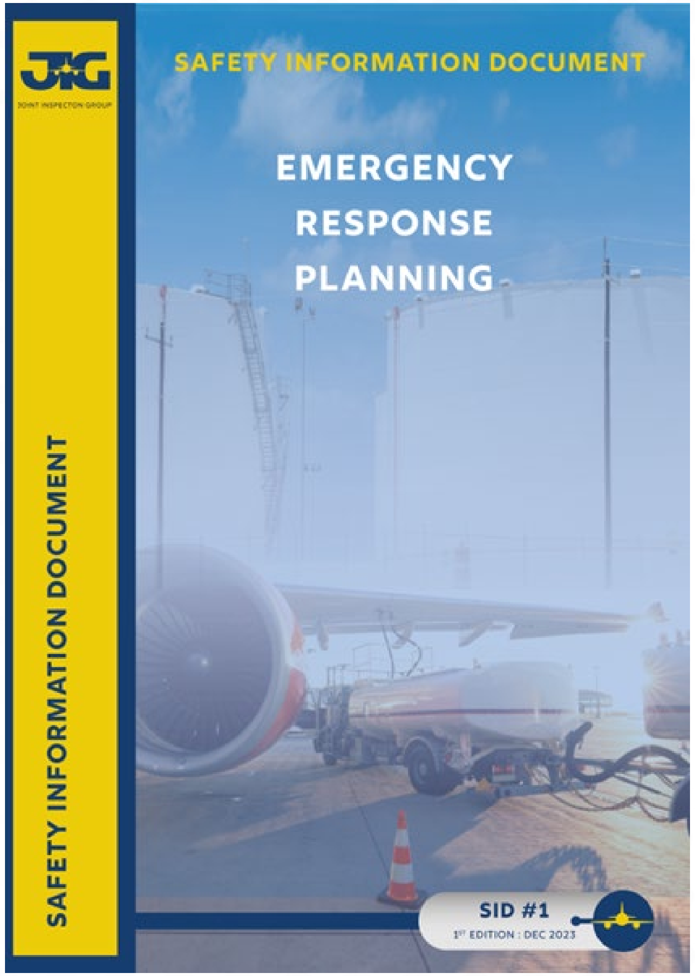
Menzies Aviation

Committee Update

HSSE COM – Safety Information Document

First Safety Information Document Published June 2025

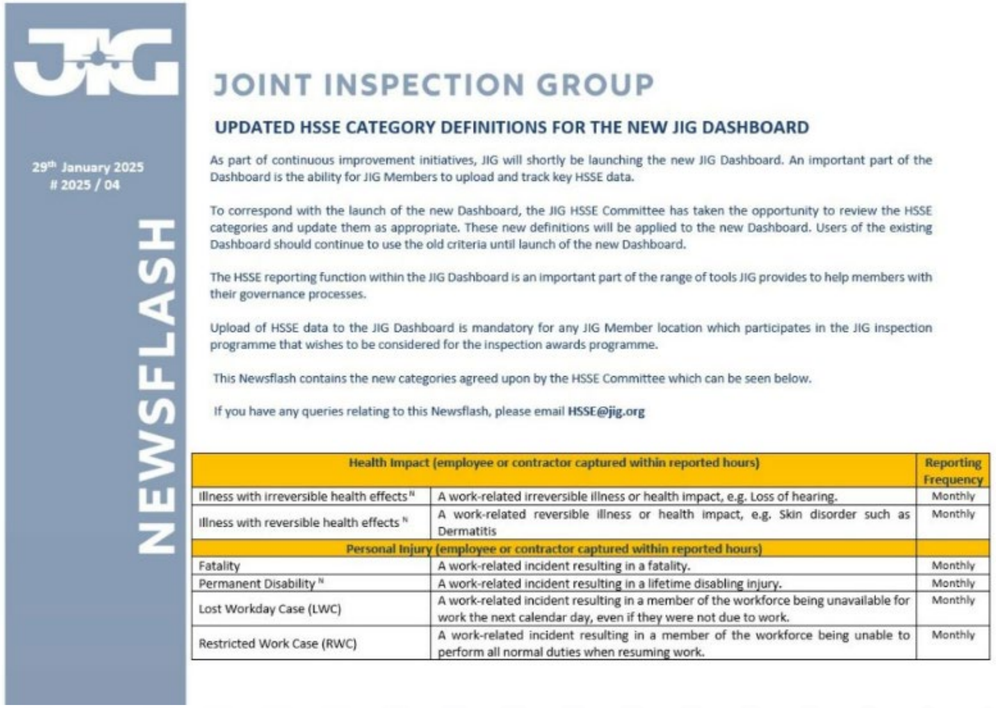
Written to give further guidance to operators of aviation fuel handling facilities on how to create and update site-specific Emergency Response Plans (ERP).



HSSE COM – JIG Dashboard HSSE Categories

To correspond with the launch of the new Dashboard, the Committee took the opportunity to review the HSSE categories and update them as appropriate.

The new definitions have been applied to the new Dashboard.



NEWSFLASH

29th January 2025
2025 / 04

JOINT INSPECTION GROUP

UPDATED HSSE CATEGORY DEFINITIONS FOR THE NEW JIG DASHBOARD

As part of continuous improvement initiatives, JIG will shortly be launching the new JIG Dashboard. An important part of the Dashboard is the ability for JIG Members to upload and track key HSSE data.

To correspond with the launch of the new Dashboard, the JIG HSSE Committee has taken the opportunity to review the HSSE categories and update them as appropriate. These new definitions will be applied to the new Dashboard. Users of the existing Dashboard should continue to use the old criteria until launch of the new Dashboard.

The HSSE reporting function within the JIG Dashboard is an important part of the range of tools JIG provides to help members with their governance processes.

Upload of HSSE data to the JIG Dashboard is mandatory for any JIG Member location which participates in the JIG inspection programme that wishes to be considered for the inspection awards programme.

This Newsflash contains the new categories agreed upon by the HSSE Committee which can be seen below.

If you have any queries relating to this Newsflash, please email **HSSE@jig.org**

Health Impact (employee or contractor captured within reported hours)		Reporting Frequency
Illness with irreversible health effects N	A work-related irreversible illness or health impact, e.g. Loss of hearing.	Monthly
Illness with reversible health effects N	A work-related reversible illness or health impact, e.g. Skin disorder such as Dermatitis	Monthly
Personal Injury (employee or contractor captured within reported hours)		
Fatality	A work-related incident resulting in a fatality.	Monthly
Permanent Disability N	A work-related incident resulting in a lifetime disabling injury.	Monthly
Lost Workday Case (LWC)	A work-related incident resulting in a member of the workforce being unavailable for work the next calendar day, even if they were not due to work.	Monthly
Restricted Work Case (RWC)	A work-related incident resulting in a member of the workforce being unable to perform all normal duties when resuming work.	Monthly

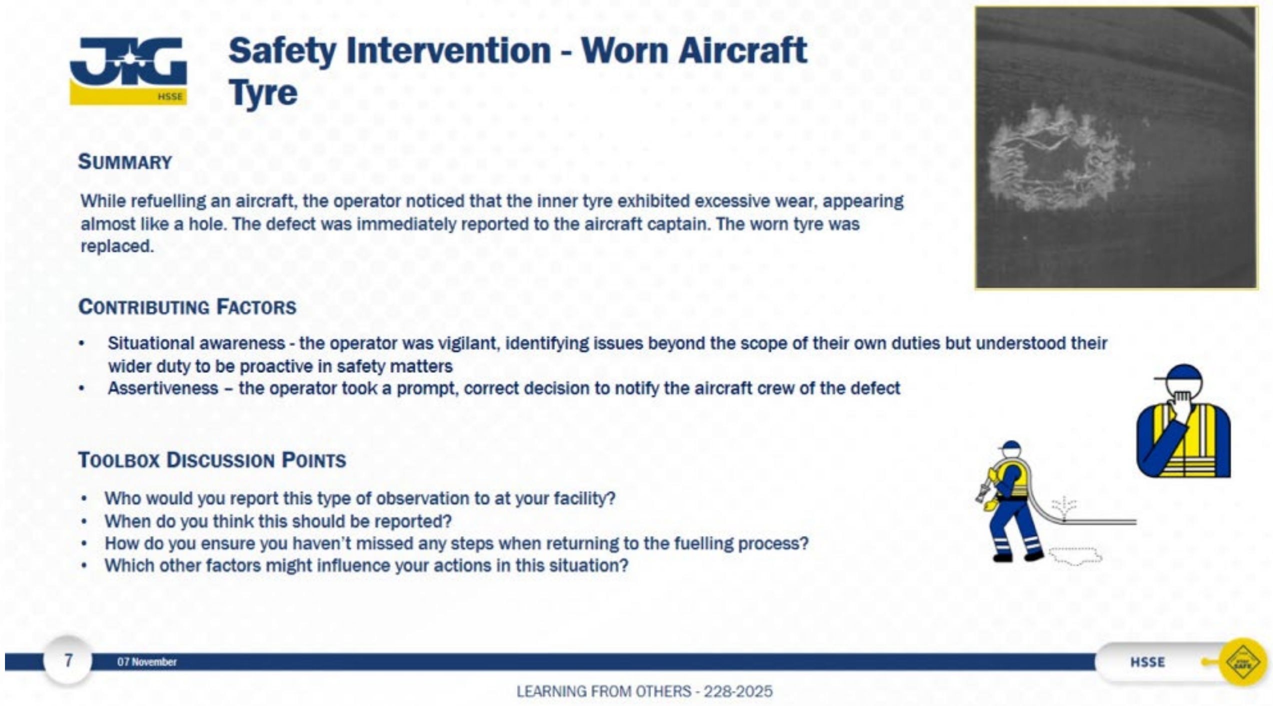
HSSE COM – Learnings From Others

2 LFO Packs published in 2025:

- ❑ 37
- ❑ 38

Each pack includes 6 anonymised occurrences
For each occurrence, the HSSE Com suggests:

- Contributing factors
- Toolbox discussion points
- Now include 'Safety Interventions'



Safety Intervention - Worn Aircraft Tyre

SUMMARY

While refuelling an aircraft, the operator noticed that the inner tyre exhibited excessive wear, appearing almost like a hole. The defect was immediately reported to the aircraft captain. The worn tyre was replaced.

CONTRIBUTING FACTORS

- Situational awareness - the operator was vigilant, identifying issues beyond the scope of their own duties but understood their wider duty to be proactive in safety matters
- Assertiveness – the operator took a prompt, correct decision to notify the aircraft crew of the defect

TOOLBOX DISCUSSION POINTS

- Who would you report this type of observation to at your facility?
- When do you think this should be reported?
- How do you ensure you haven't missed any steps when returning to the fuelling process?
- Which other factors might influence your actions in this situation?

7 07 November HSSE

LEARNING FROM OTHERS - 228-2025

2026 – Plans

2026 PLANS #1

Update JIG HSSE MS Standard

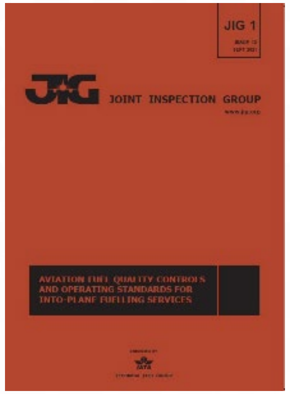
- ➢ Make more auditable
- ➢ Clearer wording to aid implementation
- ➢ Enhanced environmental management
- ➢ Alignment with ICAO Annex 19

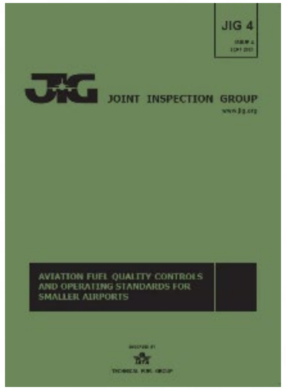
- ➢ Final draft developed
    - Included a review of Element Aims
    - Some changes to Element titles
    - Element structure remains unchanged
    - Some expectations moved/combined

2026 PLANS #2

Other Standards Review

- ➢Review the PPE appendix for JIG 1, 2, 4
- ➢JIG 4 Section 2 review





2026 PLANS #3

Safety Information Document

- Improve guidance on HSSE MS Standard for sites where audits reveal weaknesses

- **SID #2 2026 – Implementing Process Safety**

2026 PLANS #4

LFO PACKS

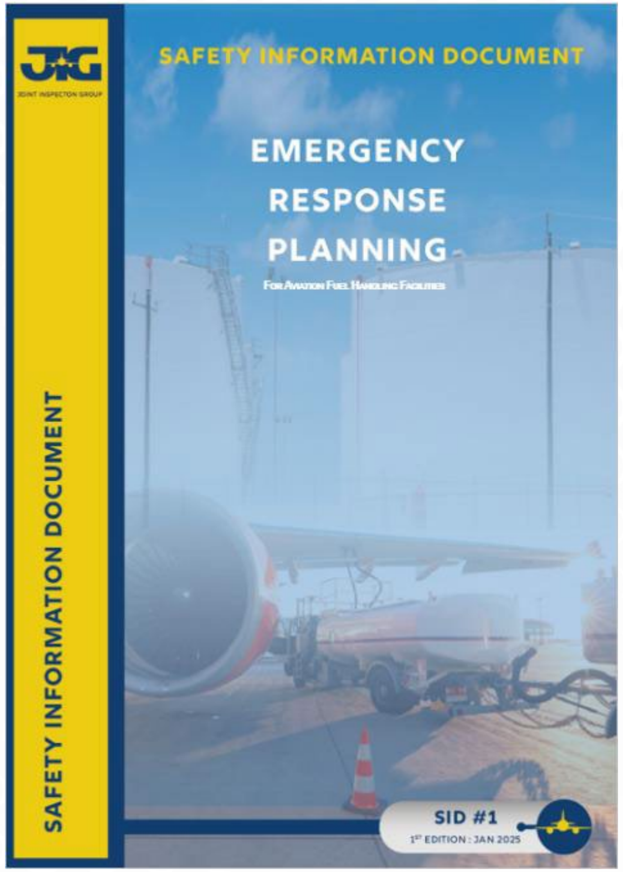
- Please help us to continue this work by sending examples of your incidents to the HSSE Committee using the Template Provided.
- https://www.jig.org/safety-hsse/learning-from-others/

- All submissions are treated with full confidentiality and anonymity.

HSSE COMMITTEE – SID#1 Recap

Lee Taylor
JIG, HSSE Committee

Emergency Management



Published in January 2025

• Provides guidance for aviation fuel handling facilities on developing and maintaining Emergency Response Plans
• Supports sites in preparing for and responding to credible emergency scenarios

Link to the JIG HSSE Management System and Audits

• Supports JIG HSSE MS Element 11 Emergency Management
• Element 11 requires structured emergency planning and documented procedures
• Ensures facilities are prepared to protect people, environment and operations during emergencies

Connection to JIG inspections

• JIG inspections verify that facilities have written emergency procedures for credible scenarios such as equipment failure, aircraft incidents, spills or fire
• Emergency procedures must be available, understood by personnel and regularly reviewed

Emergency Management

Emergency management requires different plans that address response, escalation and continuity of operations.

Emergency Management

Business Continuity Plan

a plan which describes how to continue operations if the business is affected by adverse conditions or events that deprive it of key operations assets

Emergency Response Plan

Plans for reasonably foreseeable emergencies based on the risk profile

Crisis Management Plan

to be deployed if the emergency becomes severe enough that the site needs outside help to manage it

These plans work together to manage incidents from initial response through to recovery.

Developing an Effective Emergency Response Plan

Use the Business Risk Assessment method to identify realistic Risks and Events for the Site

Use Experts if needed to understand good practice for management of identified events

Adapt the good practice to reflect the actual layout and assets of the Site

Training
- Training Requirement for employees and Contractors

ERT
- List the Employees and the Contractors, if needed, in the Emergency Response Team (ERT)

Equipment
- List of equipment the ERT or support services will need to manage the event.

Exercises
- Design Emergency Exercises to verify the effectiveness of ERP

- Emergency Response Plans must be practical and easy to use during an incident
- Plans should reflect the specific risks, layout and operations of the site
- Clear roles, responsibilities and communication during an emergency
- Coordination with airport authorities, emergency services and other stakeholders
- Regular training and exercises ensure the plan works in practice

HSSE

4 Minimum Expectations

ERP Introduction
Description of the facility
Hazardous Area Classification dwg
Key local interfaces (Airport Authority, Fire Services, etc..)

Immediate Response Team
Personnel available
Ext. Emerg. Resources (e.g. airport)
Experience/skills and training of the employees (job description) and contractors

Immediate Response (the First 10 Minutes)
First response (alarm, fuel s/d, evacuation)
Expected actions of the first responder
Who is expected to do what

Evacuation Procedures
First priority to protect the people
How the site knows who is on the premisis
List of the safe locations (assembly point, other)

Content of Emergency Response Plans
Write appropriate plan
Specific scenarios (not generic)
Hand back (how the site returns to normal operations)

Emergency Site Diagram
Critical Safety Drawings
For ITP only a plot plan (office, emergency, assembly points, vehicle parking, etc..)
Easy access to the assembly points

Lists and Locations of Emergency Equipment
List of Emergency Equipment required
Firefighting eq. (including the required inspection/maintenance)
Any Mutual Aid Agreement from others

Emergency Contact Lists
List of Emergency contacts (24/7 phone numbers) – updated and tested!
Emergency Room or Media Room (CMP)

Incident Notification and Escalation Guides
Notification guidelines (when, how, who?)
Notification guidelines for local communication
Community Awareness Procedure (educate and inform local community)

Emergency Response Exercise Programs

For Large Airport Operations operating to JIG 1 & 2 or facility operating to EI/JIG Standard 1530:

- 1 evacuation drills
- 1 field exercise
- 1 desktop exercise;

For Small Airport Operations operating to JIG 4:

- 1 field exercise or desktop exercise;

5 Response Exercises

- There are three basic types of exercise that Sites can undertake.

- They are different in complexity and purpose, and the frequency at which they should be used depends upon a Site's size, complexity and level of expected risk.

Evacuation Drills

The simplest exercise is an evacuation drill which is designed to test the evacuation and assembly procedure, including the proper accounting for all persons on-site

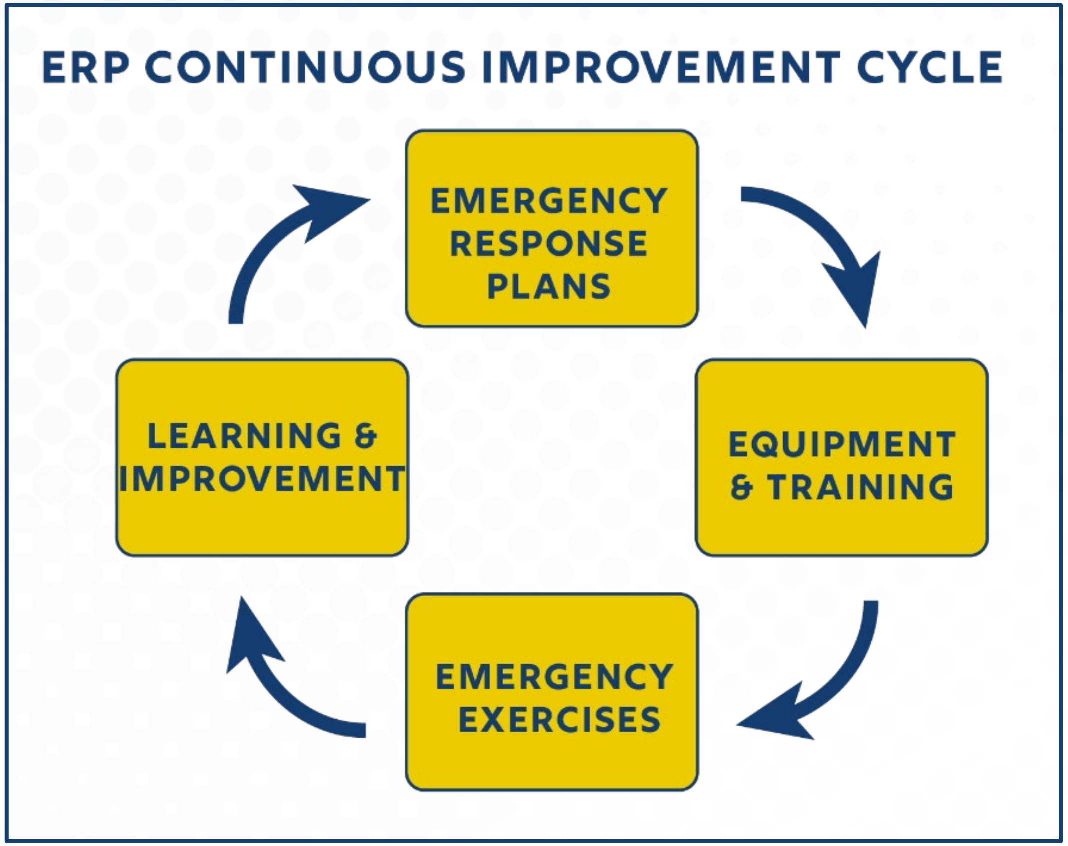
Desktop Exercise

Desktop exercises do not involve the deployment of personnel or equipment. They help familiarise employees with the Emergency Response Team, their roles, the Emergency Response Plan, available resources, escalation procedures and interfaces with other organisations.

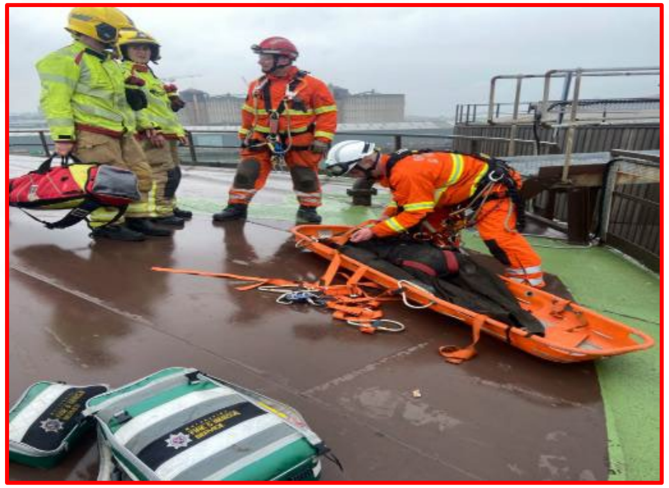
Field Exercises

A field exercise focusses on the response to a specific event or consequences of an event. It is generally "hands-on" (practical) activity based and includes the deployment and use of emergency response equipment and personnel that shall inevitably be involved.

5 Response Exercises



6 Review and Update



In order to maintain their effectiveness and ensure that they remain appropriate for the activity level of the site, the ERP should be reviewed as follows:

- Scenarios annually and/or during the annual B.R.A. review by the site management.
- ERP content, annually to check relevance and accuracy, especially of contact lists, equipment lists and drawings.
- Whenever there are changes to site infrastructure or organisation.
- After the conclusion of emergency exercises

Note that you may share the lessons learnt with the JIG HSSE Committee for further benefits to be provided to the JIG Members.

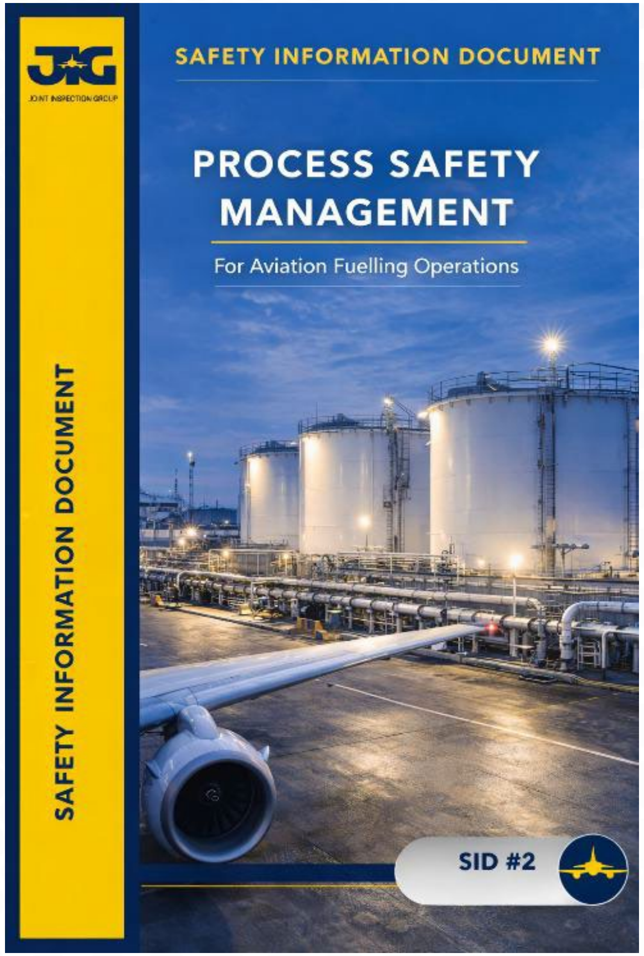
HSSE COMMITTEE – SID#2

HSSE Committee

Agenda

1. Introduction and Purpose
2. What is Process Safety Management
3. Process Safety Management Elements
4. Process Safety Fundamentals (PSFs)
5. Hazards, Barriers and Controls
6. Learning from Incidents & Continuous Improvement
7. Key Messages

Introduction and Purpose



Purpose of SID #2

- ❑ Promote consistent understanding of Process Safety Management across JIG Operations
- ❑ Support fuel depot and into-plane managers in maintaining safe systems
- ❑ Reinforce behaviours that protect barrier integrity
- ❑ Strengthen the effective use of existing JIG HSSE processes

*Process safety is about **preventing major incidents**, not replacing existing procedures.*

What is Process Safety Management (PMS)

Process Safety Management is the systematic management of systems, procedures and behaviours that ensure hazardous substances remain safely contained, preventing unplanned releases that could lead to major incidents.

⚙ Systems
Storage tanks, pipelines, hydrant systems, pumps and valves designed to safely contain and control fuel.

📄 Procedures
Operating limits, maintenance, inspections and management of change that ensure systems are operated safely.

👤 People
Competence, communication and operational discipline to recognise hazards and protect process safety barriers.

Process safety management is about maintaining control of fuel systems to prevent major incidents.

Occupational Safety vs Process Safety

Occupational Safety (Personal)

Focuses on incidents which may impact workers or those nearby and protecting the safety, health and welfare of people at work

🎯 **Focus:**
The Individual

⚠ **Hazards:**
Slips, Trips, Falls, Cuts

🔁 **Frequency/Severity**:
High/Low

🎯 **Key Metric:**
LTI/TRIR (injury Rates)

Process Safety (Asset)

Focuses on major accident hazards associated with releases of energy, chemicals and other hazardous substances.

🎯 **Focus:**
The System/Asset

⚠ **Hazards:**
Explosions, Fires, Leaks

🔁 **Frequency/Severity**:
Low/High

🎯 **Key Metric:**
LOPC / Maintenance backlog

The Baker Paradox: Having a low personal injury rate does NOT mean you are safe from a major process incident

Why Process Safety Matters in Aviation Fuelling

- Prevention of catastrophic incidents
- Managing high-risk fuel systems
- Supporting the safety management system
- Maintaining safe and reliable operations

Process safety protects people, assets and operations by preventing loss of containment.

Core Principles for Managing Process Safety

Leadership commitment
Set expectations and reinforce safe behaviours.

Communication and handover
Share clear and accurate information.

Roles and responsibilities
Understand responsibilities and escalate issues.

Competence and hazard awareness
Understand hazards and recognise deviations.

Operational discipline
Follow procedures and operating limits.

Speaking up
Question abnormal conditions and escalate concerns early.

https://www.iogp.org/bookstore/product/operating-management-system-framework-for-controlling-risk-and-delivering-high-performance-in-the-oil-and-gas-industry/

Typical Process Safety Exposures areas

Equipment and Maintenance Failures

• Poor maintenance, incorrect installation or degraded equipment can lead to fuel leaks or system failure.

Fuel System Failures

• Failures in fuel transfer systems, pumps, valves or hydrant equipment can result in loss of containment.

Deficiencies in Procedures or Documentation

• Inaccurate or unclear procedures can lead to incorrect operations or maintenance activities.

Improper Management of Change

• Changes to equipment, procedures or operating conditions can introduce new hazards if risks are not assessed.

Equipment Reliability Issues

• Ageing equipment, corrosion or component failure can weaken barriers and increase the risk of fuel release.

Process safety exposures arise when equipment, procedures or operational controls fail.

Process Safety Fundamentals (PSF)

- ❑ Based on lessons from serious industry incidents
- ❑ Ten fundamentals guiding everyday behaviours
- ❑ Complement Life Saving Rules
- ❑ Apply across storage, hydrant, transfer and into plane operations
- ❑ Build awareness of major hazards and abnormal conditions
- ❑ Encourage people to speak up early

https://www.iogp.org/bookstore/product/process-safety-fundamentals/

The 10 Process Safety Fundamentals

https://www.iogp.org/bookstore/product/process-safety-fundamentals/

How to use the Process Safety Fundamentals

Toolbox talks & Safety meetings

Can we learn from incidents that involved a PSF not being followed?

Pre-job planning

- How are the PSF applicable to the work we are doing today?
- What needs to be in place?
- Is everything in place, and in good working condition?

Last minute risk assessment

- Have I done all the PSF actions relevant before the job?
- Are there any Line of Fire hazards or ignition sources we didn't identify?

Post-job reviews

- Did we take all the actions associated with the PSF?
- What went well? What didn't go well?

Observations & walkabouts

- Are they following it?
- Yes? Great, recognise it!
- No? Intervene!
- If someone brings up a PSF dilemma, thank them and show them you will take it seriously.

Intervention

- Intervene or stop the work if a PSF is not being followed

How hazards are identified

Hazard Identification Studies

- Structured hazard reviews examine how systems could deviate from intended operation
- Techniques such as HAZOP analyse fuel systems, storage and transfer operations
- Identify potential hazards, consequences and existing safeguards

Risk Assessment

- Operational risks reviewed using structured risk assessment processes
- JIG Business Risk Assessment helps identify hazards in storage, hydrant and into-plane activities
- Highlights where additional controls or attention may be required

Operational Experience and Learning

- Incidents, near misses and abnormal conditions highlight potential hazards
- Investigations help identify weaknesses in barriers, procedures or equipment
- Lessons learned help prevent recurrence across operations

Management of Change

- Changes to equipment, procedures or operating conditions can introduce new hazards
- The Management of Change process ensures risks are reviewed before implementation
- Helps prevent unintended consequences from operational changes

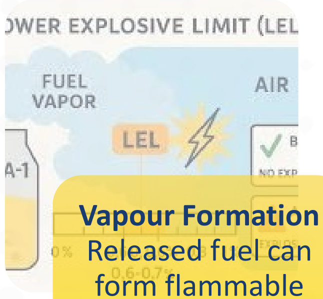
Hazards can be identified during design, day-to-day operations and when changes occur.

How Process Safety Hazards Escalate

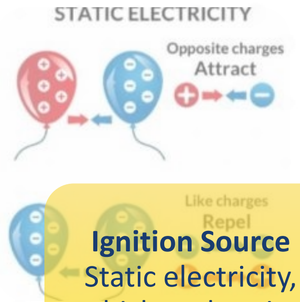
Hazard
A deviation from normal conditions occurs, such as

incorrect valve position, equipment failure or operational error.

