



SBC: Operational experience and future challenges

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Context: Why do we talk about SAF?

Core topics

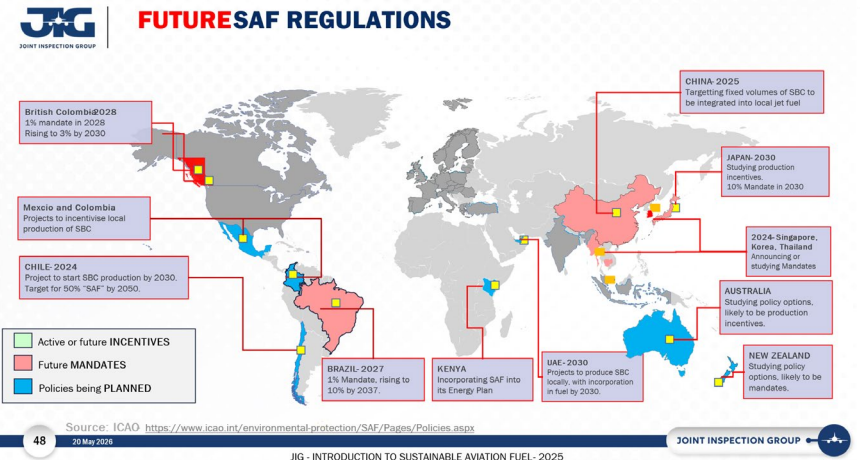
Part 1: Operational challenges in SBC blending and transportation – infrastructure, quality assurance, lessons learned

Part 2: Upcoming regulatory challenges – Book & Claim and the proportionality factor EU ETS

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Context

Why do we talk about SAF?

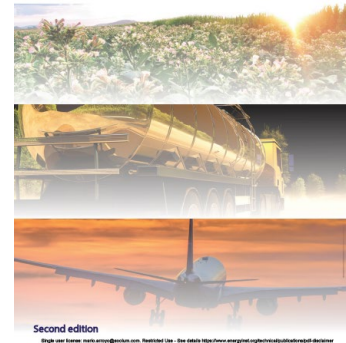


El 1533



Quality assurance requirements for semi-synthetic jet fuel and synthetic blending components (SBC)

A supplement to EI/JIG Standard 1530



Second edition

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Operational challenges in SBC blending and transportation

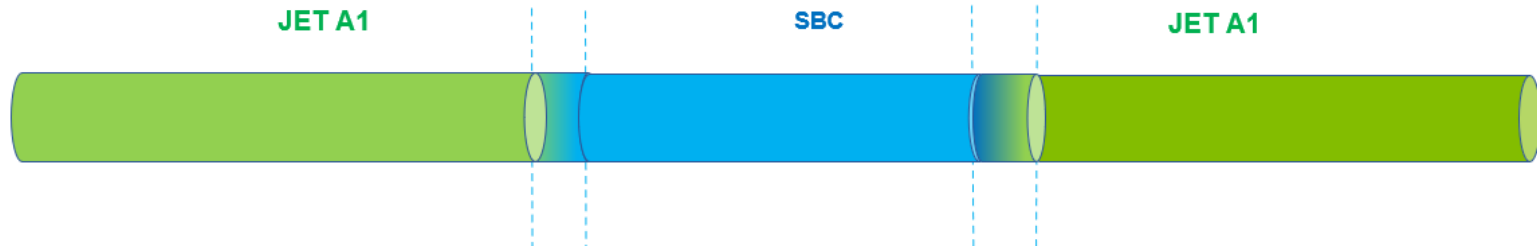


3.3 PIPELINE TRANSPORTATION

- 3.3.1** Approvals to transport SBC by pipeline are currently very limited, but additions to pipeline operator transportation specifications continue to be evaluated. General guidance is detailed in EI/JIG Standard 1530 (10.2). Each pipeline operator also has its own specific requirements. Note that the facility blending an SBC to manufacture semi-synthetic jet fuel requires the CoQ(s), CoA(s) or RT Certificate(s) of the SBC batch(es). These documents shall be supplied for pipeline transportation.
- 3.3.2** For non-dedicated pipeline transport, recertification testing shall confirm absence of contamination. See Table 3.
- 3.3.3** Interface material (known as Transmix) may present particular handling challenges, due to restrictions on blending and reprocessing of the SBCs.

Interfaces are a critical control point

- HEFA-SPK has different physical properties from Jet A-1 (lower density: 730–772 kg/m³, zero aromatics, narrow distillation range)
- The objective is not to lose a liter of SBC or certificates and avoid contamination



Additional measures implemented

- Additional protection from other grades: Spectacle blinds installed at DBB crossovers – eliminates any residual risk
- Operational: pipeline operated with continuous supervision

Quality assurance in SBC blending: Key requirements

Pre-blend analysis (handblend)

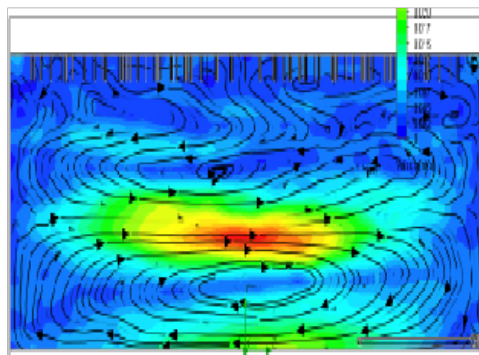
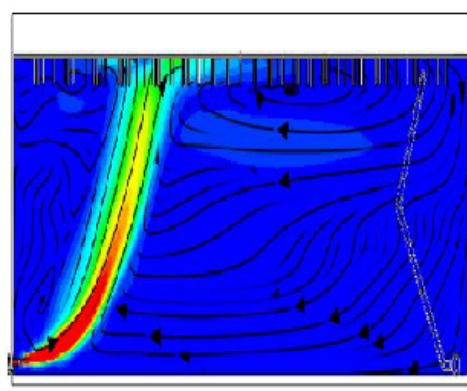
- HEFA has zero aromatics – Jet A-1 >16% aromatics for 50% blend
- Density of fossil Jet A-1 must provide margin
- Non-linear properties (freeze point, viscosity, lubricity, distillation) require lab testing confirmation

Critical tests currently requiring new equipment

- Lubricity (D5001) and viscosity at -40°C : not universally available in terminals
- Dependency on external labs and longer analysis times

Tank homogeneity & stratification

- First fossil fuel, the SAF. Depends on tank geometry and flow rates.
- Lesson learned: diffusers and recirculation capability are essential at blending nodes



Where to blend and Why

Important to define key blending nodes

Is SAF being produced in the country? Where?

Is SAF being imported? Where?

Investment decision challenge: physical blend volumes not clear

Company strategies are being defined and fluctuate

Future blending need depends entirely on whether regulation requires physical supply vs. certificate assignment

Regulatory uncertainty

Book & Claim : if large-scale B&C is adopted, physical blending demand may not materialize as projected

EU ETS proportionality rules (discussed later) will determine where physical blending is required

Upcoming regulatory & Policy challenges

Refuel EU flexibility mechanism