Loss of Containment
Fuel escapes from tanks, pipelines, hydrant systems, hoses or vehicles.



Vapour Formation
Released fuel can form flammable vapors, particularly in confined or poorly ventilated areas



Ignition Source
Static electricity, vehicles, electrical equipment or hot surfaces can ignite fuel vapours

Major Incident
Escalation may lead to fire, explosion, environmental damage or operational disruption

Major incidents usually occur when hazards escalate and barriers fail.

Process Safety Barrier and controls

Engineering Barriers

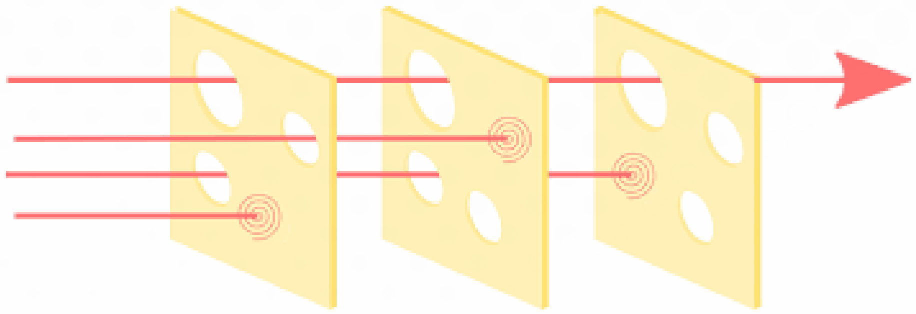
- Physical systems designed to prevent loss of containment or detect abnormal conditions
- Examples include tank overfill protection, pressure relief systems, alarms and shutdown systems

Procedural Barriers

- Operating procedures and work processes that help ensure systems are operated safely
- Includes operating limits, inspection routines, permits and maintenance activities

Human and Behavioural Barriers

- Competence, communication and operational discipline help ensure hazards are recognised and addressed
- Includes effective shift handover, reporting abnormal conditions and stopping work when safety is uncertain



Multiple barriers are required to prevent hazards from escalating into major incidents.

Management of Change (MoC)

JIG HSSE MS Element 8 : Management of change

The What

- A systematic process in assessing risk before changes are implemented
- To ensure changes do not occur without proper considerations

The Why

- Uncontrolled change is a common cause of major incidents.

The Change

- Equipment
  Operating conditions
  Procedures

Uncontrolled or poorly managed change is a common factor in major incidents.

Operating Safety Day to Day

Stay Within Operating Limits

- This includes monitoring differential pressure (DP) and flow rates to ensure the system isn't overstressed.

Effective Communication and Handover

- Accurate shift handovers ensure important information is shared
- Communicate abnormal conditions, maintenance activities or system changes

Manage Interfaces Safely

- Coordinate activities with contractors, maintenance teams and third parties
- Ensure everyone understands the hazards and operating conditions

Recognise and Respond to Abnormal Conditions

- Leaks, alarm activations or unexpected readings require attention
- Use **Stop Work Authority** if conditions are unsafe or uncertain and escalate concerns

Strong operational discipline and clear communication help maintain the barriers that prevent major incidents.

Learning from Events

Learning from Buncefield: When Weak Signals are Missed

1. **Operating Limits (The "Stuck" Gauge)**
   The Signal: The Automatic Tank Gauge (ATG) stopped updating for hours.
   Operational Lesson: Any static or "frozen" reading is an abnormal condition that must be investigated immediately.
2. **Communication (The Shift Handover)**
   The Signal: Personnel were unaware of the total volume pumped from the pipeline during the night shift.
   Operational Lesson: Handovers must be formal and based on **hard data** (litres pumped vs. tank capacity).
3. **Interface Management (Pipeline & Depot)**
   The Signal: Inadequate coordination on pumping rates and stop-times between the pipeline operator and the depot.
   Operational Lesson: Safety is a shared responsibility across the **entire interface**; confirm work scope and emergency contacts before every transfer.
4. **Abnormal Conditions (The Vapour Cloud)**
   The Signal: A heavy, white vapour cloud formed 250m around the tank before ignition.
   Operational Lesson: Use your Stop Work Authority at the first sign of an unusual smell, noise, or sight.

Learning from Events

Learning from an Aviation Fuelling Incident: Hydrant Pit Fuel Fountain

1. **Operating Limits (Hydrant System Integrity)**
   The Signal: The hydrant coupler was struck, causing damage to a pressurised fuel system.
   Operational Lesson: Damage to hydrant equipment can result in immediate loss of containment.
2. **Emergency Shutdown (Hydrant Isolation)**
   The Signal: The hydrant pit lanyard valve could not be operated to stop the fuel release.
   Operational Lesson: Operators must know the location of the nearest hydrant Emergency Shut Down (ESD).
3. **Recognising Abnormal Conditions**
   The Signal: A fuel fountain approximately 6 metres high formed within seconds.
   Operational Lesson: Any unexpected fuel release must trigger immediate shutdown and escalation.
4. **Maintaining Barriers**
   The Signal: Damage to the hydrant coupler removed a key containment barrier.
   Operational Lesson: Protecting fuel system equipment is critical to preventing loss of containment

LFO170-2020

Pressurised hydrant systems can release large volumes of fuel rapidly. Immediate recognition and shutdown are critical to preventing escalation.

Learning from Events

LFO53-2015

Learning from an Aviation Fuelling Incident: Underground Pipeline Leak

Asset Integrity (Underground Pipeline)
The Signal: Fuel levels in the underground pipeline dropped rapidly during a pressure test.
Operational Lesson: Unexpected product loss during testing may indicate loss of containment and must be investigated immediately.

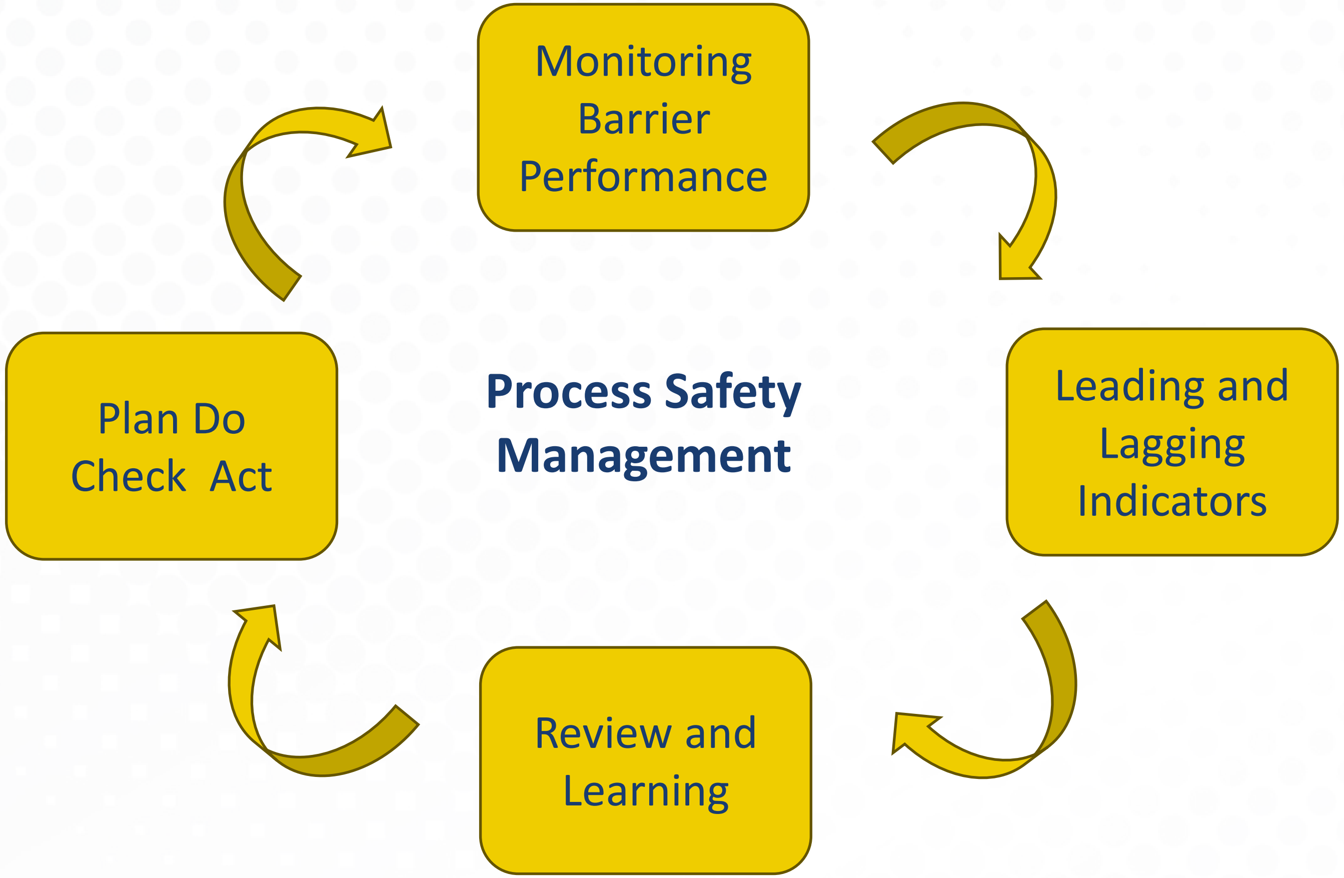
Loss of Containment
The Signal: Approximately 10,000 litres of Jet A-1 leaked from an underground pipeline.
Operational Lesson: Pipeline failures can release large volumes of fuel and create environmental and fire hazards.

Inspection and Maintenance
The Signal: The underground pipeline had been in service for over 30 years with evidence of corrosion.
Operational Lesson: Ageing infrastructure requires effective inspection, corrosion monitoring and maintenance programmes.

Monitoring and Detection
The Signal: Fuel was detected in the interceptor following the pressure test.
Operational Lesson: Stock control, monitoring systems and drainage inspections help identify leaks before escalation

Maintaining Barriers
The Signal: The pipeline had no secondary containment or cathodic protection system.
Operational Lesson: Protective systems and regular inspection are essential barriers against corrosion and pipeline failure.

Continuous Improvement



HSSE

Key Messages

1. Process safety is about preventing major incidents, not reacting to them
2. Loss of containment is the primary risk in fuel operations
3. Major incidents occur when hazards escalate and barriers fail
4. Strong barriers depend on equipment, procedures and people working together
5. Abnormal conditions must always be recognised, challenged and escalated
6. Weak signals are early warnings and must never be ignored
7. Operational discipline and communication are critical to maintaining control
8. Learning from incidents and near misses strengthens future performance


Q&A


THANK
YOU

LUNCH

GSFS

GLOBAL SKYFUEL SOLUTIONS

Summary

- ONDA Call for Tenders: Challenges and Opportunities
- JIG statistics: incorporated JVs vs non-incorporated JVs
- Aviation pools in Morocco – April 2005 to March 2025
- ONDA Agreement
- Establishment of GSFS
- Change management

ONDA Call for Tenders: Challenges and Opportunities

AIRPORTS
OF MOROCCO
مطارات المغرب

- **General framework of the ONDA tender**
  - Tender covering all Moroccan airports (2 lots – 1 supplier per lot),
  - Single licence for storage and aviation fuel supply,
  - Long-term contract, involving structural investments,
  - Full responsibility of the Designated Supplier for operations, infrastructure and liabilities.
- **Key regulatory and standard requirements**
  - Law 40-13: introduction of the concepts (Designated Supplier and Distributor),
  - Mandatory JIG compliance: JIG 1 / JIG 2 / JIG HSSE MS – required inspections,
  - EI/JIG-compliant supply chain: EI 1530 / EI 1560 – terminals, transport, hydrants,
  - Service levels strictly regulated by ONDA,
  - Third-party access rights – operational neutrality.

CHALLENGES

- Activity subject to direct contractual risk
- Full responsibility for HSSE, Quality, Environment and Safety
- Extremely detailed specifications
  - Little room for interpretation
  - Zero tolerance for major non-conformities
- Heavy and ongoing investment: hydrants, extensions, upgrades, SAF, maintenance

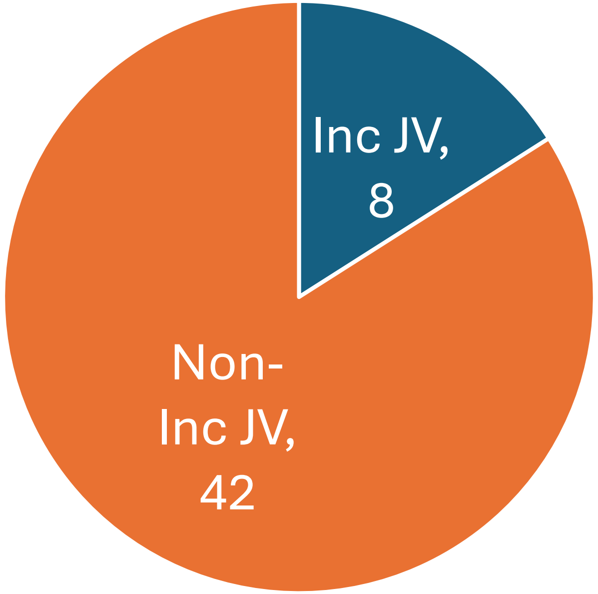
OPPORTUNITIES

- Long-term visibility on the aviation fuel business
- National standardisation in line with JIG practices
- Restructuring and professionalisation of operations
- Sustainable strengthening of the safety and quality culture

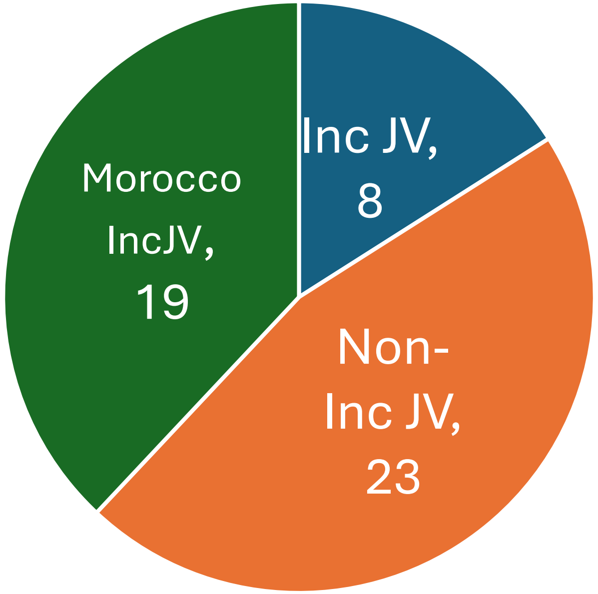
The unincorporated joint venture was the most common type of structure in Africa

Sites registered in JIG systems

Africa, pre-2025



Africa, today

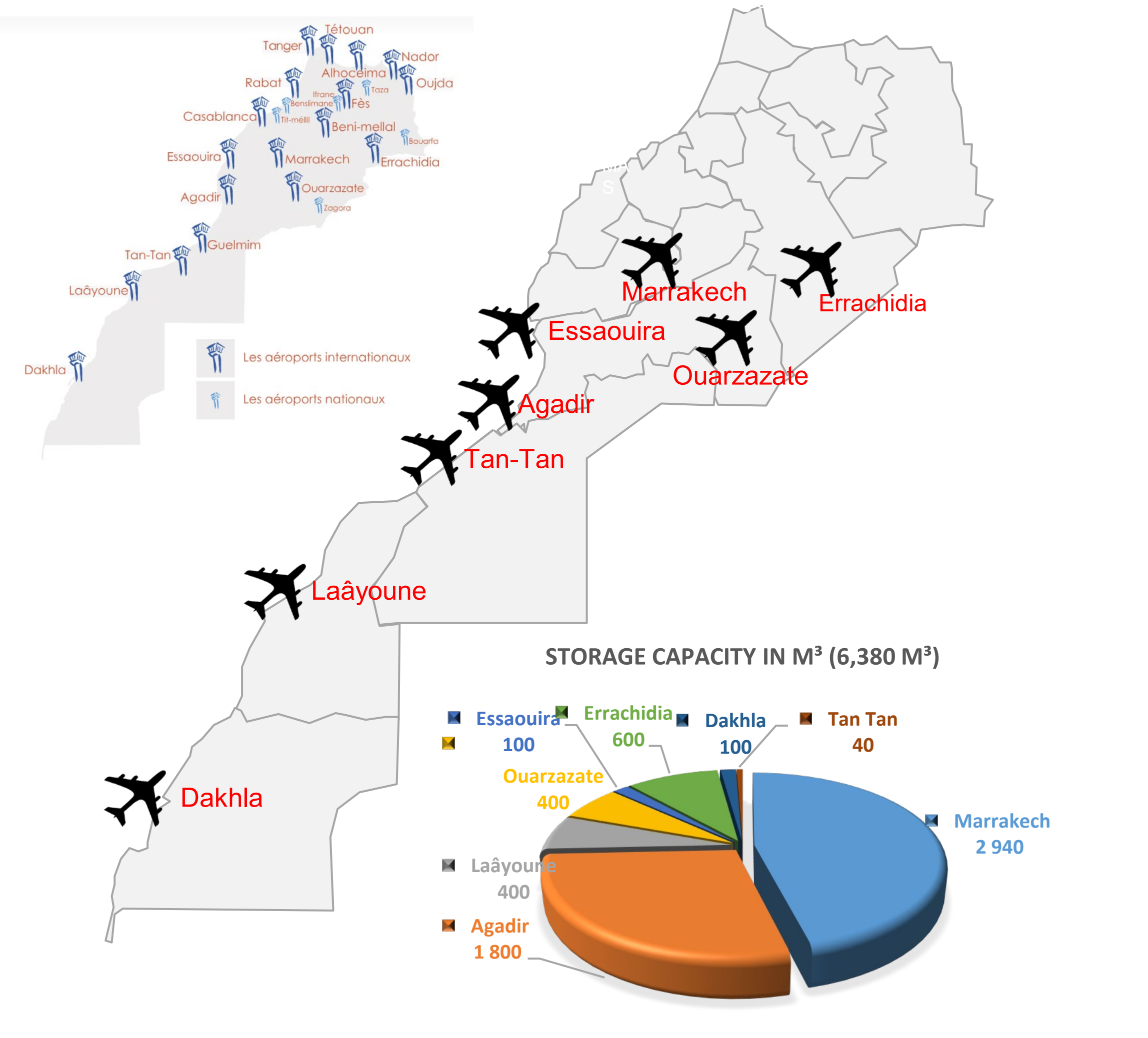


Previous situation in Morocco – April 2005 to March 2025

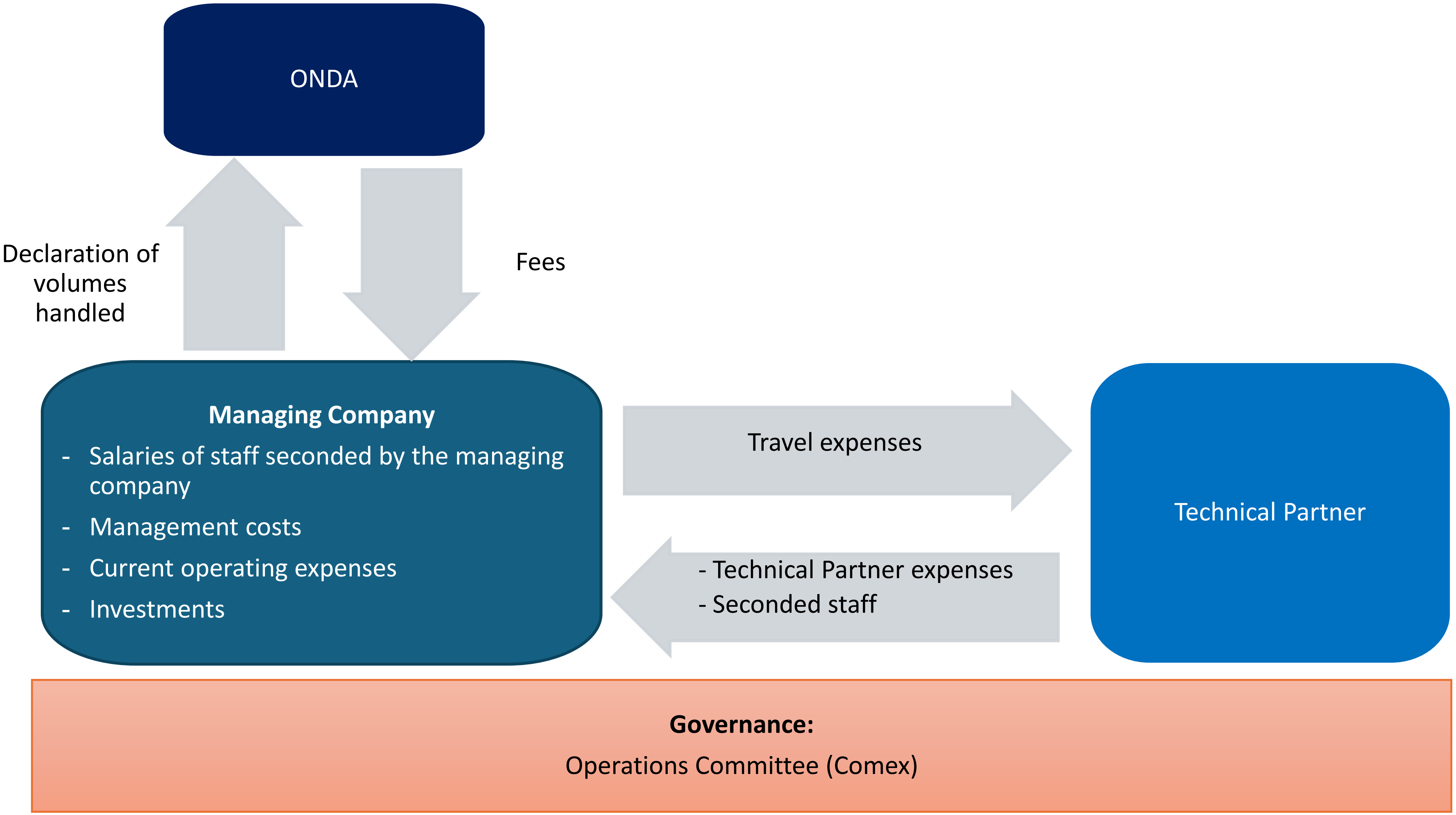
- **Northern Pools – concession awarded to the Afriquia SMDC and Ola Energy Maroc consortium**:
  - Casablanca, Tit Mellil, Benslimane, Rabat, Fez, Tangier, Oujda, Nador, Al-Hoceima and Tetouan.

- **Southern Pool – concession awarded to the TotalEnergies Marketing Maroc and Vivo Energy Maroc consortium:**
  - Marrakech, Essaouira, Agadir, Errachidia, Ouarzazate, Laayoune, Dakhla, Tan Tan.

Source: ONDA



Typical operation of an unincorporated joint venture – Pool (1/2)



Typical operation of an unincorporated joint venture – Pool (2/2)

❑ Pool operating model (50/50):

- Start of concession: April 2005,
- Governance provided by an operating committee,
- Periodic change-over of management and technical assistance roles,
- Staff seconded from both partners,
- CAPEX financed from the partners' own funds,
- Costs allocated in proportion to sales.

❑ Constraints:

- The incoming Managing Company implements their own procedures, service contracts, HSE rules, etc., which are shared/approved by the technical committee,
- Cumbersome management of re-invoicing,
- Management of seconded staff, governed by different HR policies,
- Change of contact persons for dealings with authorities and third parties

ONDA Agreement – effective from 1 April 2025 (1/2)

CONDITIONS – terms taken from the tender documents

- **Tender No. 24/2024/cc** *"for the selection of **designated suppliers** responsible for storing and refuelling aircraft at Moroccan airports"*:
    - "***Designated supplier:*** *any operator responsible for storing and supplying aircraft with fuel at* aerodromes",
    - ***"Distributor:*** *any holder of an operating licence issued by the energy authority for the sale of fuel to aircraft operators prior to access to aerodromes in accordance with the legislation in force*".
- **Duration & long-term visibility:**
    - 10 years from 1 April 2025,
    - Renewable for 10 years.
- **Safety & compliance requirements (critical pillar):**
    - Compliance with JIG – IATA – Energy Institute,
    - Full responsibility of the successful bidder for safety, security, fuel quality and HSSE,
    - Mandatory audits, inspections and reporting (ONDA, authorities, Competition Council).

Source: ONDA

ONDA Agreement – effective from 1 April 2025 (2/2)

OBLIGATIONS

- **Structural investments:**
  - Deployment of hydrant systems in Marrakech & Agadir,
  - Anticipation of traffic growth + minimum regulatory stock capacity.
- **Operational performance & service quality:**
  - Uninterrupted refuelling, 24/7,
  - Strict deadlines (receipt, storage, loading),
- **Financial considerations:**
  - Index-linked rental and commercial fees,
  - Bank guarantees,
  - A single, capped and controlled call charge.
- **Energy transition & sustainable image:**
  - Integration of sustainable aviation fuel (SAF),
  - Stricter environmental requirements (pollution, waste, energy).
- **Risks & liabilities:**
  - The successful bidder assumes all technical, environmental and financial risks,

Source: ONDA

A transformative, highly demanding agreement that positions GSFS as a strategic operator with comprehensive responsibility (safety, performance, sustainability) over the long term.

Establishment of a joint venture (1/3)

Regulatory Requirements

- **ONDA Tender Specifications**:
  - Requires a single Designated Supplier, legally liable, fully auditable, and bearing full responsibility for operational, HSSE, environmental and financial risks.

- **Incompatible non-incorporated JV model (pools)**:
  - Rotating management, periodic change of contact persons
  - Exclusive access for Pool shareholders to the aviation market,
  - Diffuse liability.

Contractual requirements

Competitive requirements

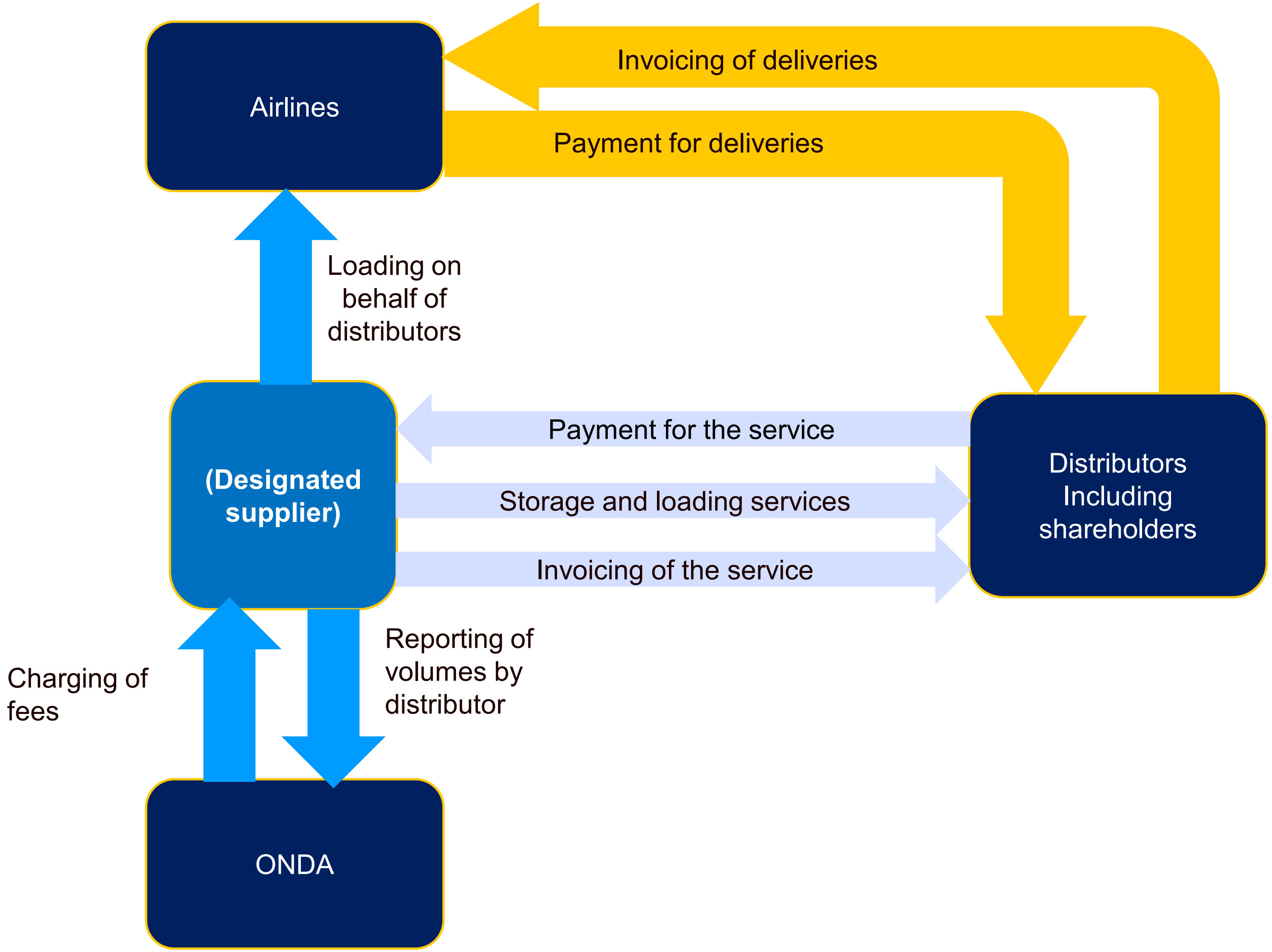
- **Competition Council requirements**:
  - Separate, independent, neutral entity, equipped with organisational and informational firewalls,
  - Fair, non-discriminatory and transparent treatment of all distributors.

What the incorporated joint venture enables

- **For ONDA:**
  - A single, clearly identified and legally accountable point of contact,
  - Full transferability of risks (HSSE, environment, quality, service continuity),
  - Greater contractual, financial and operational control over long-term concessions (10 + 10 years)
  - Explicit compliance with JIG/EI/IATA standards, with mandatory inspections,

- **For Fuel Suppliers:**
  - Fair and non-discriminatory access to infrastructure,
  - Guaranteed operational neutrality, contractually regulated and supervised by ONDA and the Competition Council,
  - Enhanced transparency regarding access rules, tariffs and service quality,
  - Formalised appeal and mediation mechanisms in the event of non-compliance.

Establishment of a joint venture (2/3)



Setting up an incorporated joint venture (3/3)

	Non-consolidated joint venture (POOL)	Incorporated JV
Legal status	No legal personality	Separate legal entity
Liability	Shared, often diffuse	Bearing directly on the JV
Governance	Joint/rotating management	Board of Directors + Management
Decision-making	Ongoing negotiation between partners	Structured and autonomous decision-making
Staff	Seconded from parent companies	JV's own staff
Financing & CAPEX	Provided by the partners	Bearing directly by the JV
Visibility for the regulator	Limited, complex	Clear, transparent, auditable
JIG / ONDA compatibility	Historically acceptable	Required today
Competitive neutrality	Difficult to demonstrate	Structurally guaranteed
Long-term continuity	Depends on partners	Contractually secured

1. **Formation of the JV**
    - MOU, Shareholders' Agreement, legal incorporation,
    - Approval from the Competition Council (27 March 2025),
2. **Recruitment and Training**
    - Secondment of staff,
    - Recruitment of central team,
3. **Investments and technical assistance**
    - Purchase of new refuellers/dispensers,
    - Construction of new sites,
    - Construction of hydrants in Marrakech and Agadir,
    - Expansion of storage capacity,
4. **Distributor contracts and ONDA agreement**
    - Sole distributor contract
5. **Operations and HSEQ manuals**
6. **Finance & Information Systems**
    - ERP roll-out
7. **Handover of GSFS/POOL responsibilities**

Change management: gradual and proactive transformation (1/2)

Business continuity: no disruption to supply chains or decline in service levels during the transition.

Leveraging existing assets: taking over infrastructure, proven operational practices and the teams' on-the-ground expertise.

Gradual transfer of responsibilities to the JV (operations, HSSE, quality, maintenance, stakeholder relations).

Clear separation of roles between shareholders, the operating JV and distributors.

Principles of the transition from POOL to JV

Organisation & Governance

- Establishment of a governance structure specific to the JV (Board of Directors, independent Executive Management),
- End of the rotating management system, a source of complexity and risk,
- Enhanced decision-making autonomy, consistent with ONDA and Competition Council requirements.

Human Resources

- Secondment of existing teams to retain critical skills,
- Gradual transition to the JV's own resources (permanent contracts, key roles),
- Harmonisation of HR, HSE and training policies in line with JIG standards.

Operations & HSSE

- Structured handover of operations in accordance with a single HSE management system compliant with JIG,
- Gradual roll-out of JV procedures, without disrupting existing practices,
- Maintenance of audits, inspections and quality controls throughout the transition phase.

Stakeholders & Competition

- Guarantee of neutrality, transparency and non-discrimination towards distributors,
- Implementation of formalised procedures (access, handling of requests, ONDA mediation),
- Deployment of competitive firewalls as required by the Competition Council.

Key aspects of change management

Change management: lessons from the Pool/JV Inc transition (2/2)

Anticipate before you are forced to

- Identify the limitations of the POOL model at an early stage,
- Prepare organisational, HR and financial scenarios,
- Avoiding an abrupt transition imposed by the regulator.

Operational continuity is key to credibility:

- Maintaining security of supply,
- Maintain product quality,
- Maintenance of JIG standards throughout the transition phase.

"Business continuity" is more valuable than the speed of transformation

Clarifying responsibilities reduces risks

- Responsibility clearly borne by the JV,
- Simplified governance,
- Enhanced accountability.

Clear accountability costs less than shared accountability

The end of rotating management improves performance

- standardisation of procedures,
- management stability,
- greater clarity for stakeholders.

Decision-making stability is a driver of security and efficiency

People are a critical factor for success: gradual handover from existing teams

- securing on-the-ground expertise
- minimising resistance to change
- facilitating buy-in for the new entity

Organisational transition depends first and foremost on team trust

Neutrality and competition cannot be improvised

- neutrality must be structural, not merely declarative
- firewalls must be organisational and informational

An operating joint venture must be designed from the outset as a neutral third party

Questions

?

MBG (Microbiological Growth) controls – JIG TID#1

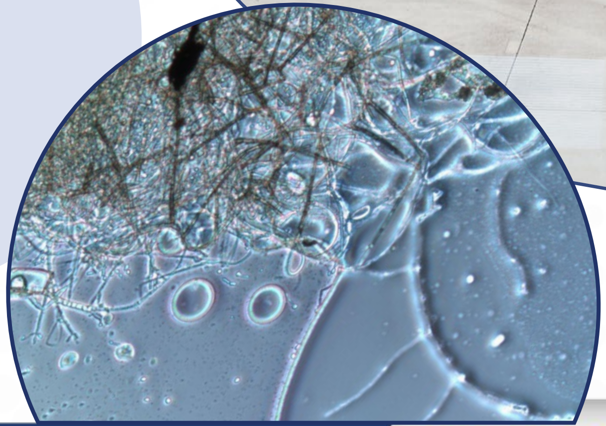
JIG Managers Workshop, Nairobi, 14-16 April 2026

Graham Hill,

ECHA Microbiology Ltd.

Graham Hill
CEO
ECHA Microbiology Ltd.
Cardiff, UK

echa
Results that count



JOINT INSPECTION GROUP

Who Are ECHA Microbiology And What Do We Do?

- ECHA MICROBIOLOGY have globally recognised expertise in the investigation, treatment and prevention of microbiological spoilage and corrosion
- Serve the Energy, Aviation, Marine & Engineering Industries

- Founded in 1983 as a spin off from Cardiff University
- Headquartered in Cardiff, Wales, UK
- Supply over 100 Countries
- Active involvement in developing industry best practice (IATA, ASTM, EI, JIG)

40 YEARS OF TECHNICAL EXCELLENCE
INNOVATIVE • ACCURATE • DEPENDABLE • TRUSTED


LABORATORY ANALYSIS & RESEARCH


CONSULTANCY SERVICES

MICROBIOLOGICAL TEST KITS


TRAINING COURSES


SITE SURVEYS

Have you seen or experienced MBG contamination in your Aviation career ?

Are you dealing with an MBG issue now ?

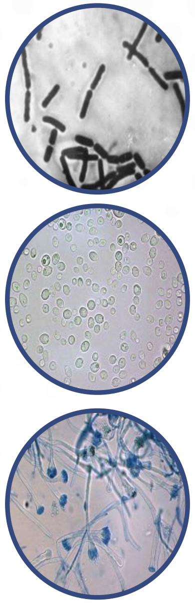
Microbial growth (MBG) in Aviation Fuels

- The Microbial Growth "Fire Triangle"

NUTRIENTS;
- Middle Distillate Fuels
  - Jet Fuel
  - Kerosene
  - Diesels
  - Gas Oils
  - Heating Oils
- Additives
- Dirt & contaminants

WATER

MICROBES



Bacteria

Yeast

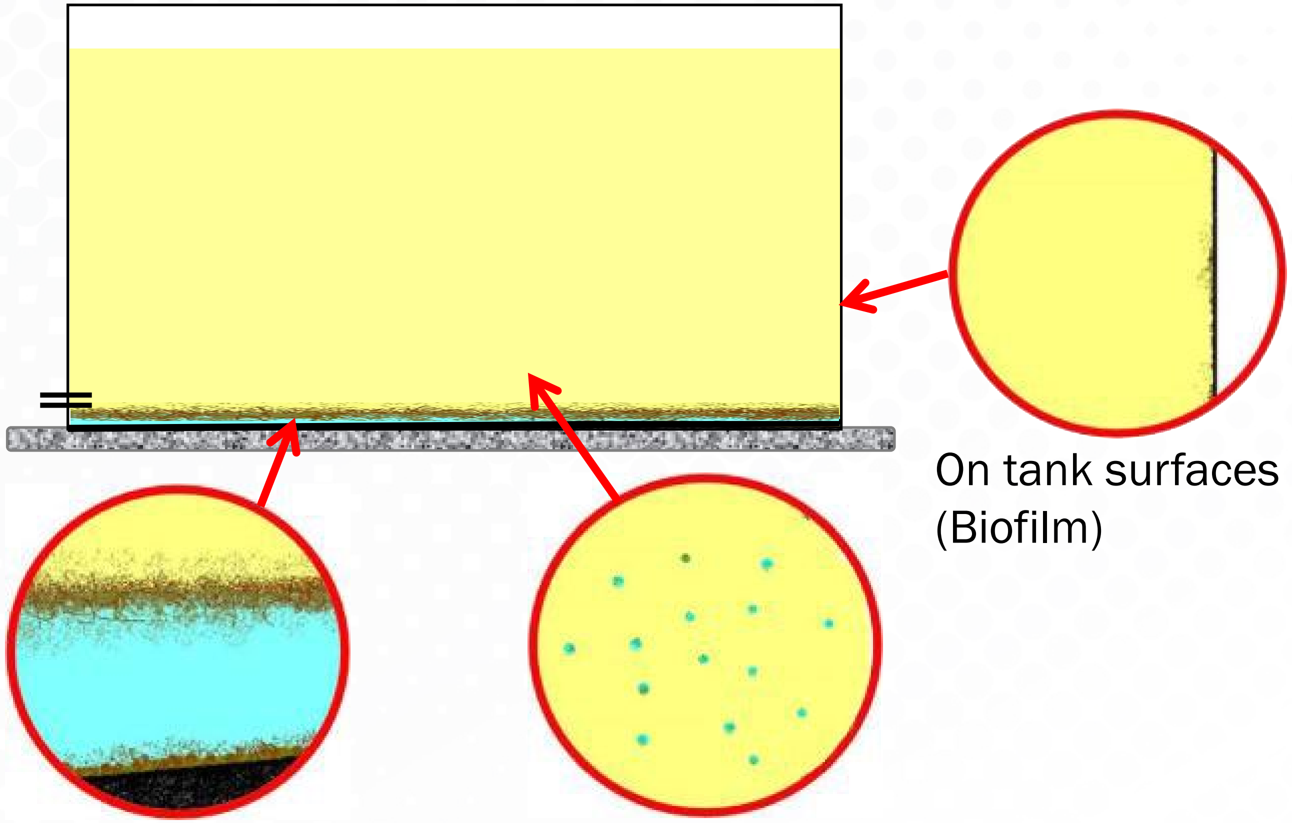
Mould

FUNGI

ENVIRONMENT;
- Temperature
- pH
- Water Activity / Salinity
- Oxygen availability
- .....etc.

Microbial growth (MBG) in Aviation Fuels

- MBG can occur wherever water is found in jet fuel systems



On tank surfaces (Biofilm)

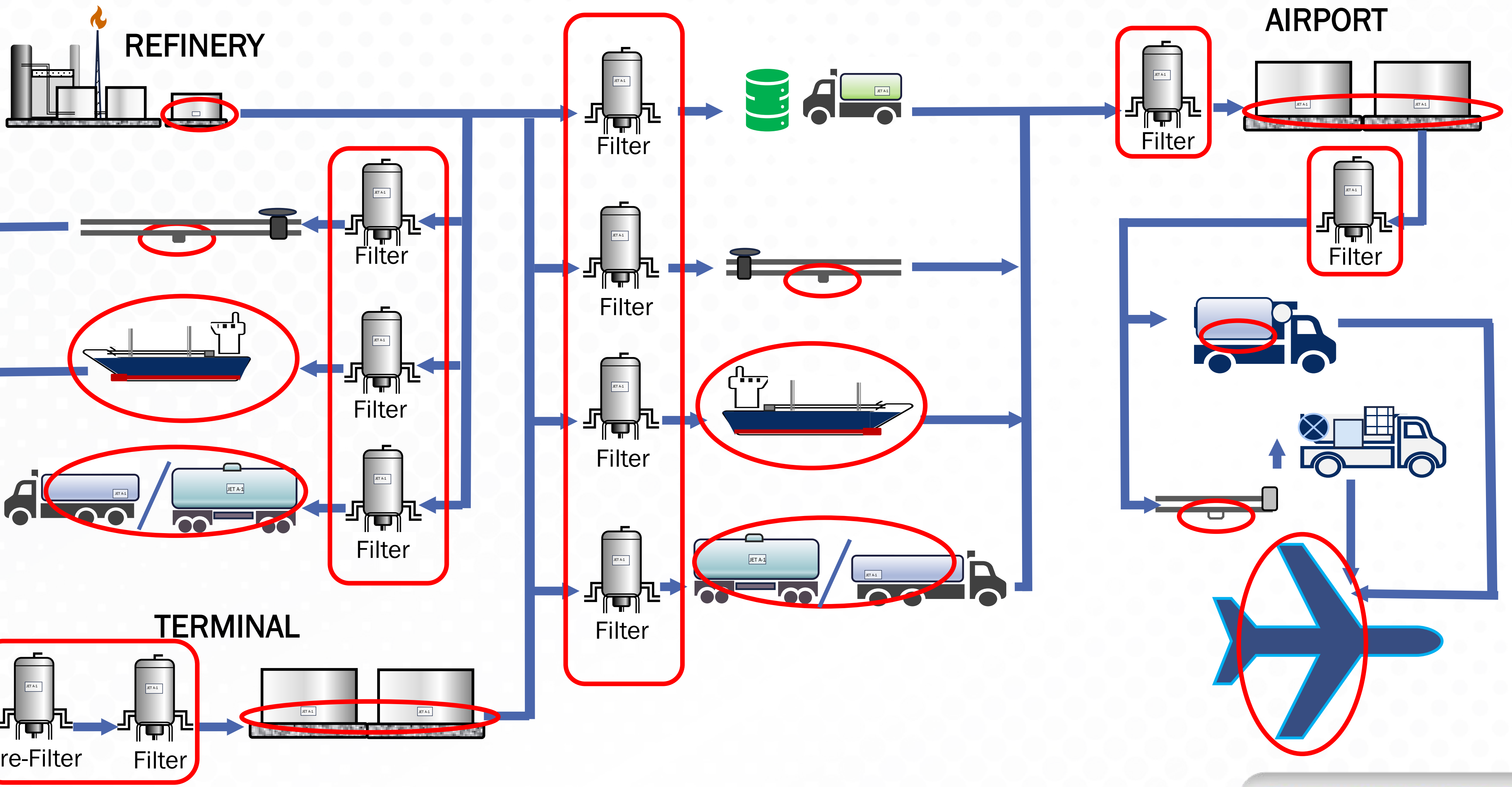
On the tank bottom

As droplets suspended in fuel

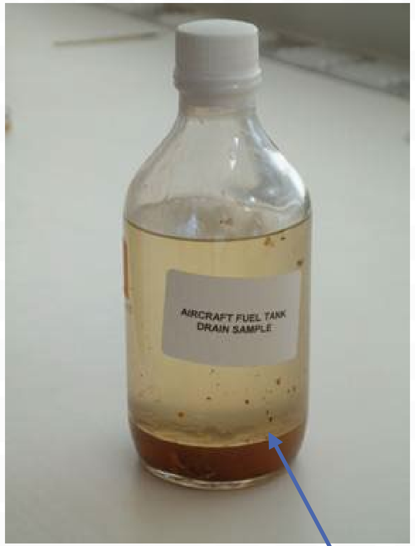
Aircraft fuel tanks

Supply & Distribution tanks

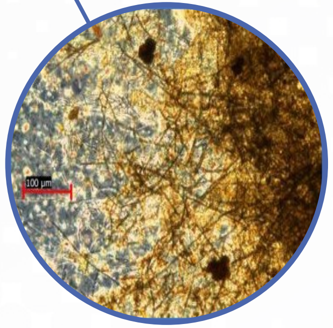
Aviation Fuel Supply – Refinery to Wing



MBG Problems - Aviation Fuel Supply



Microbial biomass in jet fuel



Emulsification at fuel water interface - Microscopic water droplets become suspended in fuel

Black/grey discolouration of water and fuel in tank bottoms due to sulphide generation by Sulphate Reducing Bacteria (SRB)

Operational risks:

- **Off spec fuel due to:**
  - **Microbial biomass (particulate),**
  - **Bio-surfactants,**
  - **Sulphide.**
- **Biomass & biofilm (sludge) in storage tanks.**
- **Filter Water Separator disarming & Filter contamination.**
- **Storage tank & pipeline corrosion.**

MBG Problems - Aviation Fuel Supply

Microbial biofilm in jet fuel storage tank

Operational risks:

- Off spec fuel due to:
  - Microbial biomass (particulate),
  - Bio-surfactants,
  - Sulphide.
- Biomass & biofilm (sludge) in storage tanks.
- Filter Water Separator disarming & Filter contamination.
- Storage tank & pipeline corrosion.

MBG Problems - Aviation Fuel Supply

Leopard spotting / fungal growth on Filter Water Separator coalescer elements (EI 1581)

Active microbial <u>growth</u> is not common on other types of aviation fuel filter, but they can be pre-maturely clogged by microbial particulates from contaminated fuel (e.g. microfilters (EI 1590), dirt defence filters (EI 1590), water barrier filters (EI 1588)

Operational risks:

- **Off spec fuel due to:**
  - **Microbial biomass (particulate),**
  - **Bio-surfactants,**
  - **Sulphide.**
- **Biomass & biofilm (sludge) in storage tanks.**
- **Filter Water Separator disarming & Filter contamination.**
- **Storage tank & pipeline corrosion.**

MBG Problems - Aviation Fuel Supply

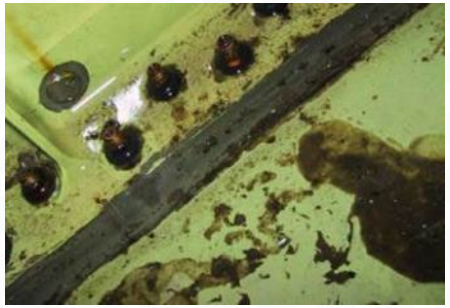
SRB pitting corrosion of tank floor

SRB pitting corrosion of pipeline flange end

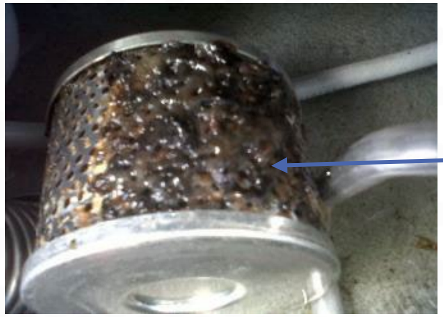
Operational risks:

- **Off spec fuel due to:**
    - **Microbial biomass (particulate),**
    - **Bio-surfactants,**
    - **Sulphide.**
- **Biomass & biofilm (sludge) in storage tanks.**
- **Filter Water Separator disarming & Filter contamination.**
- **Storage tank & pipeline corrosion.**

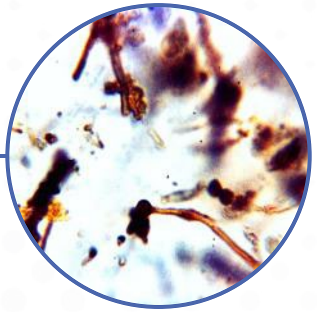
MBG Problems - Aircraft Fuel Systems



Floating Interface Biofilm (Type I)



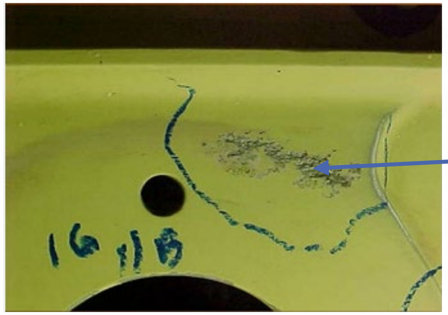
Fuel Filter Clogging



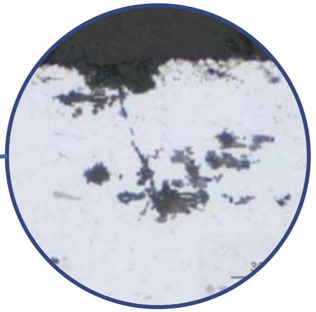
Operational risks:

- **Filter clogging and by-pass – flight delays & diversions,**
- **FQIS malfunction - Erratic or erroneous fuel quantity indication,**
- **Airframe corrosion.**

Sessile Surface Biofilm (Type II)



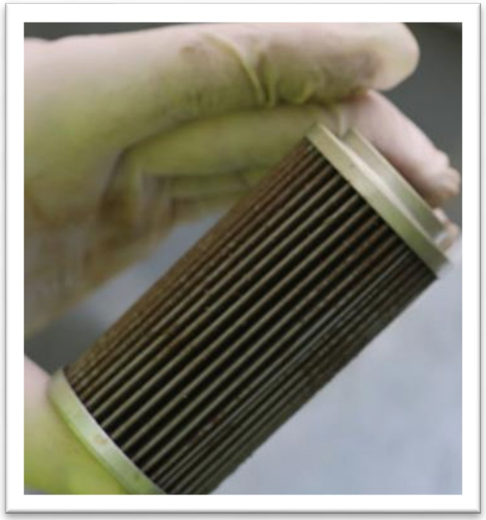
Corrosion of Aircraft Fuel Tank



THERE ARE NO LAY-BYS IN THE SKY!!!

MBG Problems - Aircraft Case History

- Turbine driven Piper MALIBU (PA-46-350P).
- October 2020 from Rottweil (EDSZ).
- Filter bypass indication during climb.
- 1 min later, engine lost power and could not be restarted; forced landing on an open field.
- Fuel filter was heavily contaminated with a brownish-black substance
- Heavy contamination (BIOFILM) was found in the header tank.



Source: https://www.bfu-web.de/DE/Publikationen/Bulletins/2020/Bulletin2020-10.pdf?__blob=publicationFile

MBG Problems - Aircraft Case History

- Flight Standards Information Bulletin for Airworthiness: FSAW 05-08A (2005):
- An aircraft operated by a major US carrier experienced 4 aborted take-offs due to filter clog indications.
- Microbial contamination determined to be the cause.
- MicrobMonitor2 testing of 27 other aircraft in the fleet revealed "similar instances of microbial contamination".
- "Carrier revised its maintenance program inspections within its fleet."
- Fuel filter clogging incidents remain a major concern for the airline industry.

ORDER: 8300.10

APPENDIX: 4

BULLETIN TYPE: Flight Standards Information Bulletin for Airworthiness (FSAW)

BULLETIN NUMBER: FSAW 05-08A (Amended)

BULLETIN TITLE: Air Carrier Implementation of Inspections for Fuel Microbial Contamination

EFFECTIVE DATE: 06-09-05

AMENDED DATE: 06-14-05

TRACKING NUMBER: FAA Safety Recommendation 04.215

APPLICABILITY:

M/M	ATA Code	14 CFR	PTRS
All part 121 and 135.411(a)(2) aircraft	28	121 135	3470

NOTE: THIS BULLETIN REQUIRES PTRS INPUT. SEE ITEM #4.

1. PURPOSE. This bulletin establishes the potential need of inspections to determine if microbial contamination exists in Title 14 of the Code of Federal Regulations (14 CFR) part 121 and 135.411(a)(2) aircraft and the removal of this contamination. This bulletin applies to principal maintenance inspectors (PMI) with certificate management responsibilities for part 121 and 135.411(a)(2) certificate aircraft.

2. BACKGROUND.

A. This bulletin is being released in response to a Federal Aviation Administration (FAA) Safety Recommendation 04.215 to prevent future incidents that will occur due to fuel microbial contamination.

B. A major carrier recently had several incidents where four separate takeoffs were aborted on one aircraft. Responding to these incidents along with "filter clog" annunciator illumination, lab evaluations were made of the filters. The

1

MBG Problems in Aviation Fuels

- Fuel supply failures
- Infrastructure integrity compromised
- Aborted flights
- Unscheduled down time
- High cost for remediation
- Operational Safety

OPERATIONS

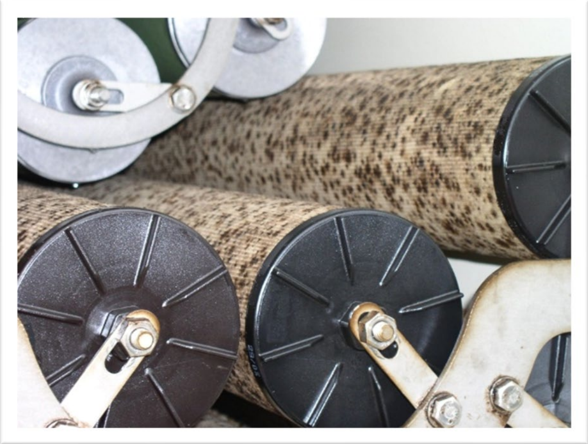
COST

SAFETY

ATTENTION NEEDED – FROM REFINERY TO WING!!

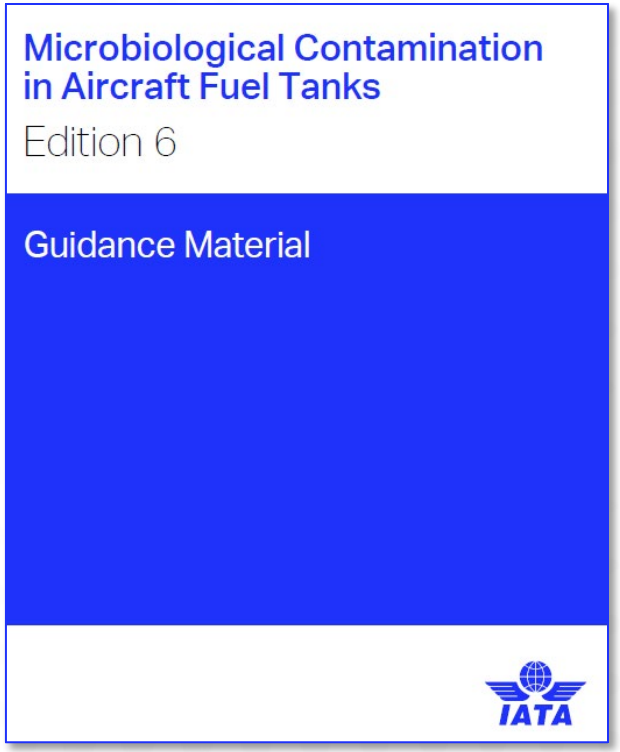
Control of Microbial Growth in Fuel

PREVENT	MONITOR	REMEDIATE
Keep it clean (as far as practicable!) Prevent ingress and accumulation of free water	Test at routine intervals to identify risk before it becomes a problem	When monitoring indicates control is lost, or if problems are experienced



IATA Guidance for Aircraft Fuel Tanks

- First Developed in 2001 by the IATA Technical Fuel Group, Microbial Panel.
- Latest is Edition 6 (December 2022)
    - Background to MBG in aircraft fuel tanks,
    - Fuel Supplier Practices,
    - Prevention Strategies for Aircraft Tanks,
    - Detection of Microbial Contamination in Aircraft Fuel Systems,
    - Fuel Tank Decontamination.
- Routine MBG Testing is recommended in IATA Guidance Material
    - Monthly to annual test of each fuel tank for operational aircraft, depending risk.
    - Monthly test generally recommended for parked aircraft.
- All major aircraft OEMs have adopted the principles of the IATA Guidance Material and introduced relevant procedures in their Aircraft Maintenance Manuals (AMMs).
- Editions 1 to 5 recommended specific test kits. Edition 6 suspended approval of test kits pending independent evaluation.



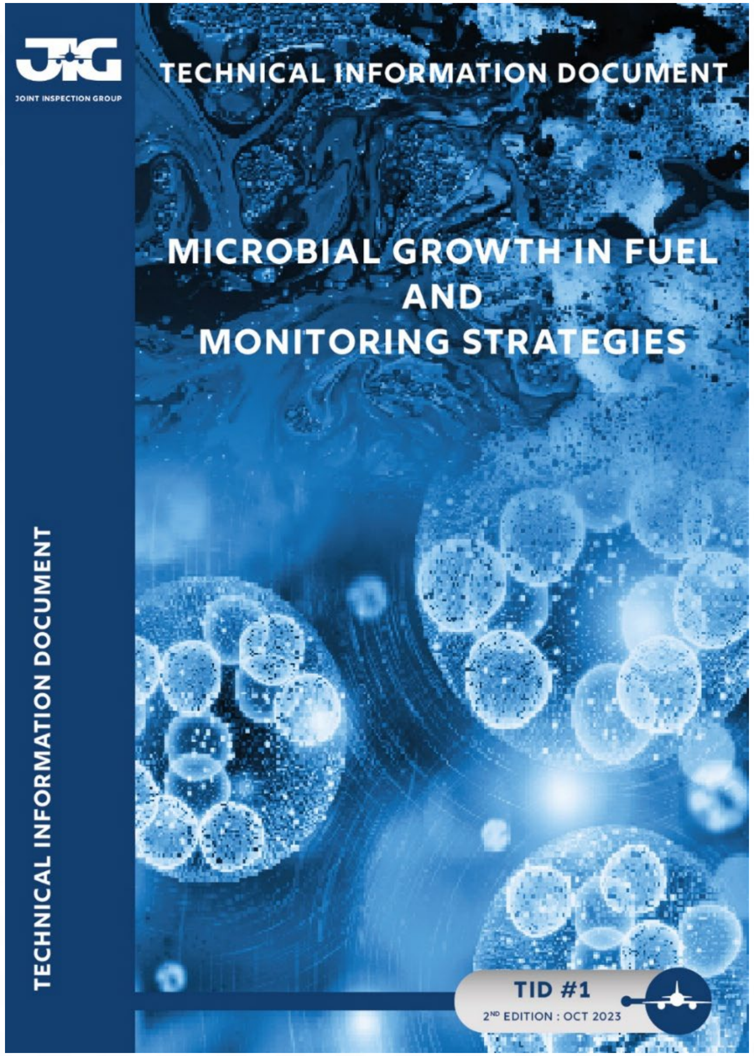
JIG Guidance – Technical Information Document #1

PART 1 Microbial Monitoring Strategies, Risk Management & Testing:

- Indicators of Contamination,
- Sampling Strategies & Determination of Site Background Contamination Levels,
- Classification of Risks,
- Test Kit Protocol Quick Guide for Routine Monitoring,
- Warning & Action Level Recommended Practice,
- Action for Operations Following JIG Standards.

PART 2 Informative Annex on MBG & Monitoring Strategies:

- Fundamentals, History, Impacts, Corrosion, Remediation….

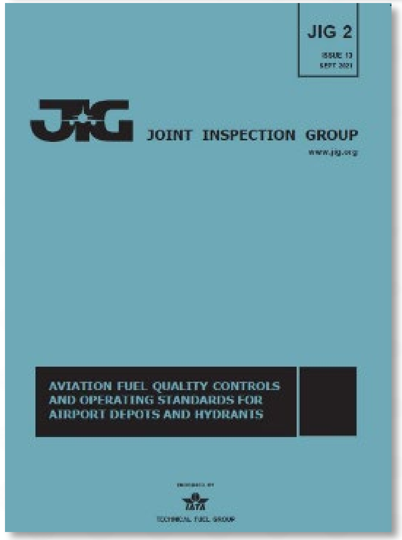


JIG Guidance – Technical Information Document #1

TID #1 supplements standard guidance in:

- EI/JIG Standard 1530 Quality Assurance Requirements for the Manufacture, Storage and Distribution of Aviation Fuels to Airports (2nd Ed. 2019):

- JIG 1, 2 and 4 Aviation Fuel Quality Controls and Operating Standards for Into-Plane Fuelling Services (JIG 1), Airport Depots and Hydrants (JIG 2) and Smaller Airports (JIG 4)



EI/JIG Guidance – EI/JIG 1530

For aviation fuel supply up to Airport, EI/JIG 1530:

- Mandates quarterly testing of product recovery tanks.
- Recommends routine microbial testing of storage tanks drains dependent on risk, based on tank design (roof type and bottom type)
  - Annual test for Low risk
  - 6 monthly test for Medium risk
  - Quarterly test for High risk
  - Monthly test for Very High risk.
- Mandates investigative microbiological testing in the event of any indications of microbial growth (e.g. poor appearance of drain samples or evidence of MBG on visual inspection)

JIG Guidance – JIG 1, 2, and 4

For airports JIG 1, 2 and 4 (supplemented by JIG Bulletin 83 and Technical Information Document #1);

- Mandates semi-annual microbial monitoring for vehicles routinely used for the defueling of aviation fuel.
- Allows microbial monitoring as an alternative to quarterly visual inspections of product recovery tanks.
- Mandates annual microbial testing of airport storage tanks as a means to validate extension of cleaning frequency from 5 to 10 years.
- Advises routine testing based on assessed risk.

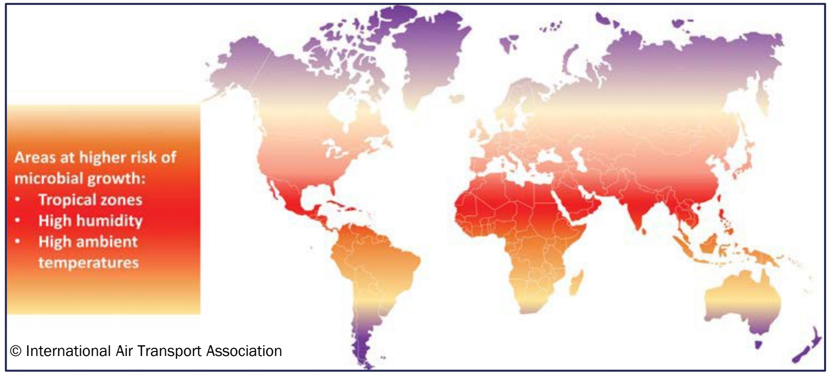
Risk Assessment of MBG

Is there a risk of water ingress and accumulation?

- Consider in-house QA procedures:
    - Tank draining procedures & draining frequency.
    - System design (filtration type, low points for effective water draining, suction point for product deliveries).
    - System condition (tank coatings & condition, subsidence of tank floors, overlapping floor plates).
    - Only very little water is needed for microbial growth; if you were a microbe, a 1 mm water film would look like a 300 m deep lake!

Are environmental factors conducive to microbial growth?

- Microbes prefer warm, humid conditions; 20 – 35 °C (68 - 95 °F).
- Specialist microbes grow outside this temperature range.
- Temperature fluctuations promote water condensation.

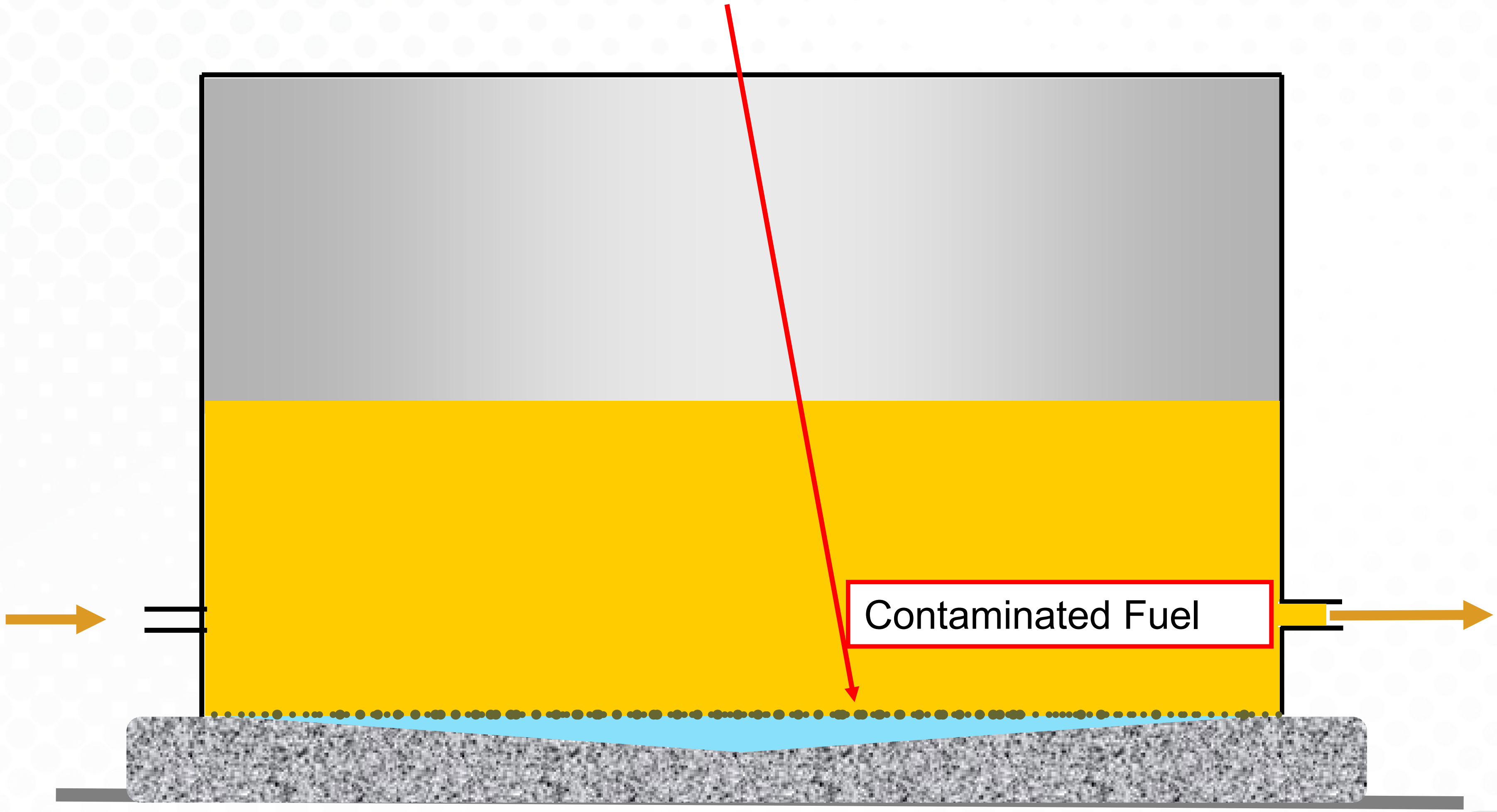


Is fuel supplied always of good quality?

- Consider supply QA procedures & infrastructure upstream (e.g. ship delivery).
- Don't assume that if supply is good there is no MBG risk!

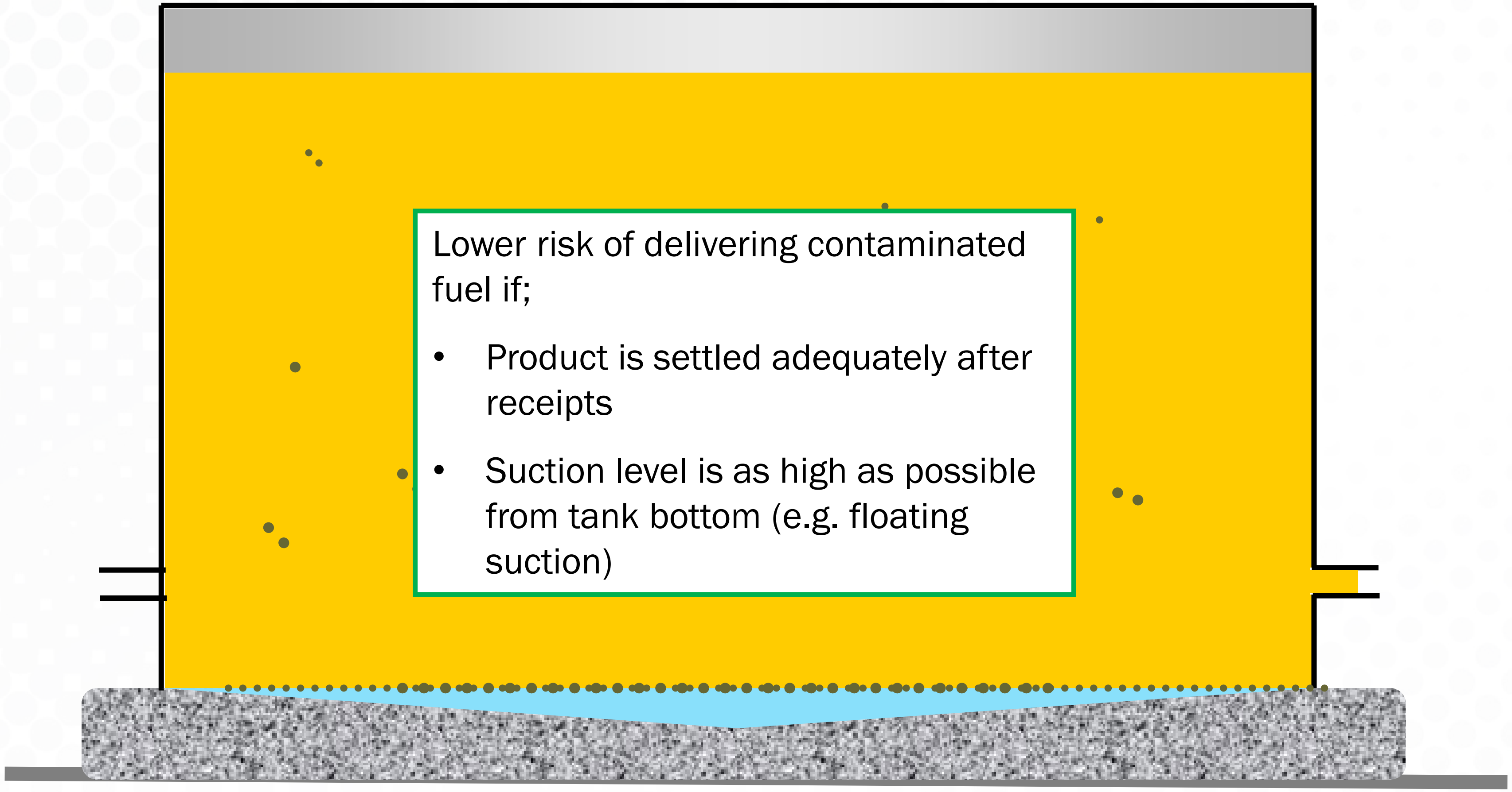
Contamination of Fuel in Storage Tanks

- Fuel receipts disturb microbial biomass into fuel



Contamination of Fuel in Storage Tanks

- With time microbial biomass re-settles to the bottom of the tank



PREVENTION of MBG

- Key routine prevention procedures:
  - Water draining,
  - Product settling after receipts,
  - Filtration.
- From Refinery to Wing....
  - KEEP IT CLEAN!
  - KEEP IT DRY!

MONITORING – TID #1 Recommendations

- Routine testing ensures that facilities are free of significant microbial contamination and provides quality assurances for fuel supplied to aircraft.
- TID #1 recommends evaluation of "normal" background levels by initial testing over a 1 year period;
  - It is necessary to generate sufficient data in the initial phase to provide a clear picture on the "normal" activity in the storage / filtration system,
  - At least quarterly where there is no previous evidence or history of microbial contamination,
  - Monthly where there have been known events of microbial contamination.
- Monitor for change;
  - On-going routine testing at defined sample points and frequencies according to the risk assessed from;
    - Initial testing period,
    - Operational experience,
    - Operating conditions (temperature, water ingress etc.).

MONITORING – TID #1 Recommendations

ROUTINE Monitoring MBG of Aviation Fuel Facilities

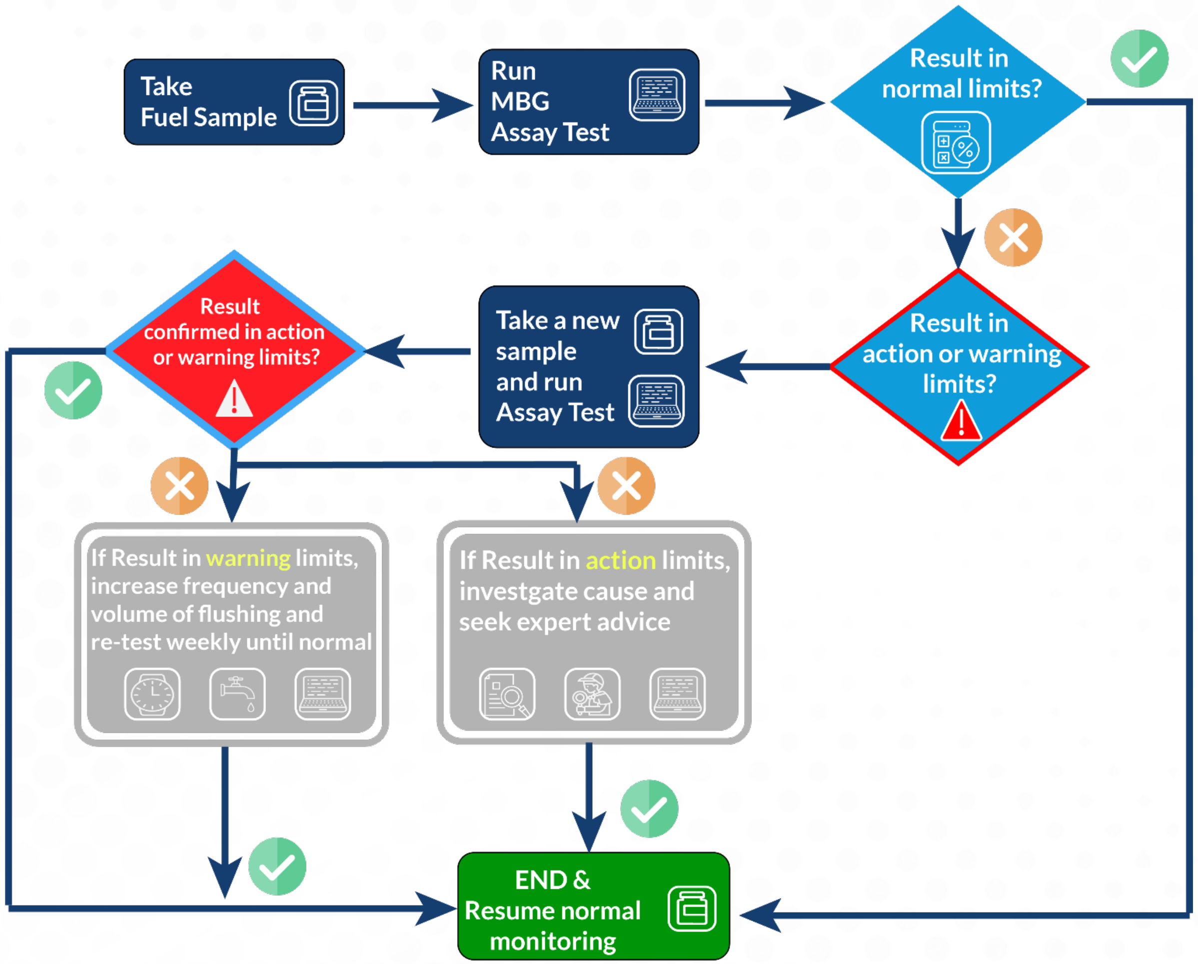
ITEM	SAMPLING LOCATION	SAMPLING FREQUENCY: HIGH RISK FACILITY (>1 Action level microbe event in previous 2 years)	SAMPLING FREQUENCY: MODERATE RISK FACILITY (Single Action level microbe detected in previous 2 years, or cause - see above)	SAMPLING FREQUENCY: LOW RISK FACILITY
Fixed Storage tanks	Storage tank sump drain line or dead bottom sample	Monthly	Quarterly to 6-monthly adviseable	ANNUAL monitoring after initial (at least) quarterly screening for 1 year to determine background contamination levels
Product Recovery tanks	Storage Tank sump drain line or dead bottom sample	Monthly	Quarterly	QUARTERLY where visual inspection is not possible
Defuelling Vehicle	Vehicle Tank sump drain line	Monthly	Quarterly	6-MONTHLY for vehicle routinely used for defuelling in the absence of cause

Source: JIG TID#1 – Microbial Monitoring Strategies (© Joint Inspection Group 2023)

MONITORING – TID #1 Recommendations

ROUTINE Monitoring MBG of Aviation Fuel Facilities

- Perform a MBG test on tank low point samples at a frequency based on risk.
- Any test result is only as good as the sample!
- Visual inspection of tank drain samples and coalescer filters remains the primary indicator!
- Consider the applicability and reliability of the test method relevant to the circumstances of use!



Source: JIG TID#1 – Microbial Monitoring Strategies (© Joint Inspection Group 2023)

Sampling

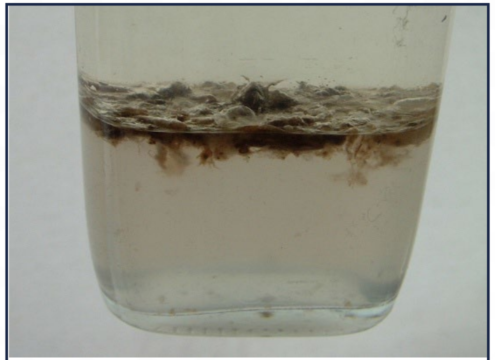
Consistency of sampling is critical:

- Take routine samples from the same point (typically the sump/ water drain).
    - Testing drains and low points provides the earliest indication of MBG.
- Sample under similar conditions:
    - e.g. after filling and settling, prior to returning tank to service.
- Hygiene around the sampling activity is vital.
    - Ensure sampling points are clean and wipe with an alcohol wipe.
- Flush a quantity at full flow, in excess of the line content, and then take a line sample for a visual appearance check and microbial assay testing.
- For routine monitoring, FUEL (not water) should be sampled and tested to enable consistent comparison between sampling intervals:
- Test as soon as possible after sampling, preferably within 24 hours.

Visual Inspection of samples

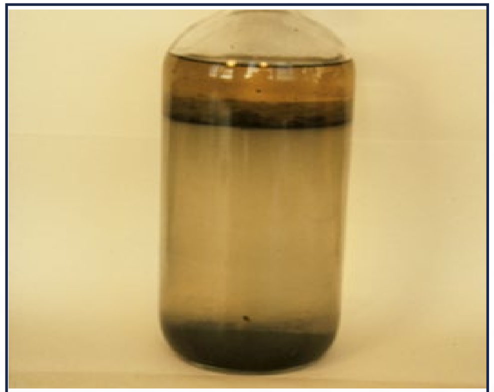
- Look for soft, brown, grey, or translucent “sticky” material at fuel:water interface of low point or drain samples.
- Swirl, roll and tilt sample bottle gently to aid observation.
- Microbial material will suspend in fuel if agitated and settle back to interface slowly.
- Fuel near water interface may be hazy due to water entrainment.
- Black or grey water phase indicates possible Sulphate Reducing Bacteria (SRB) contamination (high corrosion risk).
- Increased ratings of routine filter membrane testing can also indicate an MBG issue,
- Leopard spotting on coalescer elements (EI 1581 Filter Water Separators) is another key indicator of MBG.
- Significant contamination is not always visually evident,
  - E.g. Bulk fuel layer samples from contaminated systems may still be Clear & Bright.

Translucent Bacterial Extracellular Polymeric Substance (EPS) with other entrained particulate debris.



Floccose brown mat of fungal (yeast & mould) growth at fuel : water interface

Hazy fuel due to microbial biosurfactants emulsifying water in fuel

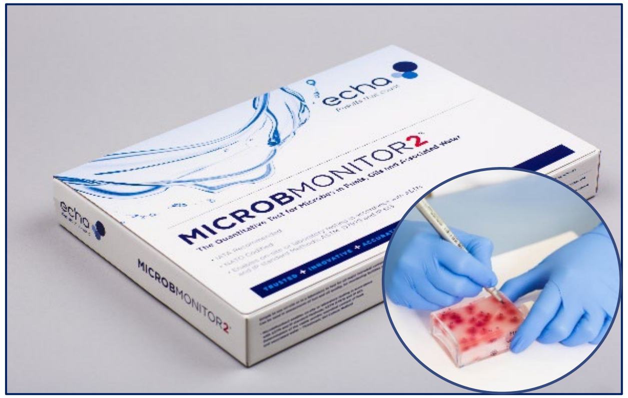


Black/grey discolouration of water and fuel due to sulphide generation by SRB

Test method selection

Test method selection:

- Use an appropriate test method, properly validated for fuels testing.
- Three types of test kit listed in JIG TID #1:
  - CFU cultivation tests – MicrobMonitor®2 (IP 613/ASTM D7978),
  - ATP tests – HY-LiTE® Jet A1 (ASTM D7463),
  - Immunoassay – Fuelstat® PLUS (ASTM D8070)
- CFU methods are considered to be the reference methods by IATA (Standard laboratory method is IP385).
- CRC-AV-31-22 Research Report: Microbial Test Kit Evaluation 2026* (https://crcao.org/crc-project-no-av-31-22/).
- Some rapid tests can be less likely to give indication of contamination if samples do not contain free water.
- Routine monitoring of facilities is not time-critical, so cultivation (CFU) methods are appropriate and provide the broadest spectrum for detection of microbes that will proliferate in fuel systems.
- Rapid test kits are appropriate for defuel situations which are time critical.

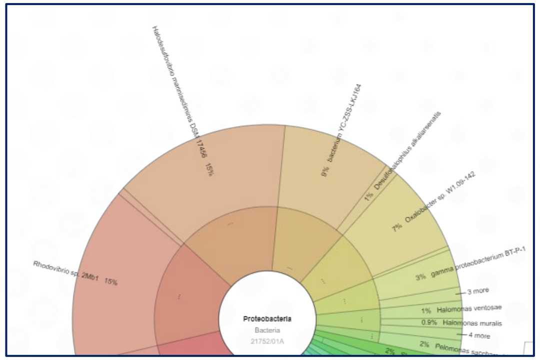


*CRC Research Report CRC-AV-31-22 *Microbial Test Kit Evaluation*. Coordinating Research Council, Atlanta, January 2026

Test method selection

Test method selection:

- On-site testing:
    - Enables a good assessment and avoids errors and delays due to transit of samples.
    - Tests for specific problem causing microbes (e.g. SRB) can also be used (e.g.: Sig Sulphide)
- Laboratory testing:
    - Enables more comprehensive diagnostic assessment,
    - Incident investigation, tracing contamination sources, risk assessment.
- Facilities should continue to use their existing method if historical data provides confidence it is reliable.
- New methods are under evaluation or in development (e.g. BugCount Fuels (ATP Test), qPCR (quantification of microbial DNA), Next Generation Sequencing (NGS)).
- Seek expert advice if needed.
- No MBG test is 100% accurate - Any test is better than No test!
- MBG testing is not a fuel specification requirement - It is a Quality Assurance tool!



MONITORING – TID #1 Recommendations

Incident Investigation of MBG at Aviation Fuel Facilities

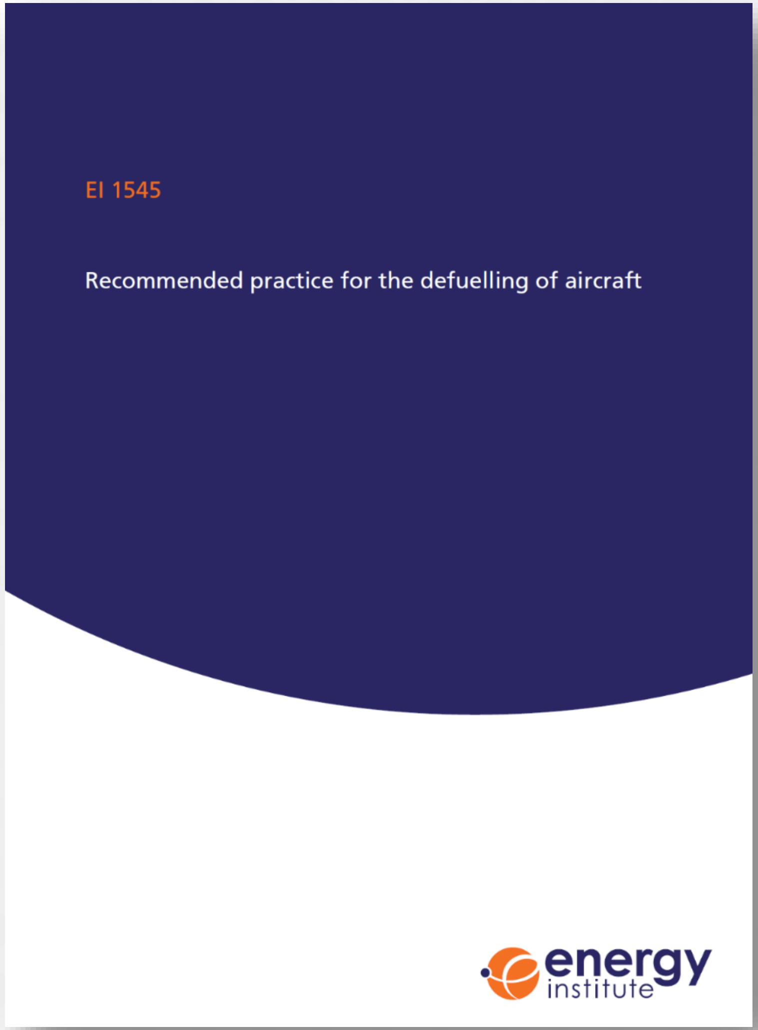
- Applies to moderate and high-risk facilities.
- Testing water phase and fuel samples is appropriate:
  - Use dead bottom or interface samplers, or
  - Take drain line samples immediately after clearing the drain line contents.
- Select a range of tests for thorough investigation.
- Ongoing testing is required for 2 years following return of levels to Normal level.

EQUIPMENT	SAMPLING LOCATION	CAUSE FOR INVESTIGATION	SAMPLING FREQUENCY: HIGH RISK FACILITY	SAMPLING FREQUENCY: MODERATE RISK FACILITY
Receipt or Outlet Filtration	Filter Water Separator vessel sump drain line sample	Contamination found in tank samples upstream or down-stream	Monthly	Quarterly to 6-monthly
Hydrants	Low point drain samples	Contamination found in tank samples or filter samples upstream or downstream	MONTHLY of at least one low point in rotation to cover all low points during 1-Year monitoring period	QUARTERLY of at least one low point in rotation to cover impacted area during 1-Year monitoring period
Pipelines	Low point drain samples	Contamination found in tank samples or filter samples upstream or downstream	Monthly	Quarterly
Refuellers	Low point drain samples	Contamination found in vehicle drain samples	Monthly for affected vehicle(s)	Quarterly for affected vehicle(s)
		Contamination found in upstream tank or filter samples	MONTHLY at least one vehicle in rotation to cover all vehicles during a 1-Year monitoring period	QUARTERLY at least one vehicle in rotation to cover all vehicles during a 2-year monitoring period
Hydrant Dispensers	Filter inlet and sump drain samples	Contamination found in upstream tank or filter samples or hydrant low point drain samples.	MONTHLY at least one vehicle in rotation to cover all vehicles during a 1-Year monitoring period	QUARTERLY at least one vehicle in rotation to cover all vehicles during a 2-year monitoring period

Source: JIG TID#1 – Microbial Monitoring Strategies (© Joint Inspection Group 2023)

Testing Aircraft Fuel Tanks Before Defuelling

- Defuelling presents a risk of introducing microbial contamination (and unapproved fuel additives) from the aircraft into the airport fuelling system.
- Procedures should be conducted in accordance with EI 1545 *Recommended practice for the defuelling of aircraft.*
- Recommends an MBG test of aircraft fuel tanks, prior to defuelling, if there is any visual evidence of, or reason to suspect, microbial contamination.
- Mandates an MBG test of vehicles used for defuelling, on a 6-monthly basis.
- Mandates an MBG test of storage tanks used for the temporary storage of defuelled product, on a 6-monthly basis.

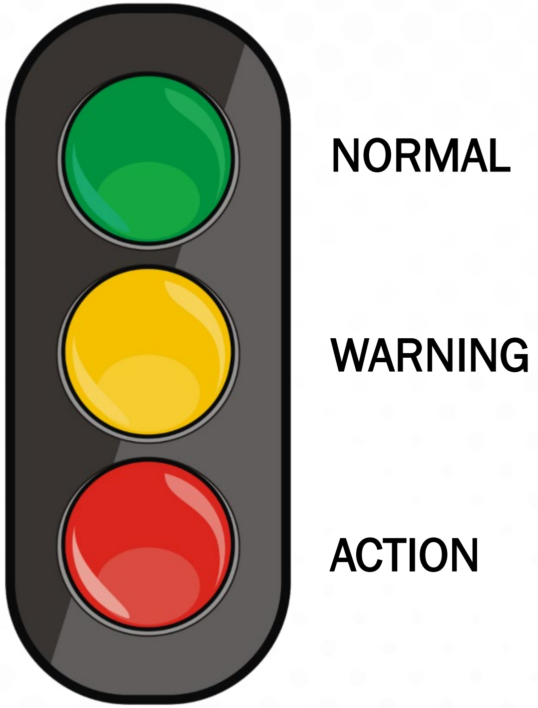

EI 1545

Recommended practice for the defuelling of aircraft

energy institute

Microbial Contamination Limits

- There are no universally agreed limits for microbial contamination in fuel.
- Microbial Testing is NOT a fuel specification test.
  - For Fuel Supply it's a Quality Assurance measure.
  - For Aircraft it's an effective Insurance Policy.
- IATA defines CFU limits for Negligible, Moderate, and Heavy contamination for samples from aircraft fuel tank drains.
- JIG defines Normal, Warning & Action level contamination for CFU methods (and two rapid methods) for fuel distribution systems.
  - Less stringent than IATA limits reflecting the fact that storage tanks and filters will be more likely to contain higher levels of background contamination and fuel will be filtered several times before uplift to aircraft.
- There are separate CFU limits for water phase and fuel phase samples.



Typical definitions of WARNING and ACTION Levels for the fuel distribution systems (Table 3 TID #1)

TEST	Sample type	NORMAL Level Contamination	WARNING Level Contamination	ACTION Level Contamination
MicrobMonitor2	Fuel	<10,000 CFU/L	10,000 - 100,000 CFU/L	>100,000 CFU/L
	Water	<100,000 CFU/mL	100,000 - 1,000,000 CFU/mL	>1,000,000 CFU/mL
HY-LiTE Jet A1	Fuel & Water	<1000 RLU	1000 – 5000 RLU	>5000 RLU
Fuelstat PLUS	Fuel or Water	Negligible	Moderate	Heavy

Note: For tests of samples representative of bulk fuel at airports and samples from the into plane operation, more stringent standards shall be applied such as those defined in the IATA Guidelines on CFU microbial contamination limits in aircraft fuel tanks. Non-culture type test methods shall only be used where there is broad agreement between the different test methods. Seek subject matter expert advice in conjunction with the test kit manufacturer.

Warning and Action Level Recommended Practice (JIG TID #1)

WARNING Level test results

If WARNING Level contamination is detected:

- Confirm by repeat testing (fresh sample),
- Confirm draining regimes are adequate following review of records for all designated low points and sumps for warning indicators (increased water, poor appearance etc.),
- Check filter DP and filter membrane test records for any anomalies (e.g. rapid rise or fall of DP, significant increase in colour membrane rating),
- Increase frequency and volume of flushing of tank/vessel sump drains,
- As a minimum, weekly re-testing shall be completed until microbe levels return to normal background levels,
- If warning level microbes persist after additional actions, seek further technical advice from a subject matter expert.

Warning and Action Level Recommended Practice (JIG TID #1)

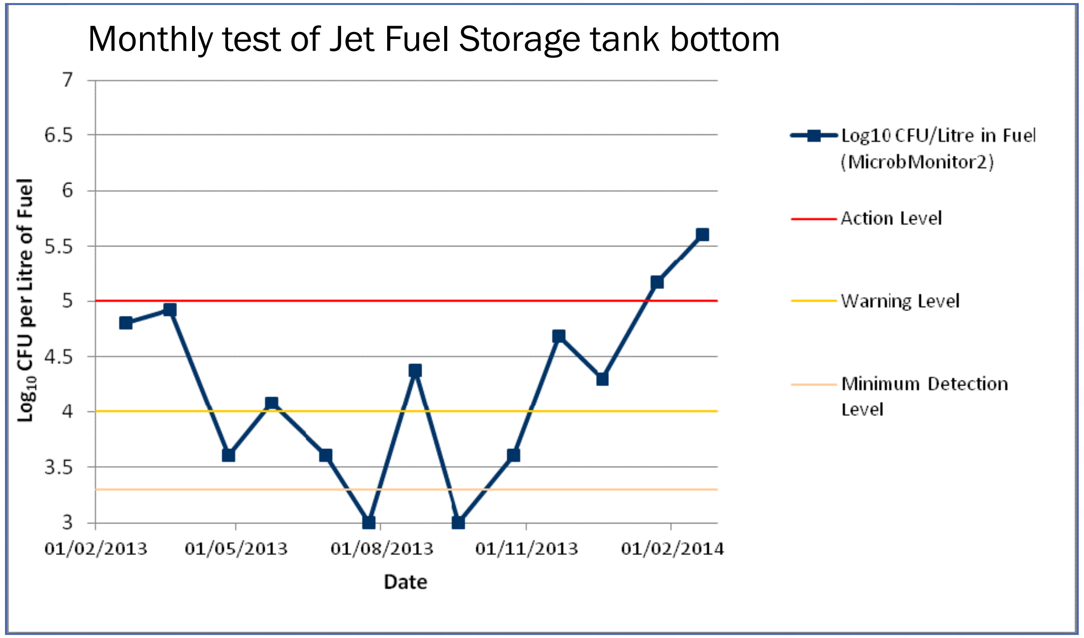
ACTION Level test results

If ACTION Level is detected:

- Confirm by repeat testing (fresh sample).
- For tanks, test representative fuel samples. (Either composite tank sump sample from the same locations and/or other locations downstream including finally delivered fuel),
- For defuelling vehicles test running sample from filter sump and defuel vehicle tank sump,
- If ACTION level contamination is indicated in the bulk/outlet fuel samples, check all filters for cleanliness and integrity, quarantine fuel supply from affected tank(s)/vehicle(s) and seek urgent advice from Operations Management and subject matter experts for remedial actions,
- Confirm draining regimes are adequate and review records for all designated low points and sumps for warning indicators (increase water, poor appearance etc.),
- Check filter DP and filter membrane records for anomalies,
- Initiate incident investigation and physically inspect elements identified as causal/at risk,
- Check imported fuel retained samples if available.

Microbial Contamination Limits

- A single test can never provide the whole picture – consider other evidence:
  - Visual inspection of samples, filters, tanks, etc.
  - Routine filter membrane colour check for filters,
  - Trends of microbiological tests results.
- A Heavy contamination from a sump sample in a supply tank is not necessarily a confirmation that fuel supply is unfit for service.
- Exceeding limits IS an indication that the result should be checked on a second sample and, if confirmed, investigation and preventative or remedial action should be taken.
- Microbiological testing is not about compliance with a fuel specification.
- It's about good facility management - Clean facilities mean clean fuel.



REMEDIATION

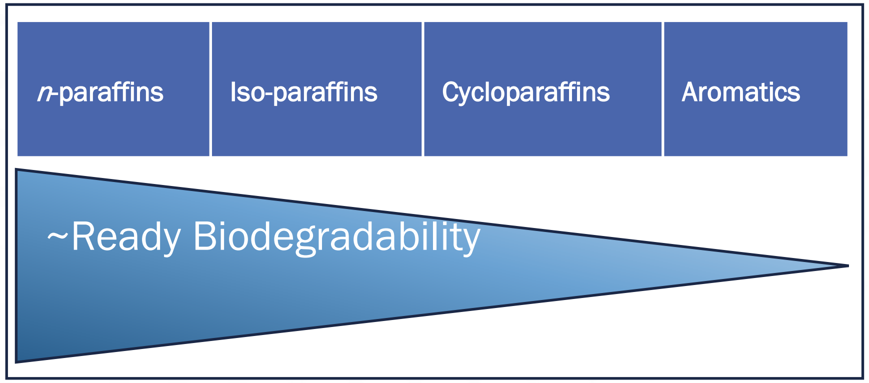
- Only one biocide is now widely approved by aircraft OEMs (Biobor JF),
  - It can generally only be added to aircraft NOT supply & distribution tanks,
  - Must be added with injection equipment (EI 1566).

- For contaminated supply & distribution facilities physical cleaning is the most practical option for remediation,
  - Aqueous biocidal washes (e.g. bleach) may be used during cleaning providing all residues can be removed before tanks are returned to service.
  - Spraying or wiping with alcohol (e.g. 70% IPA) can be appropriate for decontaminating small surface areas after cleaning (e.g. filter vessels).

Seek expert advice!!!

Susceptibility of Semi-Synthetic & Synthetic Blend Components to MBG

- Energy Institute 2024 study* considered;
  - existing microbiological research,
  - comparative data on synthetic & conventional jet fuel properties,
  - field test data.
- Chemical and physical properties of SBCs and semi-synthetic jet fuels suggest they are generally unlikely to impart significantly greater susceptibility to MBG than conventional fuels.
- Of the 8 currently approved pathways, FT-SPKs will probably be the most susceptible SBCs due to high proportion of *n*-paraffins.
- HEFA-SPK and others probably either similar or less susceptible.
- SBCs generally showed similar or lower susceptibility to MBG in laboratory studies. Some evidence that iso-paraffinic SBCs are less susceptible than those containing *n*-paraffins.
- Further research on-going.



* EI Research Report: *Assessment of the susceptibility of synthetic blend components (SBCs) and semi-synthetic jet fuels to microbial spoilage (Phase 1 Literature Review)*, Project T2303, Energy Institute, London, (in press).

SUMMARY

- If best practice is followed, operational problems are unlikely.
- Risk based management of microbial growth is the recommended approach,
  - Risk based Quality Assurance is cost effective Insurance.
- Dirt is Food and Water is Life,
  - Keep it CLEAN, Keep it DRY
- Prevention is better than Cure,
  - If in doubt, try having an Accident/ Incident!!

THANK YOU !

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COFFEE BREAK

Hydrant Design and Commissioning

JIG Manager Workshop
HYATT PLACE NAIROBI, WESTLANDS
Nairobi, 14-16th April 2026

Rob Scott

CONTENT

- Hydrant Dispensers
- Aircraft List
- Unused Hydrant Pits
- Hydrant Pit Placement
- Hydraulic Analysis
- Hydrant Commissioning
- Hydrant Contamination

Introduction

Key requirements of Hydrant Design.

Designed to meet current and future operational requirements.

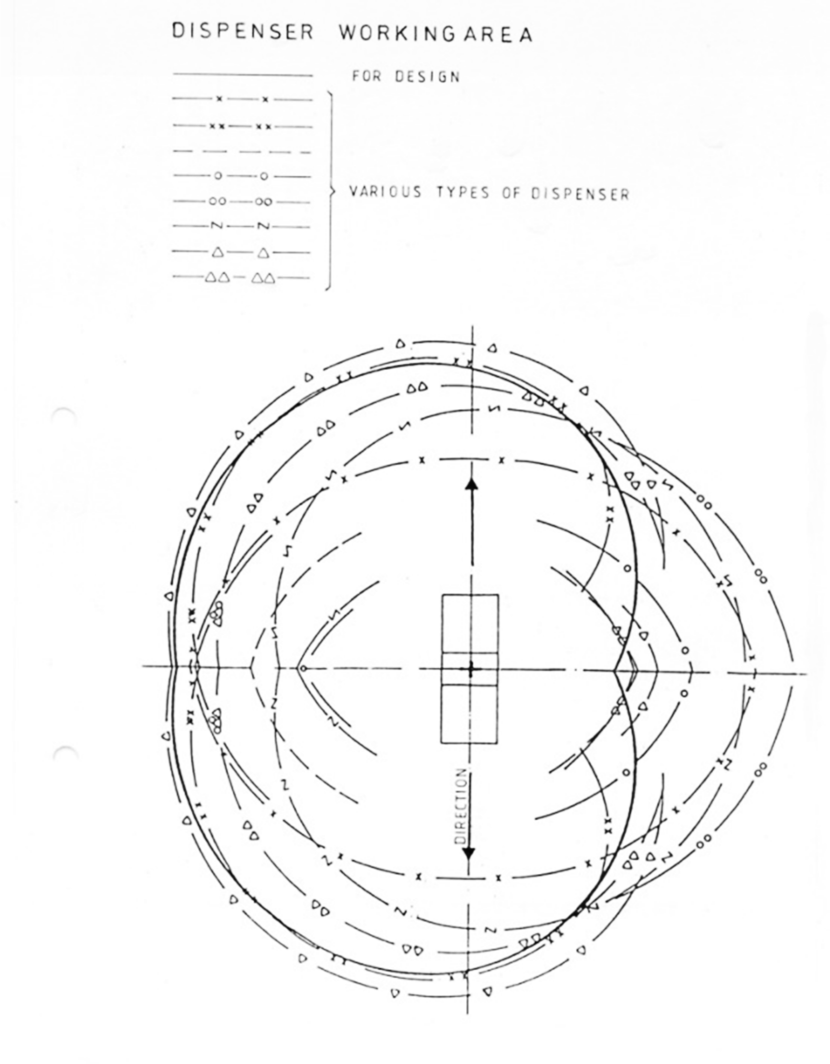
Designed to meet relevant operating standards, JIG 2, EI 1540.

Designed to be commissioned in accordance with EI 1560

Hydrant Dispenser Minimums and Maximums

- **Minimums and Maximums**

- Confirm minimum safety distance and maximum distance between aircraft fuelling point and hydrant pit.
- Suggest minimum 3.6m Safety Distance.
- Suggest maximum 10m Distance.

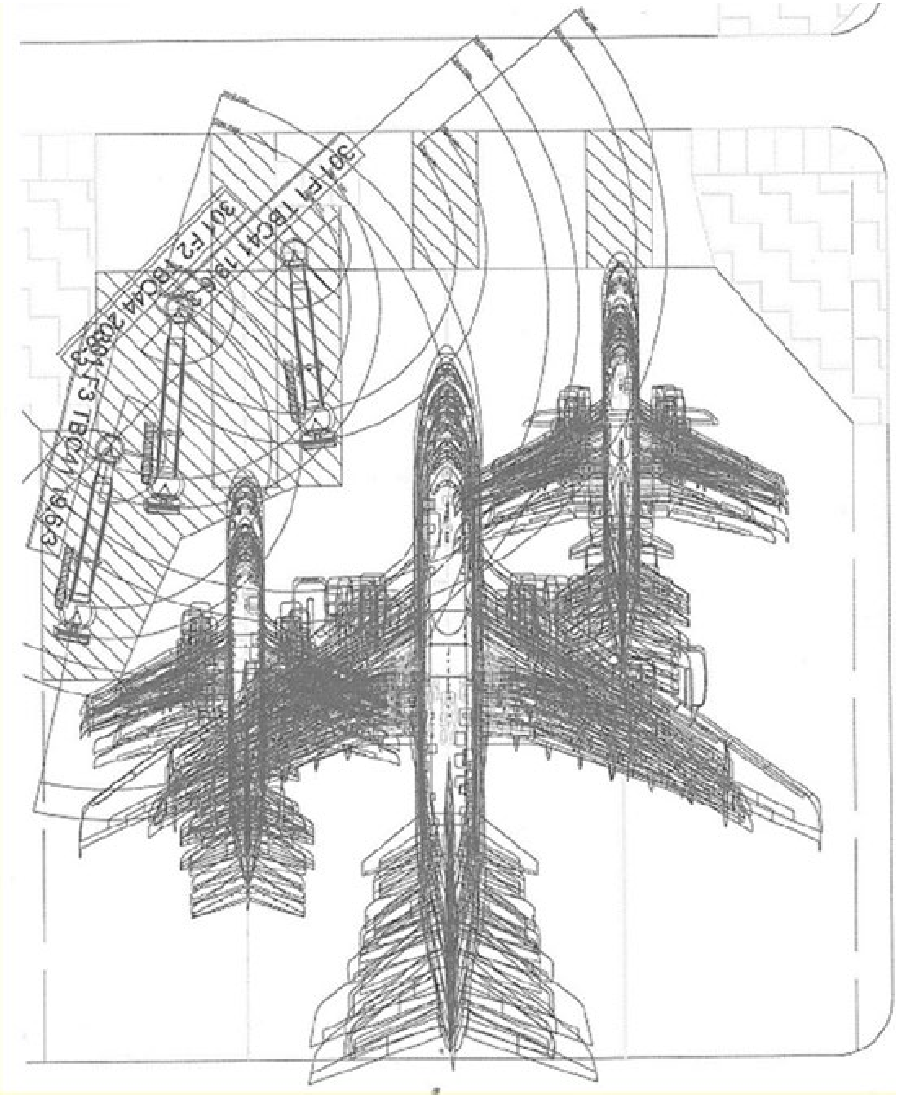


Aircraft List

Confirm Stand types-

1. **MARS Stands**
2. **Code C Only**
3. **Code E Only**

- It is essential that aircraft parking configurations are accurately determined prior to locating the pits.
- Early liaison with the Airport Authorities, makes it usually possible to restrict the number of fuel hydrant pits to two per stand, one port and one starboard of the centreline.
- However, airports nowadays are using multi-purpose stand layouts (such as 'MARS') designed to accommodate, for example, one wide-bodied aircraft or two small aircraft. In these cases, additional pits are required.



Unused Hydrant Pit Flushing

Requirement

Unused Pit Flushing

JIG 2 – Issue 13 – 8.1.3

A record of daily hydrant pit usage shall be obtained from the into-plane fuelling operators and maintained to ensure that unused pits are flushed every 3 months. If any Jet fuel hydrant pits are not used for a period of 3 months, the contents of the appropriate spur line shall be flushed out and a sample taken for a Visual Appearance Check.

Where hydrant pit risers are directly above a main hydrant line (i.e. not a spur line or deadleg (unused section)), and they can be clearly identified by a construction drawing available on site, the frequency of flushing these unused pits may be reduced to annual frequency and be achieved when performing annual dynamic pit valve tests.

Hydrant Pit Placement Analysis

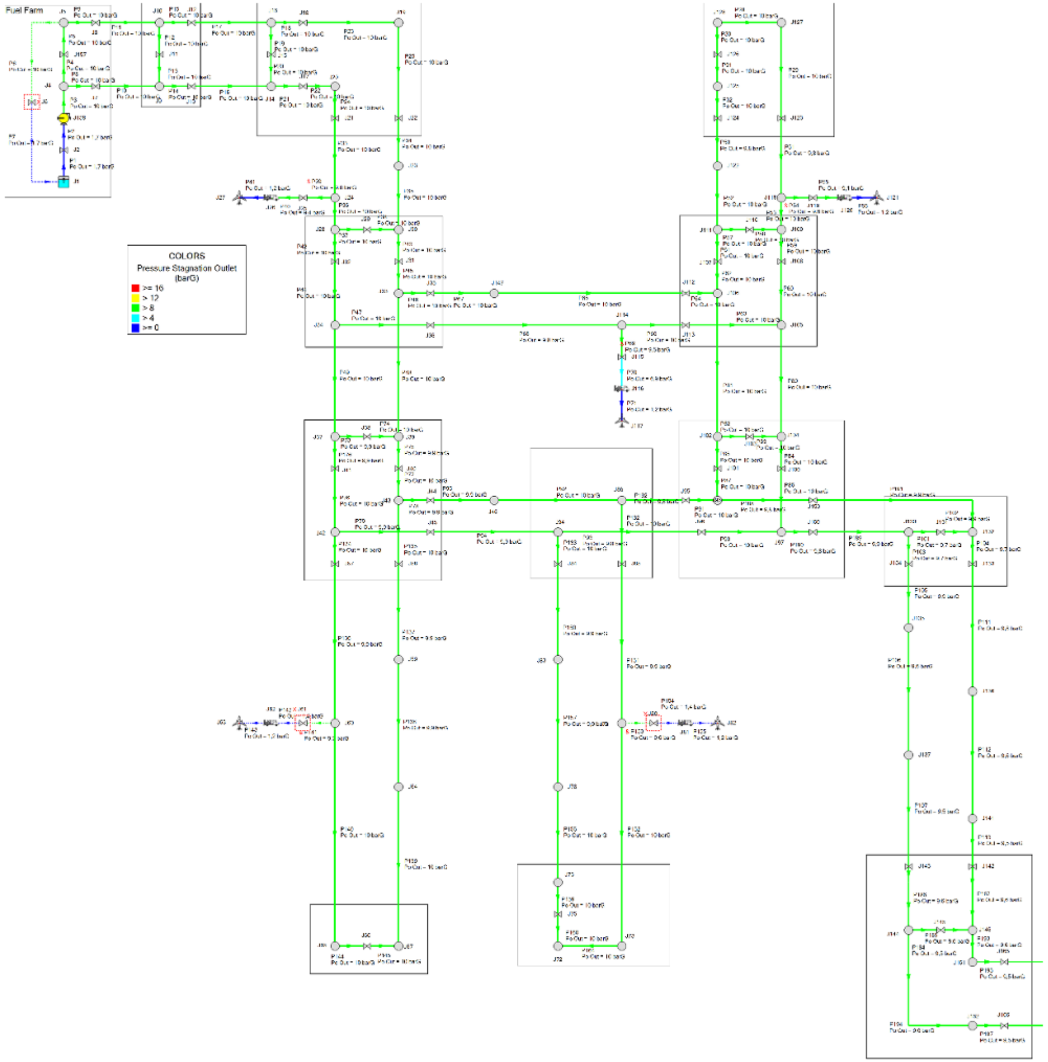
- **Analysis**
- Will be undertaken via Aviplan or similar
- Potential for at least two stop bars to be required.
- Note: Two stop bars usually required to accommodate the range of aircraft (even if stands are non-contact)

Stand definition and settings		
Item	**Value as per item description**	**Comments**
General		
Coordinates	X=670239.09m Y=2762923.27m Angle=30.6deg	Drawing coordinates
801		
Origin	X=22.50m Y= 44.94m Angle= 90.0deg	Local stand coordinates
Limits	Nose=10.07m Tail= 41.44m	Measured from origin
Misparking	Distance=0.00m Left/Right, 0.00m Forward/Backward Angle= 0.0deg	
Minimum stop line distance	1.00m	
Fuel pits		
HV-801-2	X=7.72m Y=35.29m	Local stand coordinates
HV-801-1	X=37.52m Y=33.29m	Local stand coordinates
Operational radius	10.00m	
Safety radius	3.60m	

Hydraulic Analysis and Line Sizing

Hydrant design to conform to JIG 2 and EI1540

- Projected future demands should be utilised as the basis.
- Target will be for main line velocities in the 1m/s to 2.5m/s range.
- Early stages of operation may result in low line velocities.
- Indicative line velocities for limited operations will be provided.
- Confirm periodic flushing can be undertaken if line velocities are consistently < 1m/s.



Hydrant Commissioning

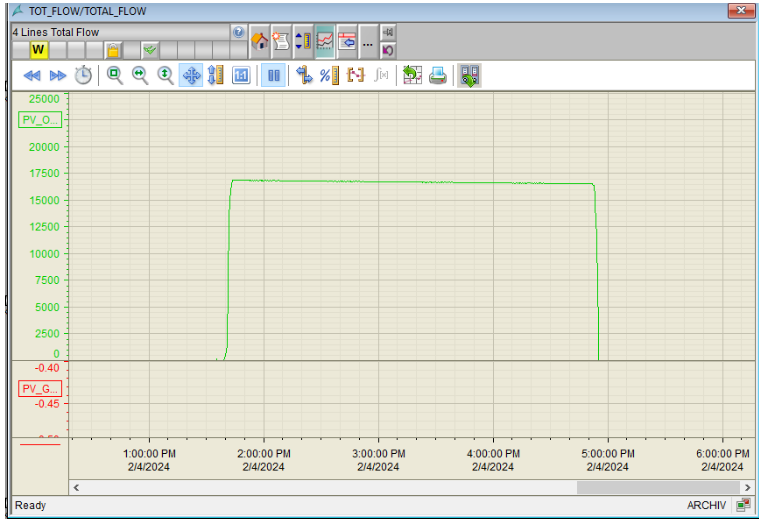
Design to consider commissioning requirements of EI1560.

- Confirm that equipment is available for flushing of hydrant pit branches / hydrant pit branch line modifications.
- Confirm strategy for flushing spur lines running between existing main lines.
- Flush back to storage?
- Spur line connections arranged to facilitate this approach.
- Target commissioning velocities – 2.5m/s to 3.0m/s

Hydrant Commissioning

- Commissioning places high demands on the system.
- Specific performance targets and requirements.
- Commissioning plans should be developed in conjunction with the hydrant design.
- The time frame for commissioning should not be underestimated.
- Pumps and filters will be taken to their maximums to complete commissioning.
- For commissioning by circulation, the method of regulating flowrate needs to be considered.

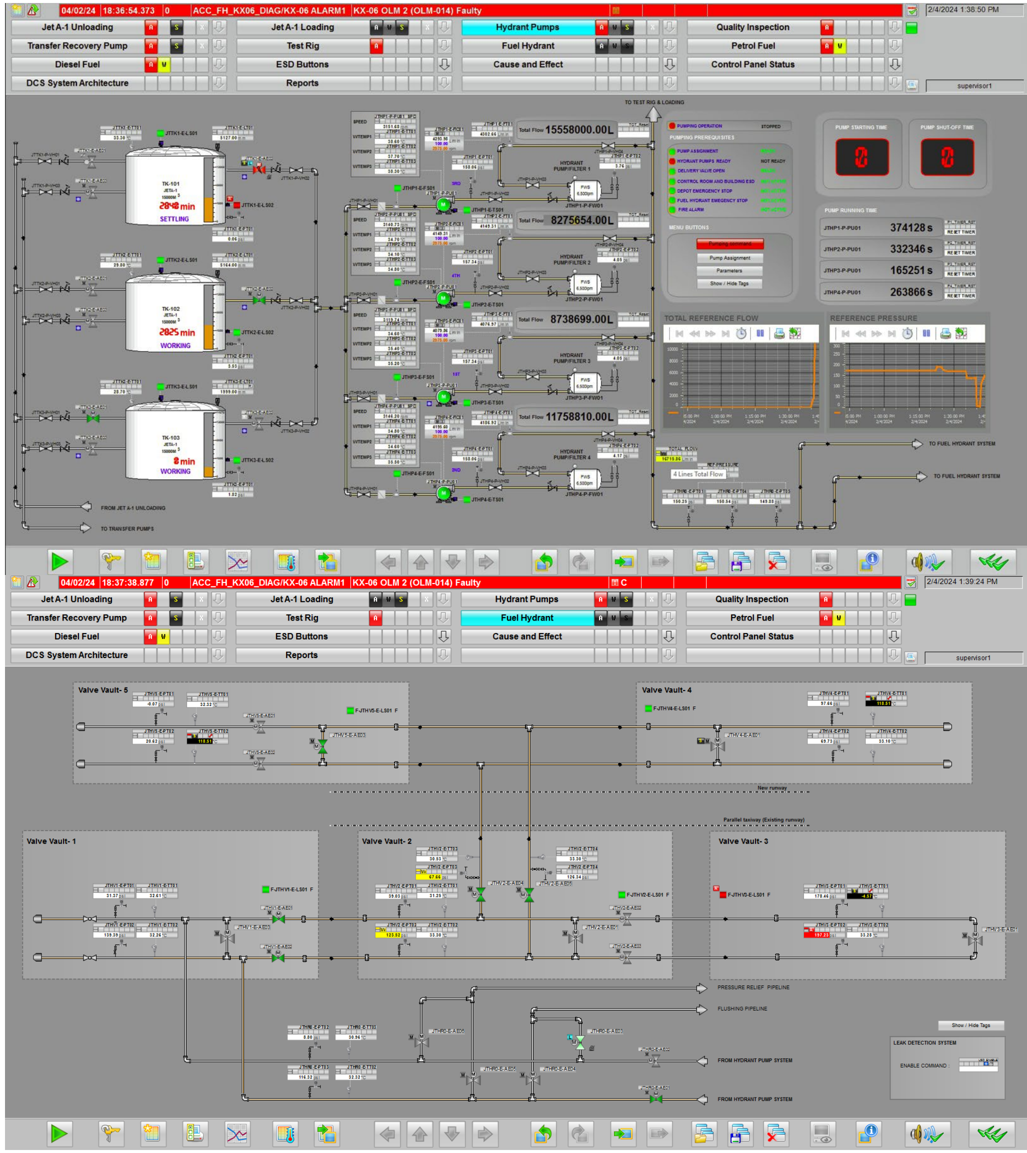
Principal Reference: EI 1560



Commissioning data capture needs to be considered.

Hydrant Commissioning

Necessary commissioning data often not captured in the base system design.



Hydrant Contamination – Materials Quality

- Failure to apply in accordance with coating manufacturers requirements.
- Application method, # of coats and film thickness, thinning and mixing ratios.
- Excessive film thickness and application issues resulting in coating delamination.
- Temperature and humidity issues resulting in coating delamination.

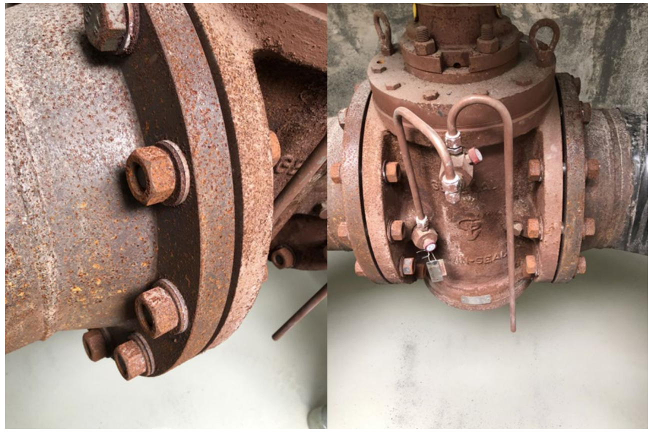
Hydrant Contamination – Material Preservation

Preservation of materials not adequately planned, or preservation breaks down over time.

Hydrant Contamination – Preservation Methods

- Special preservation greases and coatings are applied to:
  - Valves.
  - Fittings.
  - Pumps.
- Unusual properties – combined mechanical and solvent based removal.
- Only partially soluble in Jet Fuel.

Hydrant Contamination – Construction



- Reliance on dewatering equipment to prevent water ingress into hydrant lines.
- Water, sand, soil, particulates.
- Rain events inundating dewatering equipment and other temporary measures.
- Contractor self reporting of problems and issues?
- Contaminants can become “baked on”.

Hydrant Contamination – Construction

- Issues with line slope and low points, design levels never achieved.
- Commissioning and operational delays.
- Gaps in responsibilities as project nears completion.
  - Cathodic Protection
  - Preservation methods.
  - Risk of inert gas.
- Longer term robustness.
- *Assessment of the gap between design performance and real operations.*
- *Consider additional methods such as periodic flushing.*
- *Consider the need for periodic flushing in the system design.*

Prevention – Clean Build and Oversight

- Clean Build, gaps in understanding and expectations.
- Independent and knowledgeable oversight.
- Oversight for critical activities such as tie-ins.
- Ongoing education on Clean Build.
- Identification and reporting of potential issues in advance.
- Rigorous application of QA / QC processes.
- Look for falsification of records and documentation.
- Expectations for pipework in ground, product tight.
- Consequences of a contamination event.
- Operations ability to contribute to monitoring processes, 24/7 including weekends.

Prevention – Better than Cure

Questions?

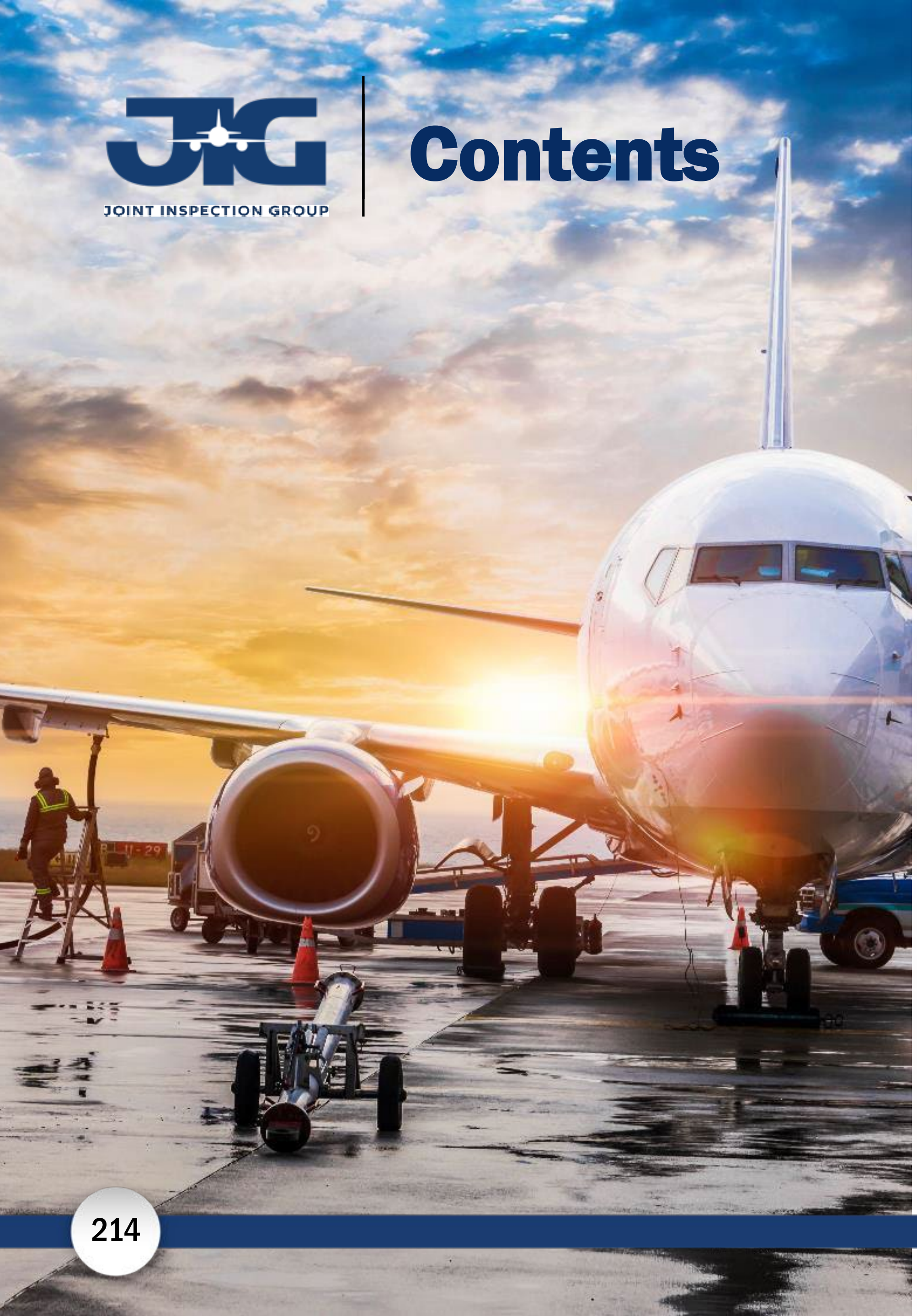
Hydrant System Integrity

Luke Hutson – Assistant Technical Manager

JIG Managers' Workshop – Nairobi – April 2026

Introduction

- Assistant Technical Manager, joined JIG Sept 2025
- Been present in the Aviation Industry for 10 years.
- Operations Engineer at STN, maintaining and managing the hydrant system.
- Global Field Engineer at Atmos International, designing and commissioning LDS systems for hydrant networks.



Contents

Do not edit
How to change the design

Does your company have airports with Hydrant Systems?

How old are your hydrant systems on average ?

What does "System integrity" mean for you ?

Hydrant System Integrity

- Hydrant systems move millions of liters of fuel per day.
- Release of product can have serious consequences for the local environment.
- It is vital hydrant systems are routinely monitored for integrity through a combination of active and passive checks.

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Causes of Product Loss

- Damage to gaskets and seals.
- Loss of flange tightness due to temperature cycling.
- Most leaks cannot be seen and are on buried infrastructure.
- However, most leaks start with low flow rate from a pinhole opening and gradually open over time. Fatigues cracks occur in pipelines that are continually pressure cycled over many years.

Causes of Product Loss – Continued

Field example of a leaking flange.

Contributing factors include seasonal temps and gasket deterioration.

Hydrant Integrity – Leak Detection Systems

EI 1540, 1560 & JIG 2 mandate that hydrants shall have the ability to test and prove the integrity of the hydrant system. This is usually in form of a Leak Detection System.

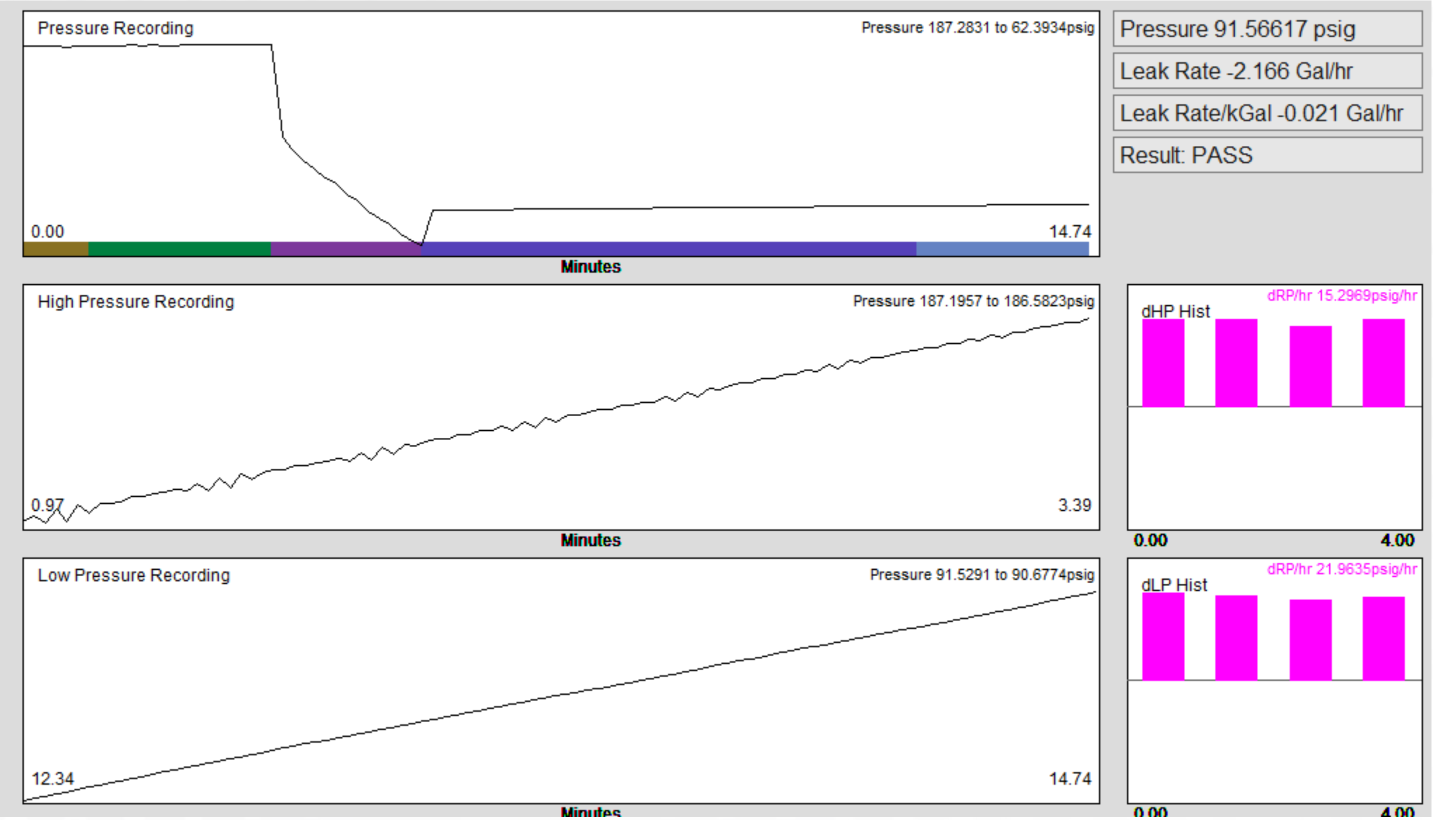
Several types of systems exist with the 'Pressure Step Method' being the most common.

LDS systems should be able to negate the effects of temperature.

3.5.6 All hydrant systems shall incorporate a means of testing and proving the integrity of the system. Further information concerning pressure testing and tightness integrity (leak detection) is contained in EI 1540 and EI 1560.


JIG 2
ISSUE 13
SEPT 2021
JOINT INSPECTION GROUP
www.jig.org
AVIATION FUEL QUALITY CONTROLS AND OPERATING STANDARDS FOR AIRPORT DEPOTS AND HYDRANTS
ENDORSED BY
IATA
TECHNICAL FUEL GROUP

Pressure Step Principles



Pressure steps compares a pressure decay obtained at high-pressure vs a pressure decay obtained at low-pressure.

Lower rate of decay at the low pressure indicates a leak.

Decay due to temperatures are almost the same a high and low pressure.

Leak Detection Systems – Leak Thresholds

EI 1540 states hydrant systems are to be segmented into appropriately sized segments for testing.

- Preferred section volume is <200m3.
- For sections <200m3 the allowable leak rate of 0.02 l/hr/m3.

  For example - 150m3 x 0.02 = 3lph @ 7Barg Reference pressure
- For section >200m3 the leak threshold is 4lph on all segment sizes.

These leak rate thresholds are the same for all types of leak detection systems

Permanent Leak Detection Systems

Permanent LDS are designed for newer hydrants with automation.

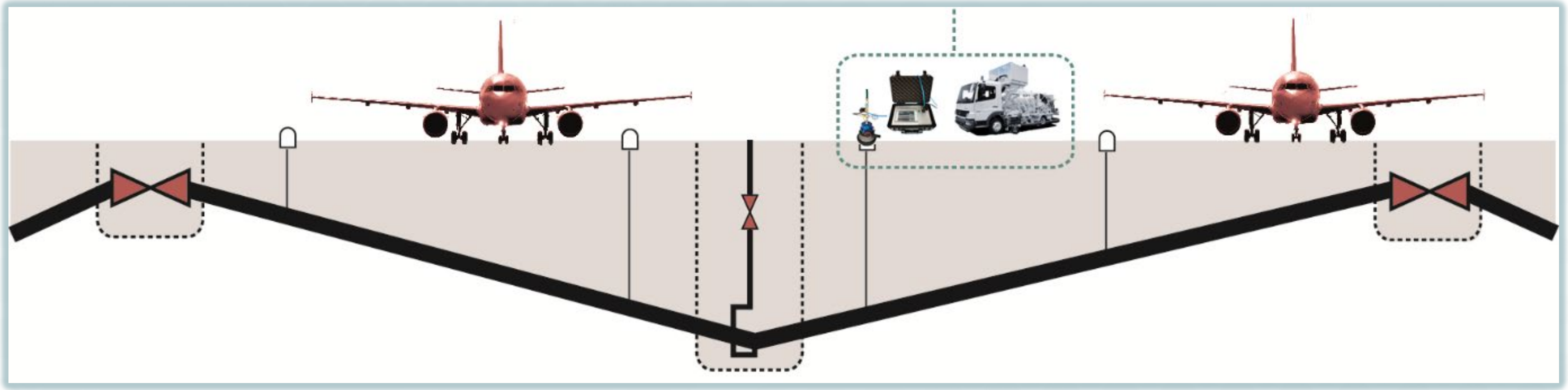
- Automation includes MOV's and appropriate instrumentation.
- Hydrants that are fitted with a fully automated, permanent leak detection system to confirm their integrity shall be checked at least monthly. Or in line with local regulations.
- New automated testing systems can test every 24 hours.
- Possible high CAPEX required.

Mobile Leak Detection Systems

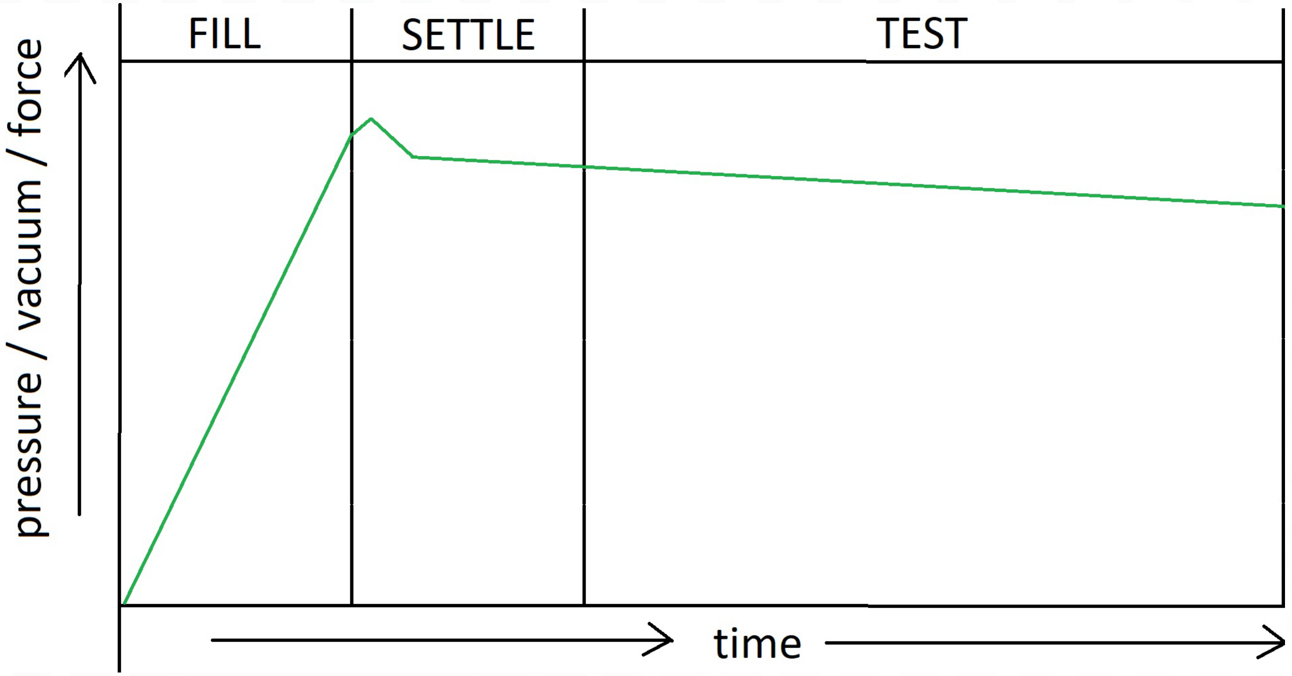
Mobile LDSs are designed for hydrant operations without permanent leak detection systems as older hydrants may not be able to host a permanent fixed system. Hydrant shall be tested every 6 months with Mobile LDS.

Mobile leak detection equipment shall be certified for use in Zone 1 explosive atmospheres e.g. IECEx or ATEX, see local regulations.

Low CAPEX solution for LDS



No Leak Detection System?



- Where no LDS system exists a monthly pressure decay test shall be carried out, minimum 2 hours.
- If using a mobile LDS, this shall be carried out in the month with no test.
- Compare with previous results changes in test pressure and fuel temp. Typically less than 10psi/0.7 Bar loss.
- Annual pressure decay at 110% of MOP to confirm tightness. Where possible > 8 hours.

No Leak Detection System?

- Example of simple pressure decay test coupler if no leak detection system is in place.

Achieving ‘Good’ Leak Detection Results

- Ensure MOV’s or manual isolations are exercised regularly to ensure correct function.

- Pressure, thermal relief valves and surge suppression shall be isolated for testing.

- High points must be vented to remove any trapped air in the system. (Precaution must be taken not to create fuel/ air mist – See JIG 2)

- Accurate as-built hydrant drawings, to ensure correct isolations and volumes.

- Test above and beyond the standards, build a portfolio of data.

- Systems shall be proved annually.

Verifying Leak Detection Systems

All hydrant systems shall be proved annually with a simulated leak test.

Achieved by using hardware to induce a measurable controlled leak on the hydrant to ensure leak rates reported are accurate.

Additional Methods of Checking Hydrant Integrity

- Visual Inspections of the hydrant pipe route.
- Soil/Air interface must be checked.
- Stock control by fuel loss/ gain analysis.
- Monitoring Pump start frequency and run time duration.

Hydrant Integrity – Cathodic Protection

JIG 2 3.10 - Cathodic Protection shall be installed for all hydrant systems and may be required for buried tanks and pipelines.

Cathodic protection works by preventing or reducing the electrochemical process that causes corrosion to buried steel structures.

Maintains hydrant system integrity and safety.

Extends asset life and reduces failures.

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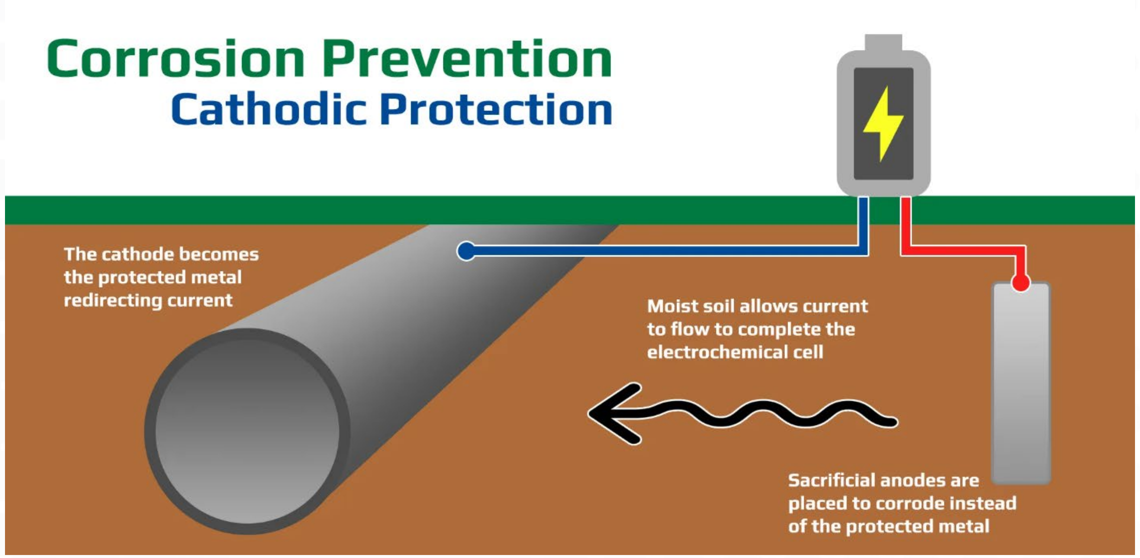
Cathodic Protection Principles

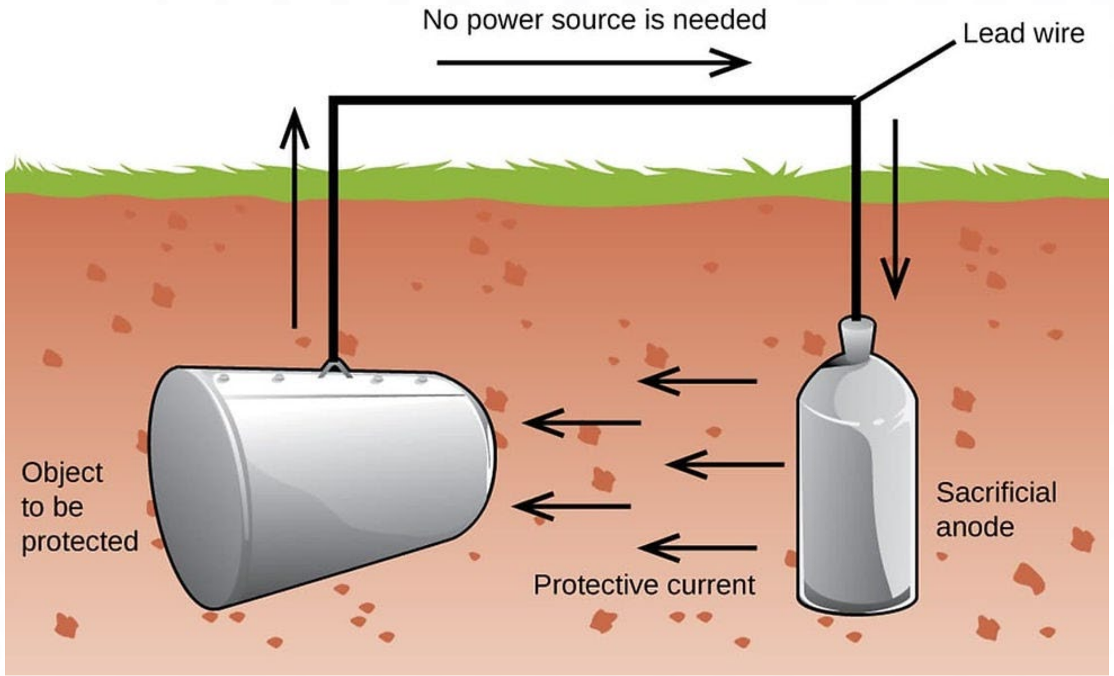
Achieved by a Sacrificial Anode CP (SACP) or Impressed Current CP (ICCP) system.

- **Sacrificial Anode Cathodic Protection (SACP)** relies on galvanic action, where a more reactive metal (such as zinc or magnesium) is electrically connected to the steel structure and preferentially corrodes, providing protective current without the need for an external power source.

- **Impressed Current Cathodic Protection (ICCP)** uses an external DC power supply to drive protective current from inert anodes onto the structure, allowing greater control of protection levels and suitability for larger or higher-demand systems.

Cathodic Protection Principles





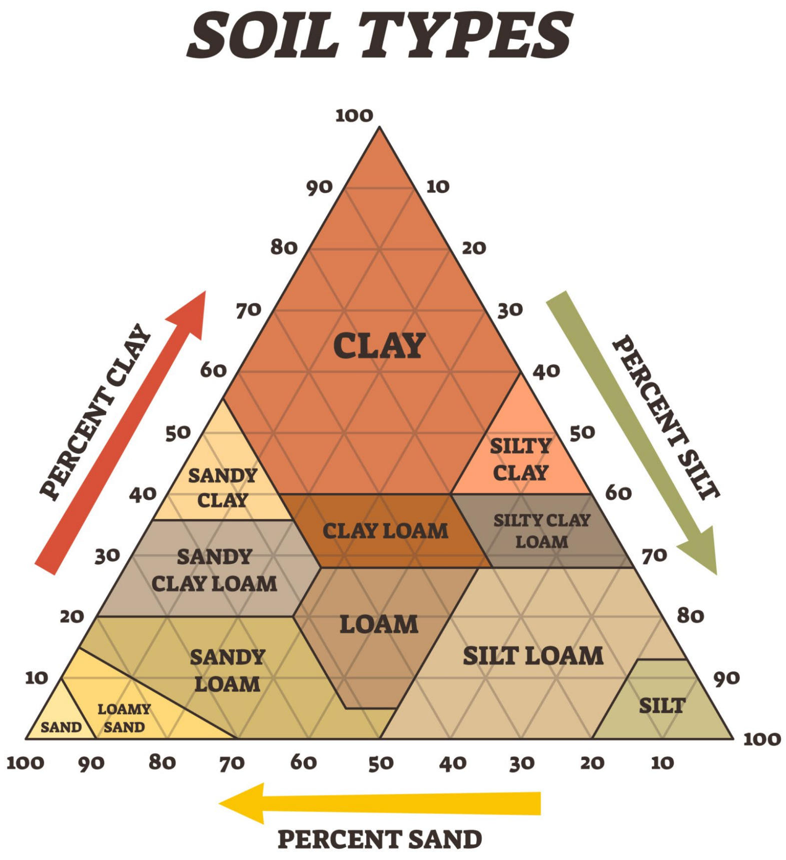
Cathodic Protection – Maintenance

JIG 2, 10.18 Cathodic protection

An agreed maintenance programme shall be in place. Monitoring by trained and competent person(s) shall be performed at least quarterly and a system check by a qualified person shall be performed annually.

Typical checks include verifying pipe-to-soil potentials, ensuring electrical continuity, inspecting anodes or rectifier output, and checking for damage, interference, or abnormal readings to confirm effective protection.

Cathodic Protection Design Considerations



Cathodic Protection system choice should be based on a local soil study and local expertise.

- Dry sand and gravel can be highly resistant and can give poor CP performance.
- Wet or clay soil provide optimal conductivity.
- Salty soils in coastal areas can be highly corrosive and place more demand on the CP system.

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Teşekkür ederim.

Grazie

谢谢你

शुक्रिया

Dziękuję

Gracias

THANK YOU

Dankeschön

Cảm ơn bạn

Merci

Köszönöm

Obrigado

Bedankt

Дякую.

Terima kasih

Tak

ありがとうございます

Σας ευχαριστώ

Asante

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Hydrant Pit Valve & Intake Coupler Design Characteristics

Nairobi: April 2026

Presented By Andy Walton
Aljac Fuelling Components Ltd
Eaton's Carter® Ground Fuelling distributor for EMEA

Where do we start?

We need to go back to the 1940's.

Post war enthusiasm for air travel.

Larger aircraft and increased fuelling needs.

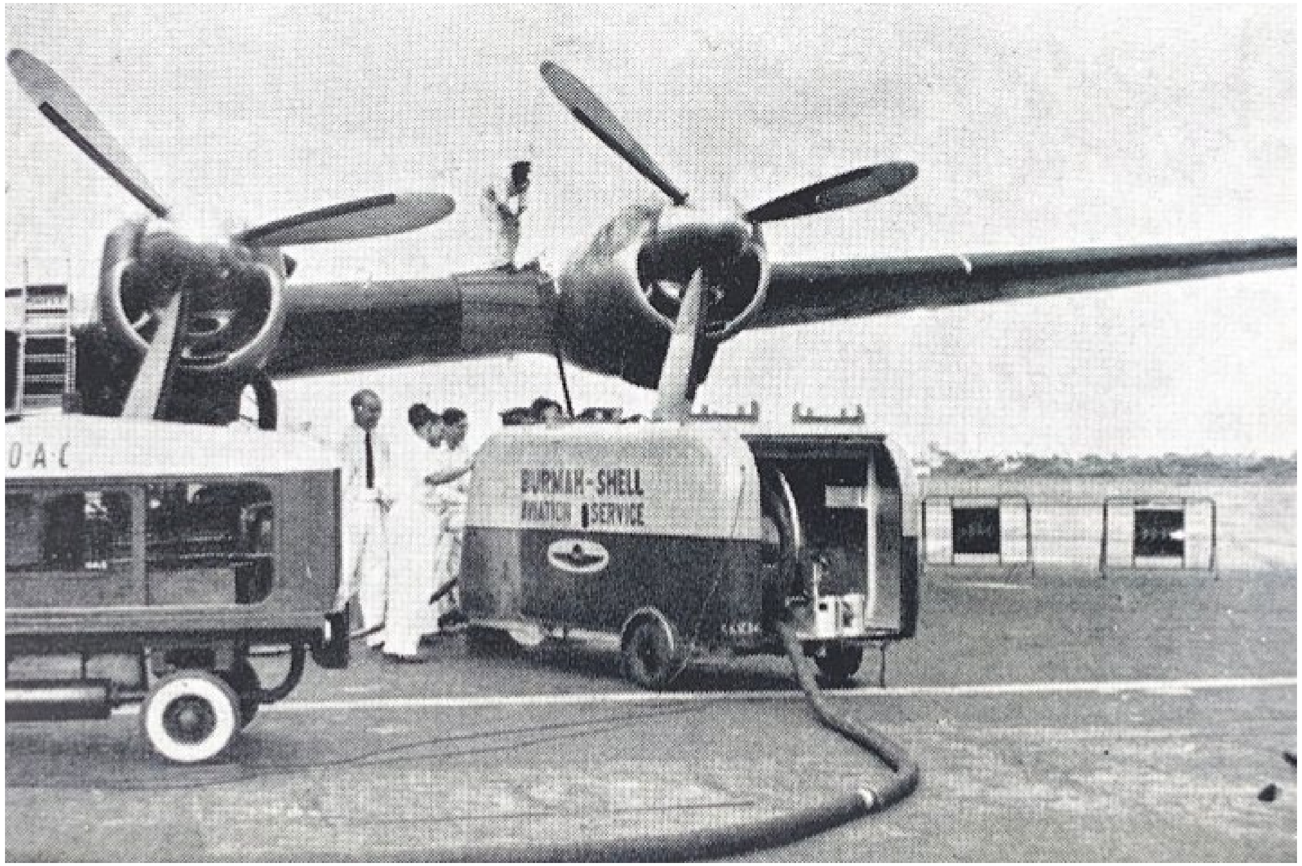
Where do we start?

First installations of fuel hydrant type systems in the 1950’s.

Large scale developments in locations such as Singapore.

Over 100 installations by the late 1950’s.

But no standards!



Aljac MEMBER OF THE ELAFLEX GROUP

Where do we start?

Wider introduction of larger jet engined aircraft in the late 1950's and into the 1960's.

Widespread adoption of 4" API style couplers. Carter manufactured their first 4" coupler around this time.

Still no standards!

First introduction of standards

Efforts to introduce standards began in the 1970’s with the American Petroleum Institute (API) and Institute of Petroleum (IP)

First introduction of API 1584 in 1975.

American
Petroleum
Institute

IP THE INSTITUTE
OF PETROLEUM

First introduction of standards

API 1584 1st edition released in 1975.

Key features:

- **4” Class 150lb inlet flange.**
- **12” high.**
- **4 inch API outlet adaptor.**

API 1584 2nd edition released in 1994 with no significant changes.

American Petroleum Institute

First introduction of standards

IP standard for aviation hydrant pit systems "Recommended Arrangements for New Facilities" First released 1980.

Key features:

- **6 inch class 300lb flange.**
- **4 inch API outlet adaptor.**
- **16-18 inches high.**
- **Shall have an independent means to close the hydrant pit valve.**

Results in manual type pilots.

IP THE INSTITUTE OF PETROLEUM

Development of standards

API and IP merged their aviation specifications.
API/IP 1584 released in 1999.
Still 2nd edition from 1994.

Key features:

- **Ability to replace API outlet adaptor with hydrant pressurised.**
- **Either 12 or 18 inches high.**
- **Now includes air, dual (air/lanyard) and manual pilot controls.**

American Petroleum Institute

IP THE INSTITUTE OF PETROLEUM

Development of standards

API/IP 1584 3rd edition released in 2001.

Key changes:

- **Introduces steady load and pit coupler impact load (knock off) test.**
- **Coupler designed to break away in the event of an incident.**
- **Pit valve 4" API outlet required to close if coupler breaks away under flow conditions.**

American Petroleum Institute

IP THE INSTITUTE OF PETROLEUM

Development of standards

1999 API 1584 merged with UK IP specification becoming API/IP 1584.

2001 API/EI 1584 3rd Edition released.

2003 IP became Energy Institute (EI) specification renamed API/EI 1584.

2010 API withdrew aviation specifications, renamed again to EI 1584.

Key milestones

API/IP 1584 2nd edition to API/IP 1584 3rd edition (later EI 1584 3rd Edition)

Introduces steady load and pit coupler impact load (knock off) test.
In the event of an impact, hydrant pit couplers would break away cleanly from the pit valve with no pressurised release of fuel.

Hydrant coupler must separate from the pit valve under a steady load condition between 17,800 N and 22,240 N (4000 – 5000lbf)

Hydrant pit valve must remain un-damaged with a steady load of 40,000N (9000 lbf) applied (ensuring the coupler breaks away before damaging the pit valve)

Key milestones

API/IP 1584 2nd edition to API/IP 1584 3rd edition.

Hydrant pit couplers shall (previously may) have an interlock mechanism to prevent the collar from lifting once latched onto a pit valve.

64900 external
interlock
mechanism

64910 internal
interlock mechanism

Key milestones

EI 1584 3rd edition to EI 1584 4th edition. (Released May 2017)

Hydrant pit couplers may (previously shall) have an interlock mechanism to prevent the collar from lifting once latched onto a pit valve.

64900 external
interlock
mechanism
becomes
optional

Key milestones

EI 1584 4th edition to EI 1584 5th edition. (released Nov 2025)

No significant changes affecting Hydrant Pit Valve or Hydrant Coupler design.

To my knowledge all Hydrant Pit Valves and Hydrant Couplers which qualified to EI 1584 3rd edition have "grandfathered" over, through 4th edition and are automatically qualified to EI 1584 5th edition.

Design requirements

NB: Draft SAE Document AIR 4782 A Not released – refers to EI 1584

EI 1584 is the only document which contains design requirements and is in circulation.

(possible exception of internal oil company documents and Military documents)

SAE INTERNATIONAL

AEROSPACE INFORMATION REPORT	AIR4782	REV. B
	Issued 1994-02 Revised Proposed Draft 2014-05-02 Superseding AIR4782A	
Hydrant Valve and Coupler Historical Background		

RATIONALE

Required

1. SCOPE

This SAE Aerospace Information Report (AIR) presents historical information and background data related to hydrant valves and couplers used in worldwide ground refueling of commercial aircraft (hereafter generically referred to as hydrant devices). Military hydrant devices are not included since their mission requirements demand approaches that may differ.

1.1 Purpose

The purpose of this document is to provide definitions, background and educational information for use by design engineers, users of the systems and other interested parties who are involved with hydrant devices and associated equipment.

1.2 Field of Application

Soon after World War II, the military techniques for underwing refueling of turbine-engined aircraft were adopted for use on commercial aircraft. Advantages include significantly improved safety, convenience and rapidity of refueling.

Refueling systems for commercial aircraft evolved to comprise five basic elements, as follows:

a. Hydrant systems (or supply systems)

b. Hydrant couplers (hydrant system to servicer systems)

c. Servicer system (hydrant to aircraft)

d. Aircraft couplings (service systems to aircraft fuel systems)

e. Aircraft fuel systems

Element (d), the aircraft couplings, are now true worldwide standards, having been adopted for military and commercial aircraft of all countries, and controlled by international standard documents.

Design requirements

These are not exhaustive lists!

Design requirements

Hydrant Pit Valve – current requirements.

- **Outlet adaptor in accordance with API RP 10004.**
- **Outlet adaptor poppet shall close automatically when Hydrant Coupler is closed or removed.**
- **Hydrant pit components shall be designed so they can be installed and maintained in a pit with minimum internal diameter 460mm (18")**
- **Hydrant Pit Valve height – 4" or 6" class 150lb flange – 290mm – 415mm**
  Hydrant Pit Valve height – 6" class 300lb flange – 406mm – 415mm
- **Pressure control, if fitted, shall be included on the Hydrant Pit Valve or Hydrant Coupler.**
- **Deadman function must be provided on Hydrant Pit Valve or Hydrant Coupler (upstream of the inlet hose)**

Design requirements

- Hydrant Pit Valve – current requirements.
- Connections must be provided for deadman control, if fitted.
- If flow control is included, connections for reference pressure must be fitted.
- Air/fuel operated pilots must have a quick disconnect for control hose connection. Quick disconnect on the pilot must be "leaky" type to prevent locked in pressure.
- Flow: 4500 litres per minute.
11000 litres per minute catastrophic excess flow.
- Pressure: Design pressure: 1 900 kPa (275 psi).
Operating pressure: −10 to 1 400 kPa (−1,5 to 200 psi).
Proof pressure: 2 850 kPa (415 psi) minimum.
Burst pressure: 5 690 kPa (825 psi) minimum.

Design requirements

Hydrant Pit Valve – current requirements.

- **Pilot Device** **Manual operation via a lanyard with maximum 25 lbf force. Air/Fuel operation via externally supplied air or fuel pressure with minimum 35 psi, thi smust be supplied via a deadman device.**
- **Closing time (via lanyard or deadman control) shall be two to five seconds.**
- **Opening time 90% of rated flow in 5 – 20 seconds. 100% of rated flow less than 30 seconds.**
- **Deadman system shall not impact on opening or closing times.**
- **Overshoot shall not exceed 200 litres at all flowrates up to rated flow. (300 litres under excess flow)**

Design requirements

Hydrant Pit Valve – current requirements.

- **Pressure loss limitations.**
- **Pressure sealing requirement – minimal leakage witnessed at poppet when closed (with pressure relief poppet depressed) (Hot valve check)**
- **Wear Gauges shall be provided by the manufacturer.**
- **Pilot device override required – previously the service valve.**
- **Pressure equalising poppet – Not explicitly listed as a requirement however it is shown in various drawings.**

Design requirements

Hydrant Pit Coupler – current requirements.

- **Static seal between valve and coupler, without coupler/valve being opened.**
- **Static seal shall not be broken if coupler/valve are opened.**
- **Shall incorporate an interlock to prevent poppet opening (and hence pit valve poppet opening) before being locked in position.**
- **Shall incorporate an interlock to prevent unlocking and disconnection before Hydrant Coupler poppet is closed.**
- **Hydrant pit components shall be designed so they can be installed and maintained in a pit with minimum internal diameter 460mm (18")**
- **Deadman function must be provided on Hydrant Pit Valve or Hydrant Coupler (upstream of the inlet hose)**

Design requirements

Hydrant Pit Coupler – current requirements.

- **Connections must be provided for deadman control, if fitted.**
- **If flow control is included, connections for reference pressure must be fitted.**
- **Flow:** **4” inlet, 4” outlet – 4500 litres per minute**
4” inlet, 3” outlet – 3000 litres per minute
- **Weight:** **Hydrant Couplers shall be as light as possible and not more than 17kg unless provided with a CLAD.**

Design requirements

Hydrant Pit Coupler – current requirements.

- **Pressure:** Design pressure: 1 900 kPa (275 psi);
  Operating pressure: −10 to 1 400 kPa (−1,5 to 200 psi) min.
  Proof pressure:
    - uncoupled, closed: 1 830 kPa (265 psi) min.
    - coupled, open: 2 850 kPa (415 psi) min.

  Burst pressure:
    - uncoupled, closed: 2 740 kPa (400 psi) min.
    - coupled, open: 5 690 kPa (825 psi) min.
- **Deadman Control:** Deadman actuation shall cause the Hydrant coupler to open in 5 seconds or greater.
  Deadman release shall cause the hydrant coupler to close in 2 – 5 seconds, overshoot shall not exceed 200 litres (or 5% of flow in some areas)

Design requirements

Hydrant Pit Coupler – current requirements.

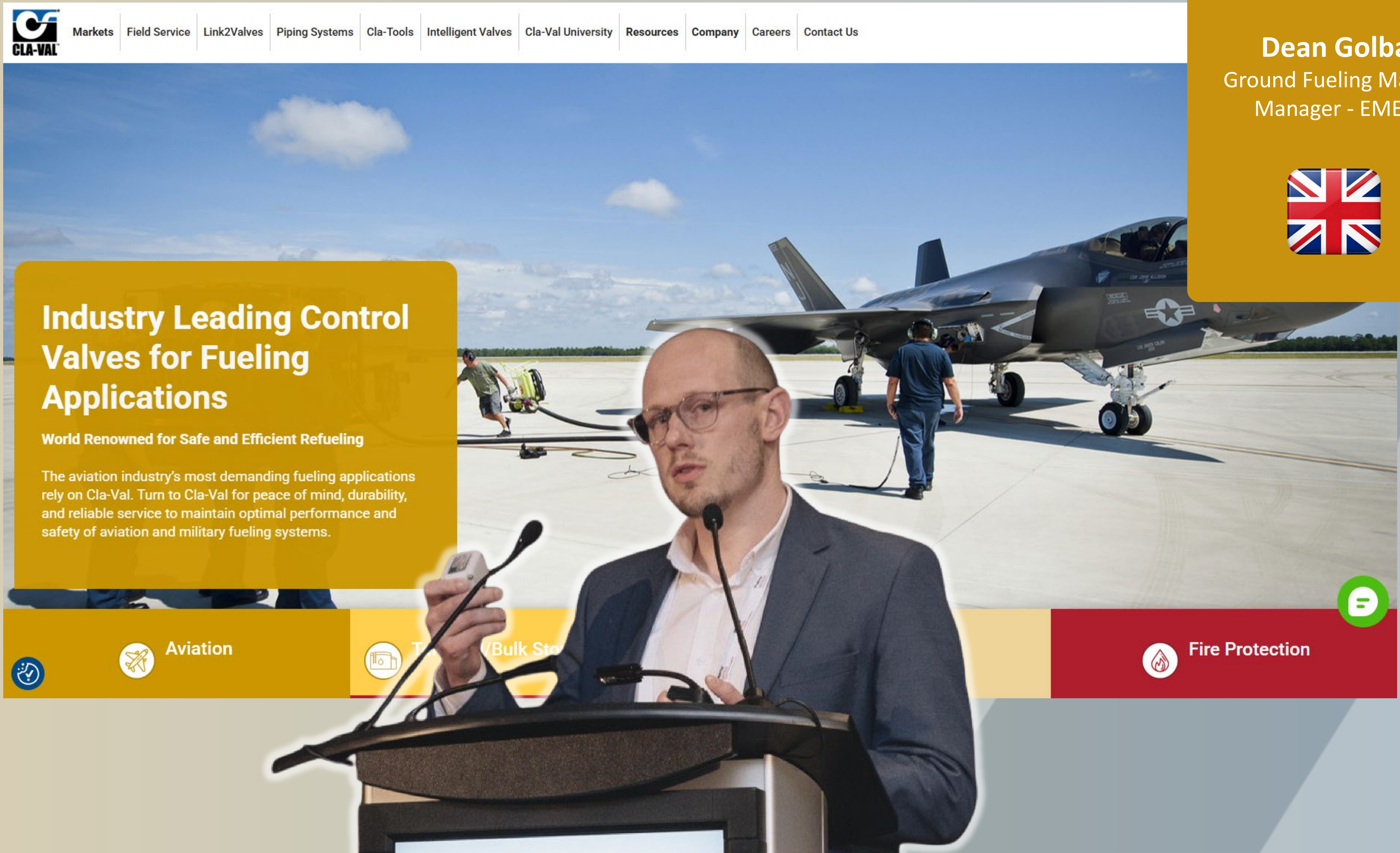
- **Pressure loss limitations.**
- **Maximum 30ml fuel release during disconnection from Hydrant Pit Valve.**
- **Wear Gauges shall be provided by the manufacturer.**
- **Equalisation valve – Not explicitly listed as a requirement however it is mentioned as part of the opening characteristics.**

2026 JIG Managers' Workshop - Nairobi

David Cassagne

Directeur Général /
Managing Director

CLA-VAL



Dean Golba

Ground Fueling Market Manager - EMEA

Section 2 – Hydrant Pit Valve and Coupler Inspection and Maintenance

Section 2 – Inspection et maintenance des vannes de fosse hydrant et des coupleurs

JIG 2 Issue 13 – Pit Valves

Weekly Check
Contrôle hebdomadaire

Weekly inspection and monthly testing – A9.1

A9.1.1 Visual inspection

Each hydrant pit box, including those fitted with hydrant valves, low point valves, high point valves or where valves have been removed and a blank flange installed, shall be inspected weekly or more frequently if required, e.g. during storm season, in accordance with the following list:

1. Ensure pit box is clean and free from water, product and surface dirt/grit. Clean if required.
2. Examine condition of pit lining.
3. Ensure valve and components are free from product leaks.
4. Examine condition of jacking screws, where fitted.
5. Visual examination of operating handle/linkage and lanyard connections.
6. Ensure presence and condition of dust cap and tether (where required).
7. Ensure the pit lid is in sound condition.
8. Examine the condition of seal (if fitted), tether (if required), pit number and product/grade marking if applicable.

Details of water, fuel, dirt and any defects shall be reported immediately and rectified as necessary.

JIG 2 Issue 13

Monthly Check
Contrôle mensuel

Weekly inspection and monthly testing – A9.1

A9.1.2 Monthly integrity testing

The integrity of the valves shall be checked once per month, using either a modified EI 1584 test coupler fitted with a pressure gauge or a device with a deflection shield/cover. Due to the potential of product release into the pit box, use of a test coupler is the preferred method for performing this check. This check is performed by opening the connected test coupler poppet or depressing the hydrant pit valve pressure equalising valve, to determine if there is any hydrant pressure bypassing any of the pit valve seals when it is closed.

1. Ensure that the operating mechanism is free from obstruction, is secure and that no excessive free play is observed.
2. Keep the main valve in the closed position.
3. Connect a test coupler and open the poppet. Observe the test coupler pressure gauge, a continued rise in pressure indicates that the one or more of the pilot, servicing the main valve seals, are bypassing and the valve shall be removed from service and repaired.

If a shield/cover is used instead of a test coupler, depress the pressure equalising valve and hold down for as long as it is required to establish there is no continuous fuel flow, e.g. for approximately 10 seconds. After the initial release of fuel, a steady flow will indicate that one or more of the pilot, servicing or the main valve seal is bypassing and the valve shall be removed from service and repaired.

If only a few drops of fuel are observed following the initial release of fuel, the valve is serviceable. If more than a few drops are observed the valve is bypassing and shall be removed from service and repaired.

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JIG 2 Issue 13

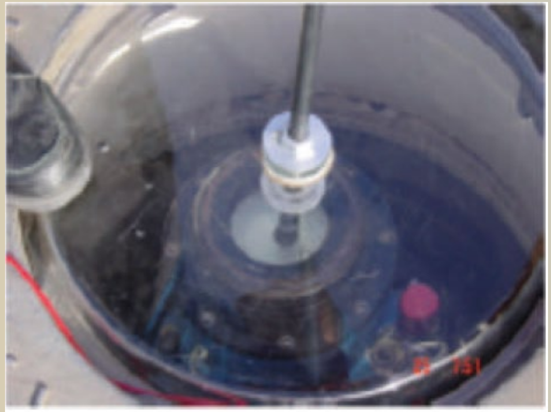
Monthly Check
Contrôle mensuel

Pit Valve Integrity Checks – 3.5.1

“The condition and integrity of all hydrant valves shall be tested in accordance with the procedure in Appendix A9.”

Hydrant pit valve checks – 8.2.2

“**Monthly integrity testing** and annual dynamic testing of hydrant pit valves shall be carried out in accordance with Appendix A9. The dynamic test shall also be carried out after a valve has been overhauled or repaired (see Appendix A9.4).”



Monthly Check
Contrôle mensuel

Future Technology

Monthly Check
Contrôle mensuel

ATMOS
INTERNATIONAL

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JIG 2 Issue 13

3 Months Max
3 mois max.

Pit Valve Flushing – 8.1.3

“A record of daily hydrant pit usage shall be obtained from the into-plane fuelling operators and maintained to ensure that unused pits are flushed every 3 months. If any Jet fuel hydrant pits are not used for a period of 3 months, the contents of the appropriate spur line shall be flushed out and a sample taken for a Visual Appearance Check. Where hydrant pit risers are directly above a main hydrant line (i.e. not a spur line or deadleg (unused section)), and they can be clearly identified by a construction drawing available on site, the frequency of flushing these unused pits may be reduced to annual frequency and be achieved when performing annual dynamic pit valve tests.”

CLA-VAL

JIG 2 Issue 13

Annual or following overhaul/repair
Annuel ou après révision/réparation

Hydrant pit valve checks – 8.2.2

“Monthly integrity testing and **annual dynamic testing** of hydrant pit valves shall be carried out in accordance with Appendix A9. The dynamic test shall also be carried out after a valve has been overhauled or repaired (see Appendix A9.4).”

A9.4 Testing after repair or overhaul

“After repair or overhaul, the hydrant pit valve shall be fully tested, preferably on a test rig at the maximum flow to which the hydrant pit valve will operate in service. Closure time by pulling the lanyard (see Appendix A9.2) shall be between 2 and 5 seconds.”

CLA-VAL

JIG 2 Issue 13

Annual Check
Contrôle annuel

Annual dynamic testing – A9.2

The annual dynamic check shall be made to ensure the hydrant pit valve closes between 2 and 5 seconds from the time the lanyard is pulled. On dual air/lanyard operated valves, the air-operated valve closure mechanism shall also be tested separately, as detailed below. The performance checks of the valve shall be made under pressure at the highest flow rate practicable and may be carried out during a fuelling operation. The results shall be recorded. The following procedure is considered best practice (use a stopwatch):

1. Following bonding, connection of lanyard and other normal preparatory work, connect the hydrant dispenser pit coupler to the hydrant pit valve to be tested.
2. Connect hydrant dispenser delivery hoses to a receiving vehicle with sufficient ullage for test and venting systems designed to tolerate maximum achievable flow rates.
3. Establish the highest achievable flow rate.
4. With the deadman still activated, pull the lanyard and verify that fuel flow stops.
5. Observe the time immediately when the lanyard is pulled.
6. The total time from operation of the lanyard until flow stops shall not exceed 5 seconds.
7. The time of valve closure, from when flow begins to decrease until flow stops, shall not be less than 2 seconds.
8. Contact the manufacturer or their local distributor for adjustment or replacement if the above times are outside the acceptable range.

JIG 2 Issue 13

Annual Check
Contrôle annuel

Annual dynamic testing – A9.2

On air-operated pilot valves, continue as follows to test the air-operated mechanism (separately) once the test of the lanyard closure has been successfully completed:

1. Open the pilot valve and activate the deadman to allow air supply to the coupler and the pit valve.
2. Establish the highest achievable flow rate and, with the air still applied, terminate the air supply to the pit valve and release air pressure. It is important to ensure that the pit valve closure is tested, not the inlet coupler pressure controller/deadman elbow, which also closes when air pressure is exhausted by releasing the vehicle deadman. This may be achieved by activating a test valve (see diagram below) fitted in the air line to the inlet coupler.
3. Observe the time immediately when the air is disconnected, then when the flow rate begins to decrease and finally when the flow stops.
4. When a test valve is used, reset to its normal fuelling setting.
5. The total time from operation of the lanyard/disconnection of the air until flow stops shall not exceed 5 seconds.
6. The time of valve closure, from when flow begins to decrease until flow stops, shall not be less than 2 seconds.
7. Contact the manufacturer or their local distributor for adjustment or replacement if theabove times are exceeded.

CLA-VAL

Annual Check
Contrôle annuel

JIG 2 Issue 13

Annual Check
Contrôle annuel

Hydrant pit valve checks – 8.2.2

"**Annual** wear checks of pit valves and test couplers shall be carried out in accordance with Appendix A9.3."

A9.3 Annual wear check of valves and test couplers

The outlet adaptor of each pit valve shall be checked for wear annually, using an appropriate gauge provided or approved by the pit valve manufacturer, in accordance with the manufacturer's instructions.

Test couplers, where used for monthly integrity testing, shall be checked for wear at least annually, using the appropriate wear gauge provided or approved by the test coupler manufacturer, in accordance with the manufacturer's instructions.

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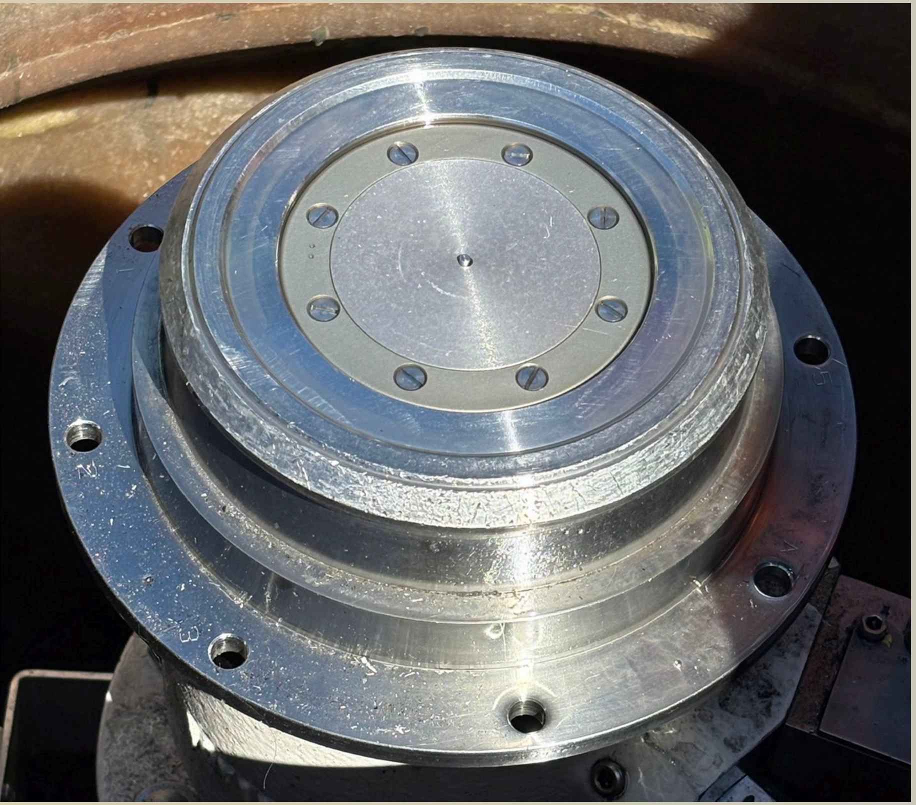

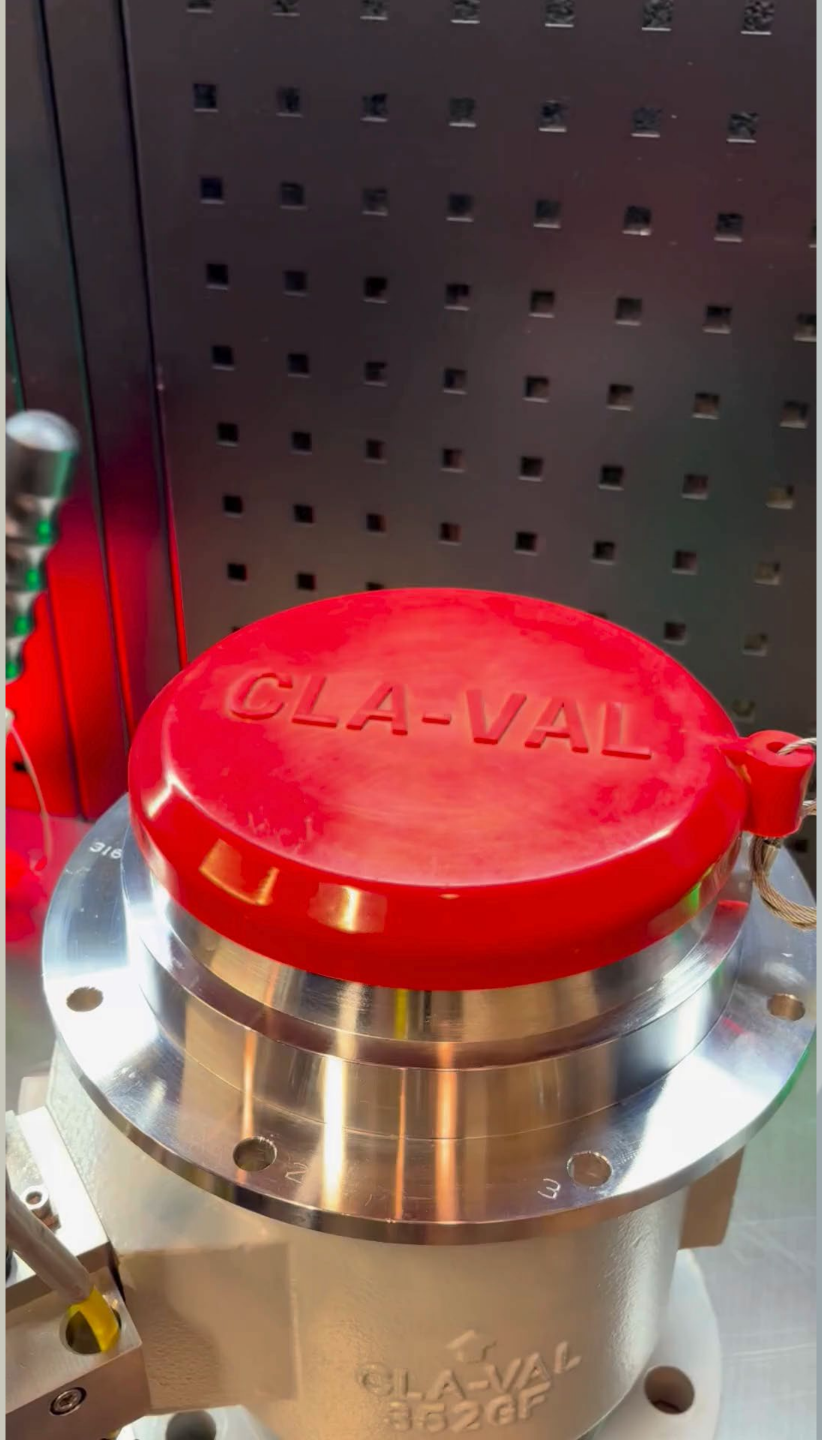

Annual Check
Contrôle annuel


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JIG 2 Issue 13 - Schedule

Test / Essai	Section	Frequency / Fréquence
Visual Inspection *Inspection visuelle*	A9.1.1	Weekly *Hebdomadaire*
Integrity Inspection *Contrôle d'intégrité*	A9.1.2	Monthly *Mensuel*
Pit Valve Flushing *Rinçage de la vanne de fosse hydrant*	8.1.3	3 Months Max or with High dP Investigation *3 mois maximum ou en cas d'investigation de dP élevé*
Dynamic Testing *Essai dynamique*	8.2.2 & A9.2 & A9.4	Annual or following overhaul *Annuel ou après révision*
Wear Checks *Contrôle d'usure*	8.2.2 & A9.3	Annual *Annuel*

"If a pit valve doesn't shut instantly or hold pressure, it's no longer a safety device."

"Si une vanne de fosse hydrant ne se ferme pas instantanément ou ne maintient pas la pression, ce n'est plus un dispositif de sécurité."

CLA-VAL

JIG 2 Issue 13 – Couplers

Annual Check
Contrôle annuel

Annual wear check of valves and test couplers – A9.3

Test couplers, where used for monthly integrity testing, shall be checked for wear at least annually, using the appropriate wear gauge provided or approved by the test coupler manufacturer, in accordance with the manufacturer's instructions.

JIG 1 Issue 13 – Couplers

Annual Check
Contrôle annuel

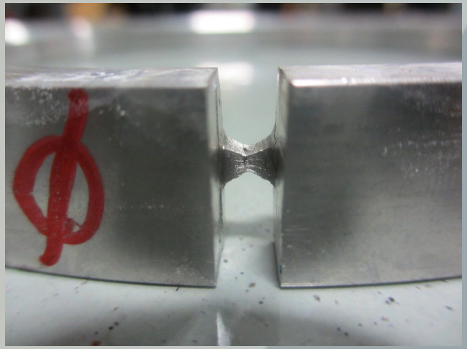
4.12 Pressure fuelling nozzles (underwing nozzle) and hydrant dispenser inlet couplers

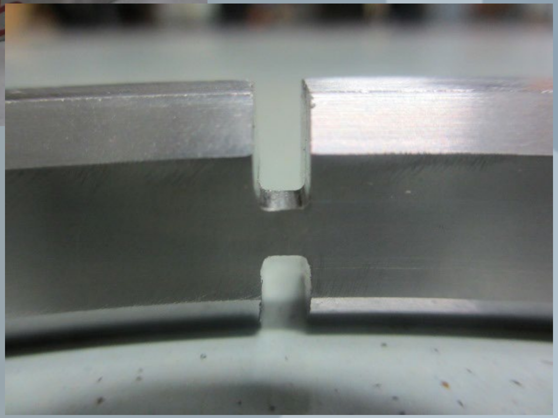
Nozzles and couplers shall be checked for leaks during every fuelling operation and shall be checked for wear at least annually using the appropriate gauge(s) (and/or instructions) provided or approved by the equipment manufacturer. For some intake couplers several gauges and checks are required to establish overall wear e.g. lug wear, collar wear, and collar to body interface wear. Confirmation shall be sought from the equipment manufacturer to establish which checks are necessary for each piece of equipment. Repairs shall be performed in accordance with the manufacturer's recommendations by trained and competent person(s) using the recommended tools.

Annual Check
Contrôle annuel

353GF Fracture Ring

- Patented Design incorporates a Fracture Ring
- 12 hardened Stainless Steel Balls connect the coupler to the API Adapter of the Pit Valve
- The Balls are held in place until a force sufficient to break the Fracture Ring is applied
- Delivers a precise, instantaneous, repeatable separation
- Uses no springs or other “soft” components
- Not subject to wear or fatigue over time (in normal operations)





CLA-VAL

Cla-Val Recommended Maintenance Intervals

Pit Valve – 352GF

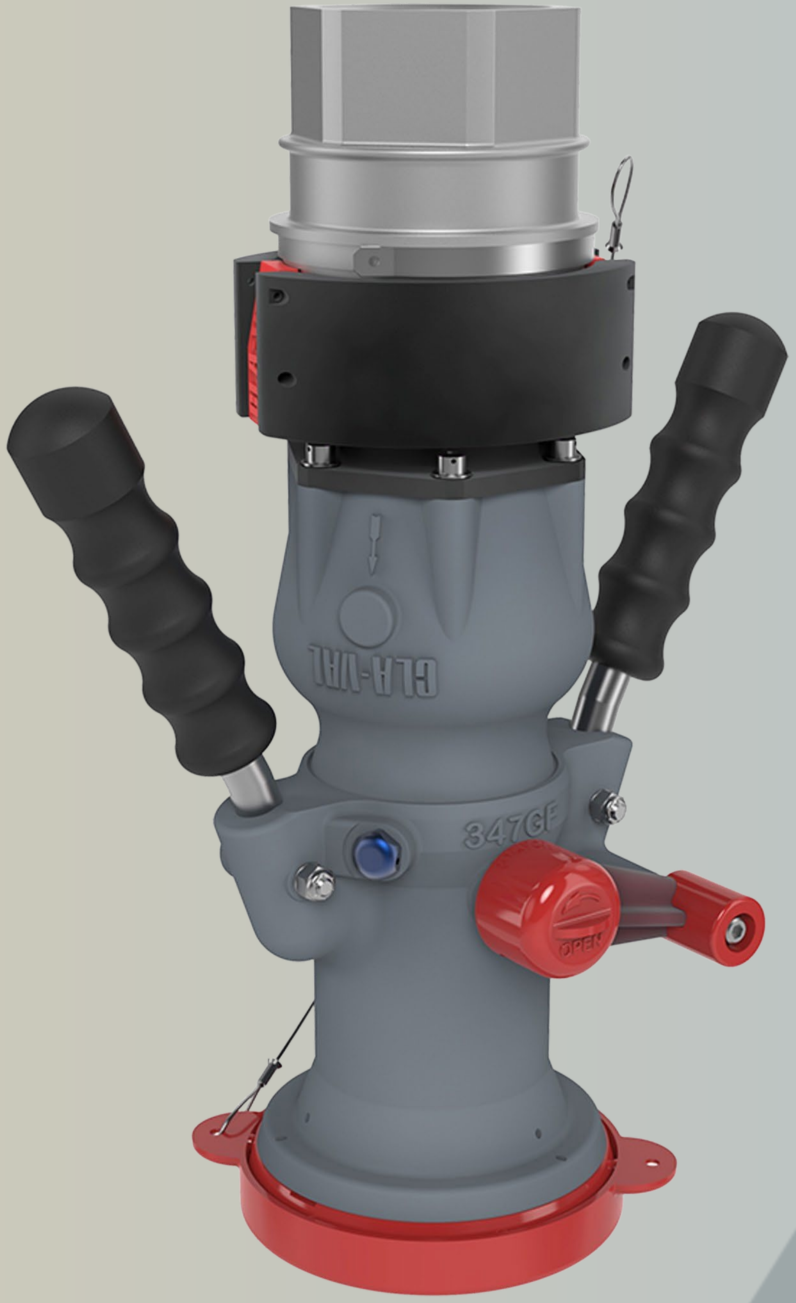
- **Visual inspection:**
  - **Every 3 months (quarterly)**
  - Inspect sealing surfaces, outlet interface, pilot attachments, and check for leaks.
- **Wear gauge inspection:**
  - **Annually**
  - Use the specified Cla-Val wear gauge to assess outlet and interface wear.
- **Functional & leak check:**
  - **At least quarterly**
  - If any mechanical or performance failure is detected, a full overhaul is required.
- **Overhaul / seal replacement:**
  - **At every overhaul**, it is recommended that **all rubber seals** within the pit valve be replaced.

Coupler – 353GF

- **Visual inspection:**
  - **Every 3 months (quarterly)**
  - Check for physical damage, missing parts, seal leaks, and proper operation of locking and sleeve mechanisms.
- **Functional check:**
  - **At least quarterly**
  - Verify proper opening/closing, locking, and absence of leakage.
- **Overhaul / seal replacement:**
  - **As required**, if any mechanical or performance issue is found during inspection
  - At each overhaul, **replace all rubber seals and cotter pins**.
- **Quick Disconnect swivel seal (O-ring):**
  - **Replace every 12 months** (recommended) regardless of condition.

Section 3 – Nozzle Design (Applicable standards and design characteristics)

Section 3 – Conception des pistolets de ravitaillement (normes applicables et caractéristiques de conception)



CLA-VAL


CLA-VAL
GreenLine
364 GF
CLA-VAL
OPEN
SHUT
364GF
SuperLeggera

01

Designed to SAE AS5877 REV. C

Aircraft Pressure Refueling Nozzles

- Must interface with ISO 45 / MS24484 aircraft adapter
- Standardised envelope and geometry ensures global compatibility
- Designed for commercial and military applications
- Configurations vary (Type I, II, III) depending on use case
- SAE AS5877 is a manufacturer qualification standard, not a third-party certification scheme

02

Performance Expectations

- Flow capability up to 600 gpm (2271 L/min)
- Operating pressure ~60 psi, surge tolerance up to 300 psi
- Must maintain sealing across:
    - Wear
    - Misalignment
    - Temperature variation

"This isn't just a component; it's a globally standardised interface between vehicle and aircraft."

364GF SuperLeggera

03

Material Selection.

“Material selection is about fuel integrity and safety.
The nozzle is the FINAL delivery interface.”

Design Considerations:

- Must not degrade fuel quality
- Must withstand:
    - Temperature extremes
    - Corrosion environments (coastal, humidity)
- External surfaces must be:
    - Non-sparking on impact

Allowed / Required Materials:

- Corrosion-resistant metals
- Aluminium (lightweight, non-sparking)
- Stainless steel
- Fuel-resistant plastics / elastomers
- Materials compatible with:
    - Jet A / Jet A-1
    - Military fuels (JP-8, etc.)

Strictly Prohibited (in wetted, wear areas):

- Zinc
- Magnesium
- Manganese
- Copper
- Cadmium
- Any alloy containing >5% of the above

SuperLeggera 364GF

04

Key Design Features of Nozzles

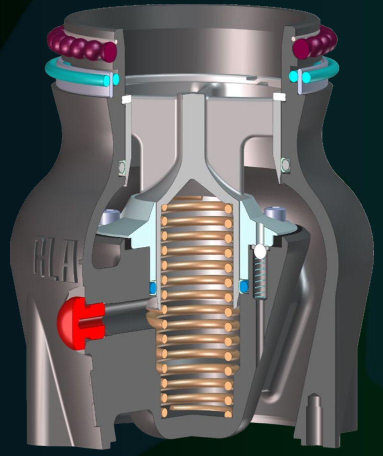
Inlet types:
- Threaded (2", 2.5", 3")
- Flanged connections

Handles:
- Stick, stirrup, or wheel (ergonomics matter)

Swivel:
- 360° rotation to reduce hose strain

Strainers:
- 60 / 100 mesh (last line of defence)

Optional Features:
- Hose End Pressure Control Valve 15, 35, 45, 50, 55psi (pressure regulation)
- Dry break / quick disconnect
- Vacuum breaker
- Bonding cable



05

Critical Functional Design Requirements

“Good design is invisible. If it’s working properly, nothing happens.”

Safety Interlocks:

- Cannot open unless properly connected
- Cannot disconnect under flow

Sealing Performance:

Must prevent leakage under:

- Pressure
- Wear conditions
- Misalignment

Pressure Control:

Regulated systems must:

- Limit surge
- Protect aircraft tanks

Maintenance Design:

- Easy disassembly with basic tools
- Standard seals preferred

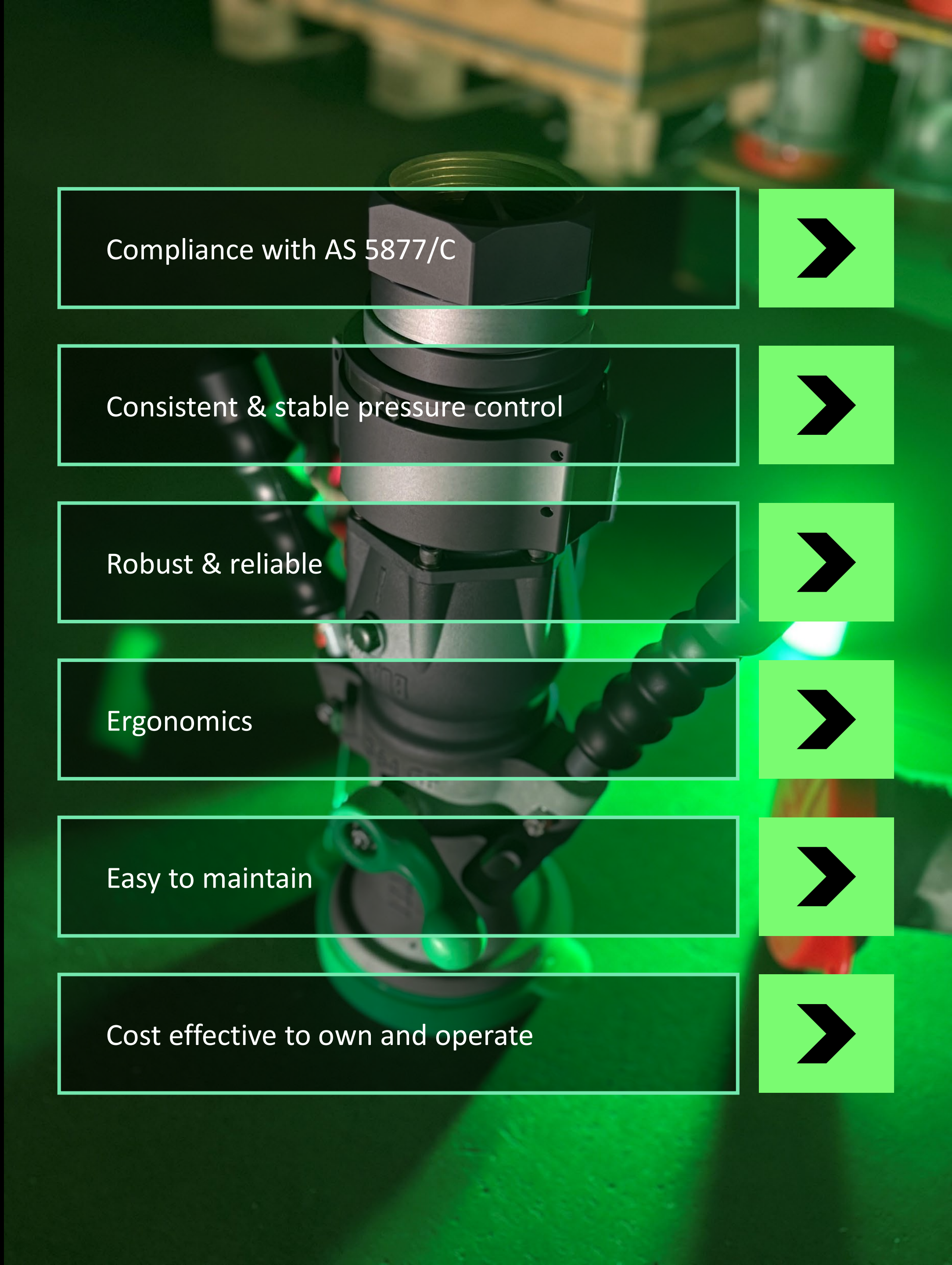
06

Nozzle evaluation

"If you're evaluating nozzles, these are the six things I would focus on."

CLA-VAL FUELING

Underwing Nozzle
Nose Seal
Change Out



- Compliance with AS 5877/C
- Consistent & stable pressure control
- Robust & reliable
- Ergonomics
- Easy to maintain
- Cost effective to own and operate

SuperLeggera 364GF

CLA-VAL GreenLine

CLA-VAL

2026 JIG Managers' Workshop - Nairobi

364GF SuperLeggera

MEMBER OF THE ELAFLEX GROUP

Aviation Pressure Fuelling Nozzles Inspection & Maintenance Processes

LEARNING
MANAGERS WORKSHOP

Nairobi: April 2026

Presented By Andy Walton
Aljac Fuelling Components Ltd
Eaton's Carter® Ground Fuelling distributor for EMEA

My points of reference:

- EMEA – Which means JIG locations generally.
- Aviation fuelling systems design and manufacture.
- Supplier of Aviation ground fuelling equipment.
- Eaton’s Carter® ground fuelling product range.

Inspection & Maintenance Processes: Why do we need them?

Safety!

- **Operators.**
- **Passengers and Crew.**
- **The Aircraft.**
- **The Environment.**

How is this achieved?

- Publications
- Specifications
- Guidelines
- OEM Instructions
- Operating Procedures

So how do we unpick all this information?

Specifications:
SAE AS5877A

SAE AS5877A

- **Operating Lever:** **Open and Close only – No Flow Control**
  Not Part of the Attachment Mechanism
- **Nozzle removal not possible unless the operating lever is closed.**
- **Nozzle shall not open unless correctly attached to a male adaptor.**
- **Nozzle shall remain open or closed during fuelling or de-fuelling without any need for external force to the lever.**

SAE AS5877A

- Strainer: any inspection mechanisms shall be securely locked to prevent accidental disconnection during use or storage.
- HEPC Breather: Leakage shall be directed away from the operator.
- HEPC: Limit delivery pressure and prevent excessive surge pressures.
- Electrical Continuity: Less than 10Ω Nozzle Inlet to Adaptor locking flange.
- Leakage: It shall not leak in the connected and open condition or disconnected and closed condition.

How do we achieve this?

Two piece body and external collar design
Interlock relationships between collar, body and operating lever.

How do we achieve this?

Single piece body with internal interlock mechanisms.

So how do we unpick all this information?

- The industry needs operators who understand what makes a nozzle safe to use.

- And equipment maintainers who understand what safe to use means and how to keep nozzles in a safe condition.

- And Inspection and test regimes to ensure this happens.

Fortunately, we have:

Publications

Guidelines

OEM Instructions

Operating Procedures

Extract from JIG 1 iss 13

4.12 Pressure fuelling nozzles (underwing nozzle) and hydrant dispenser inlet couplers

Nozzles and couplers shall be checked for leaks during every fuelling operation and shall be checked for wear at least annually using the appropriate gauge(s) (and/or instructions) provided or approved by the equipment manufacturer. For some intake couplers several gauges and checks are required to establish overall wear e.g. lug wear, collar wear, and collar to body interface wear. Confirmation shall be sought from the equipment manufacturer to establish which checks are necessary for each piece of equipment. Repairs shall be performed in accordance with the manufacturer's recommendations by trained and competent person(s) using the recommended tools.

Extract from JIG 1 iss 13

6.6.4 Aircraft fuel adaptor condition check.

(b) **After connection and before starting fuel flow, rotate the nozzle handle to the locked position and open the poppet actuation lever. The aircraft adaptor shall be checked that it is secure by attempting to remove the nozzle with the handle in the locked position.**

(c) **On starting of fuel flow the nozzle to aircraft connections shall be checked to ensure that there are no leaks. Fuelling shall not be carried out from an adaptor to with the coupler does not connect securely, or which leaks.**

Trained operators!
Basic checks at every fuelling

JIG: Operating procedures.

ITP's: Internal operating procedures.
JIG Guidelines.
OEM Instructions.

OEM's: Inspection guidelines.

Extract from JIG 1 iss 13

4.12 Pressure fuelling nozzles (underwing nozzle) and hydrant dispenser inlet couplers

Nozzles and couplers shall be checked for leaks during every fuelling operation and shall be checked for wear at least annually using the appropriate gauge(s) (and/or instructions) provided or approved by the equipment manufacturer. For some intake couplers several gauges and checks are required to establish overall wear e.g. lug wear, collar wear, and collar to body interface wear. Confirmation shall be sought from the equipment manufacturer to establish which checks are necessary for each piece of equipment. Repairs shall be performed in accordance with the manufacturer's recommendations by trained and competent person(s) using the recommended tools.

Extract from EI1540 6th Ed

10 EQUIPMENT MAINTENANCE AND TESTING
10.1 GENERAL

- A maintenance system of planned inspection and testing shall be established for each site such that all fixed and mobile equipment receives thorough attention in accordance with industry recommendations and manufacturers' instructions. If disassembly or repair is required based on inspection or testing of the piece of equipment, then recommissioning of the equipment shall form part of this system.
- All inspections, testing, maintenance and remediation activities shall be undertaken by a competent person who is trained for the task being undertaken.

Trained technicians!

JIG: Annual checks (minimum)
OEM recommendations.

EI: Frequency - site determined.
OEM recommendations.

ITP’s: JIG Guidelines.
EI Publications.
OEM Instructions.
Internal procedures.

OEM’s: Inspection guidelines.
Wear limits.
Frequency – site determined.

Site Managers

- Operator Training.
- Technician Training.
- Inspection and Maintenance plans and records.
- Testing plans and records.

Training!
Training!
Training!

Extract from JIG 1 iss 13

4.12 Pressure fuelling nozzles (underwing nozzle) and hydrant dispenser inlet couplers

Nozzles and couplers shall be checked for leaks during every fuelling operation and shall be checked for wear at least annually using the appropriate gauge(s) (and/or instructions) provided or approved by the equipment manufacturer. For some intake couplers several gauges and checks are required to establish overall wear e.g. lug wear, collar wear, and collar to body interface wear. Confirmation shall be sought from the equipment manufacturer to establish which checks are necessary for each piece of equipment. Repairs shall be performed in accordance with the manufacturer's recommendations by trained and competent person(s) using the recommended tools.

Aljac training courses on Eaton’s Carter® nozzle range.

Course content

- Classroom Theory work.
- Practical, hands on session.
- Design Characteristics and Operation.
- Inspection and Maintenance.
- Testing.
- Trouble Shooting.
- Questions and Answers.

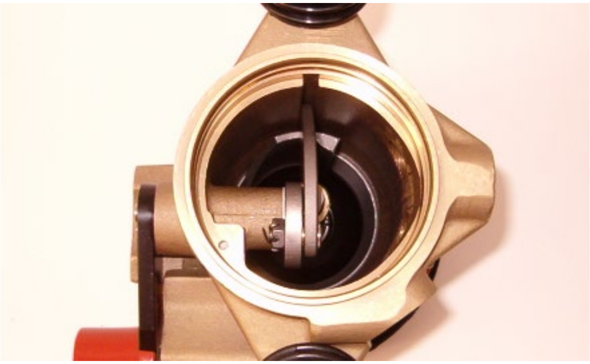
Nozzle Overview

- 64348 Nozzle.
- Body and external collar design.
- 3 point engagement.
- 3 indexing pins.
- 3 interlock pins.

Aljac MEMBER OF THE ELAFLEX GROUP

Nozzle Overview

- **64200 Nozzle**
- **One piece body design**
- **6 point engagement**
- **Internal interlock via nose seal**
- **Interlock plate**



Extract from JIG 1 iss 13

6.6.4 Aircraft fuel adaptor condition check.

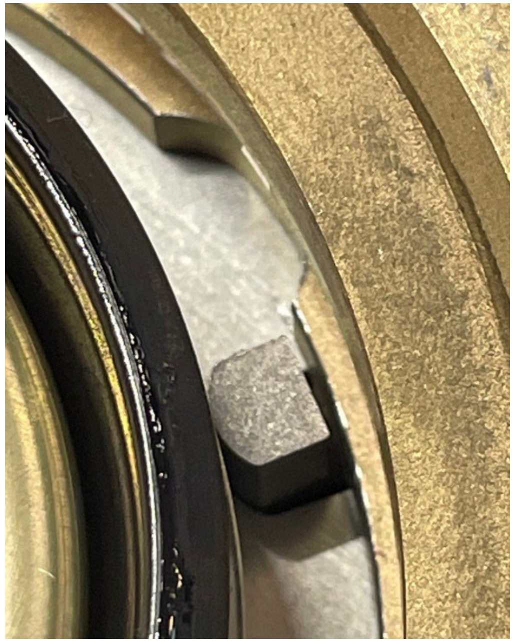
(b) After connection and before starting fuel flow, rotate the nozzle handle to the locked position and open the poppet actuation lever. The aircraft adaptor shall be checked that it is secure by attempting to remove the nozzle with the handle in the locked position.

64348 Nozzle Interlocks

3 x interlock pins. Positioned within a cutout in the collar. They prevent the collar from rotating unless depressed into the body

The face of the ISO45 adaptor depresses all 3 when positioned into the nozzle.

Depressing the pins removes the interference between pin and collar allowing it to rotate.



64348 Nozzle Interlocks

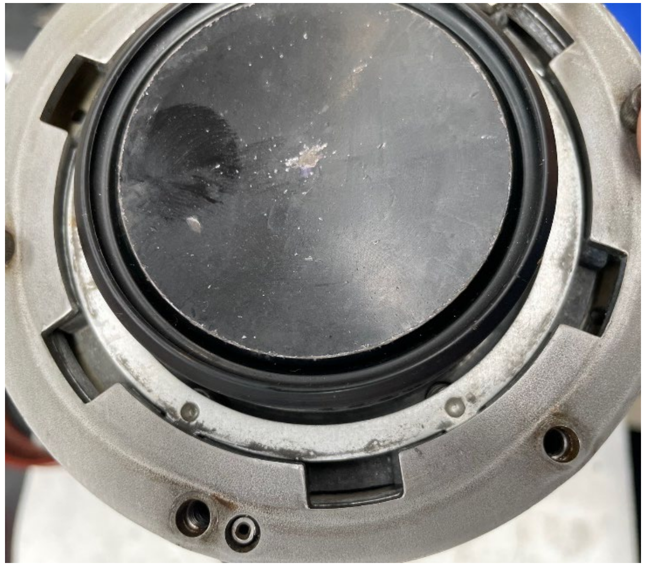
Nozzle not connected Interference between handle and collar

Nozzle connected but not open – handle is free to move

Nozzle connected and open – interference between handle and collar. Nozzle cannot be disconnected

64200 Nozzle Interlocks

The front of the nozzle has an indexing plate which is pushed up with springs.

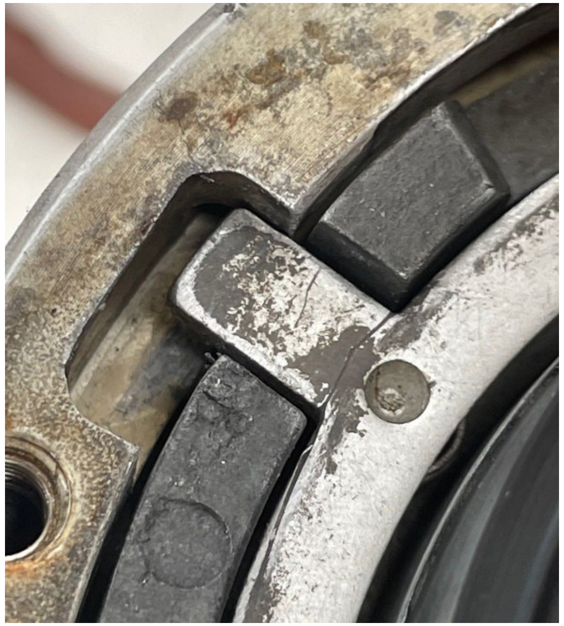


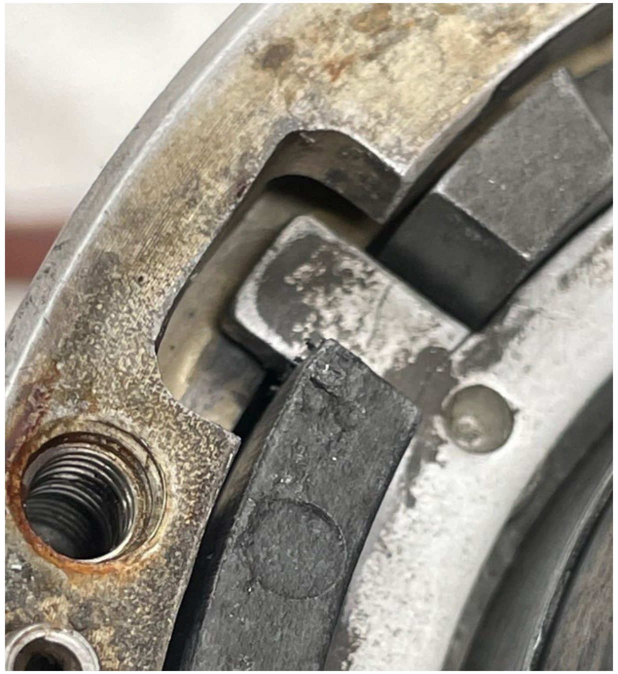
This plate is pushed in by the front face of the ISO45 aircraft adaptor.

Here, with the front plate removed you can see it has 4 tags.

64200 Nozzle Interlocks

You can see that there is an interference between the tags and the body, preventing the nose seal from rotating.





When the ring is pushed in the tags clear the body and allow it to rotate

4 tags ensure that the ISO45 is flat into the nozzle before it can be connected.

64200 Nozzle Interlocks

Section of the nose seal interferes with the crank when not connected to an ISO45 adaptor.

Connecting to the ISO45 rotates the nose seal and removes the interference.

The crank and poppet can now be opened. The nozzle cannot be removed from the ISO45 without closing the poppet first.

64348 Safety Inspections

- Examination of the connection end of a disengaged nozzle (nozzle not connected to an adapter) discloses the three Collar Assy Lock Pins (19) and three Index Pins (21) installed between the Collar Assy (8) and the Nose Seal (43). Refer to Figure 2. The three spring loaded Collar Assy (8) Lock Pins (19) engage three cutouts (arched shaped windows) in the interior flange of the Collar Assy (8) when the Collar Assy (8) is in the fully disengaged position. These Collar Assy Lock Pins (19) prevent accidental rotation of the Collar Assy of the disengaged nozzle. One of the three cutouts in Collar Assy (8) is normally narrower than the other two. This assures that, even with badly worn adapters, a minimum of two Lock Pins (19) will be activated to prevent the nozzle from being opened when not connected to an adapter.
- With the Collar Assy (8) locked in the disengaged position, the flat portion of a ramp integral to the Collar Assy (8) is positioned over a flat on the Lever (14) in a manner that prevents opening the Poppet (15).
- When connecting to an aircraft, the Index Pins (21) mate with three slots in a serviceable MS24484 Adapter Flange to index the nozzle to the flange so the Collar Assy (8) mates with the flange lugs during engagement and prevents disengagement of the Collar Assy (8) from the flange without releasing the three spring loaded Collar Assy Lock Pins (19) to the Collar Assy (8) lock positions.

64348 Safety Inspections

- Examination of the center portion of the Lever (14) on a disengaged nozzle discloses the fact that a flat edge of the Lever (14) is beneath the flat portion of a ramp that is integral to the Collar Assy (8). With the Collar Assy (8) locked by the Collar Assy Lock Pins (19), the Collar Assy (8) ramp prevents rotation of the Lever (14) to the poppet open position.
- When the Collar Assy (8) is fully engaged to a serviceable MS24484 Adapter the Collar Assy ramp clears the Lever (14) and permits Lever (14) rotation to the open position.
- With the Lever (14) fully open, the round portion of the Lever (14) prevents rotation of the Collar Assy (8) in the disengage direction until the Lever (14) has been fully closed.
- These interlocks are designed to prevent accidental opening of the poppet of a disengaged nozzle or accidentally disengaging a nozzle with the poppet open.

64348 Safety Inspections

- The poppet operating internal linkage design is such that the linkage is "over center" at each extreme of travel (Lever (14) fully open against internal mechanical stop or fully closed against internal mechanical stop).
- Thus, internal pressure against a closed poppet, when the linkage is against the closed mechanical stop, provides a force only in the closed direction.
- In a similar manner, with the Lever (14) in the fully open/mechanical stop position, the 50 lb. force applied by the MS24484 Adapter Poppet Spring provides a force to maintain the open direction.

64348 Fuelling Inspections

- Inspect the connection end and verify that the Index Pins (21) are intact, in place, and not excessively worn or damaged. Verify that all three Collar Lock Pins (19) are intact, undamaged and **are extended and engage all three cutouts in the Collar Assy (8) and physically prevent Collar Assy (8) rotation.**
- If the Collar Lock Pins (19) do not spring into their correct position, it could mean that the aircraft adapter is defective and should be inspected (see paragraph 4.3.3) and reported as possibly being defective. If the Collar Lock Pins (19) are not extended and engaged in all three cutouts in the Collar Assy (8), the operator should squeeze the Lever (14) and Handle Grip (4) together while observing the connecting end of the nozzle. This should cause the Collar Lock Pins (19) to "spring" into the cutouts in the Collar Assy (8). If not, then the nozzle should be taken out of service.
- Upon engagement to an aircraft and opening the nozzle but before operating the deadman control it is recommended that the operator attempt to remove the nozzle from the aircraft. This should not be possible. If it can be removed, either the nozzle was never fully engaged onto the aircraft or needs repair, or the aircraft adapter, is in need of repair or replacement.

64348 Monthly Inspections

- Inspect the connection end and verify that the three Index Pins (21) are intact and in place. Verify that the three Collar Assy Lock Pins (19) are intact and in place and extended and engaging all three cutouts in the Collar Assy (8) and physically preventing Collar Assy (8) rotation. Check the Bearing Plate (42) containing the pins for possible cracks.
- Prior to connecting the nozzle to the aircraft inspect the Lever (14) for cracks or looseness with the Screw (39) that attaches it to the nozzle. **Do not use the nozzle if cracks or looseness is apparent.**
- Hold the nozzle with the outlet or connecting end facing such that it can be observed. Apply pressure on the Collar Assy (8) in the direction to connect the nozzle aircraft, counterclockwise, to take up the slack and inspect the relative location of the three Lock Pins (19) with respect to the cutouts in the Collar Assy (8). The two Lock Pins (19) that are engaged in the normally wider cutouts should not be resting against the edge of their respective cutouts. If there is a space between these Index Pins (19) and the edge of the normally larger cutout, the collar is still in functional condition. If all three Lock Pins (19) are resting against the edge of their respective cutouts (there is no space), the Collar Assy (8) may no longer be in a functional condition and should be replaced if it fails the next step.

64348 Monthly Inspections

- With the nozzle being held in the position described above, attempt to open the nozzle with the Lever (14). The nozzle should be prevented from opening by the interference between the Collar Assy (8) and the Lever (14). If the nozzle is openable, it should be removed from service and repaired.
- Inspect the Lever (14) and the adjacent ramp surface of the Collar Assy (8) and verify that neither part is damaged or has missing pieces that permit the Lever (14) to be rotated to the open position with the nozzle disengaged or that will allow the Collar Assy (8) to rotate to the disengaged position when the Lever (14) is open. Broken or missing parts can result in dangerous fuel spills while refueling aircraft.
- Verify that the Lever (14) is in the fully closed (against internal mechanical stop) position. (This is necessary to assure that the linkage is over center so internal pressure can not force the poppet open during the Collar Assy (8) engagement).

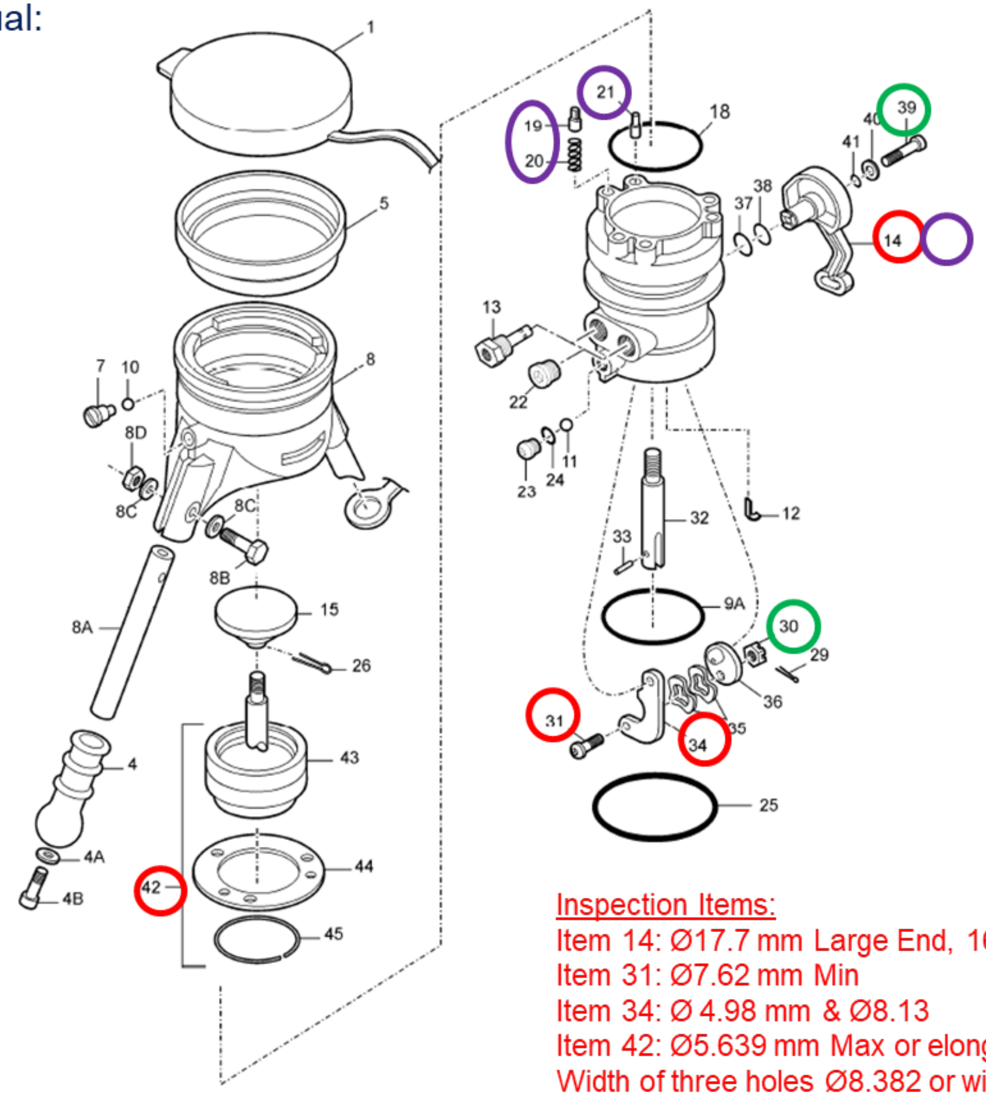
64348 Maintenance Inspections

Consult maintenance manual:

Torque Setting

Dimension

Visual Inspection



Torque Settings:
Item 30: 14.2 Nm
Item 39: 14.2 Nm +- 0.5Nm

Inspection Items:
Item 14: Ø17.7 mm Large End, 16.1 mm Small End
Item 31: Ø7.62 mm Min
Item 34: Ø 4.98 mm & Ø8.13
Item 42: Ø5.639 mm Max or elongated (round holes)!
Width of three holes Ø8.382 or width exceeding 6.426mm

64348 Maintenance Inspections

Strengthening insert cast into the support webs of the collar. Visual check for separation, excessive wear or deformation.

64348 Nozzle Inspections

Crank pin wear

Particular attention should be paid to item 31

We are aware that it is possible to maintain the nozzle without removing this item. Failure to inspect can have serious consequences. And cause the poppet to become trapped in the aircraft adaptor.

Good, new pin

Bad, heavily worn pin

Where are we?
Demonstrably a very safe industry!

- Trained staff.
- Daily inspections.
- Monthly,Bi-Annual, Annual inspections.
- Routine tests.
- Post maintenance tests.
- Third party inspections.
- Record Keeping.
- Safety First, no blame culture.

But don't ignore!

- An industry wide desire to maintain the highest standards.
- Very high levels of integrity from all staff.
- A lot of pride.

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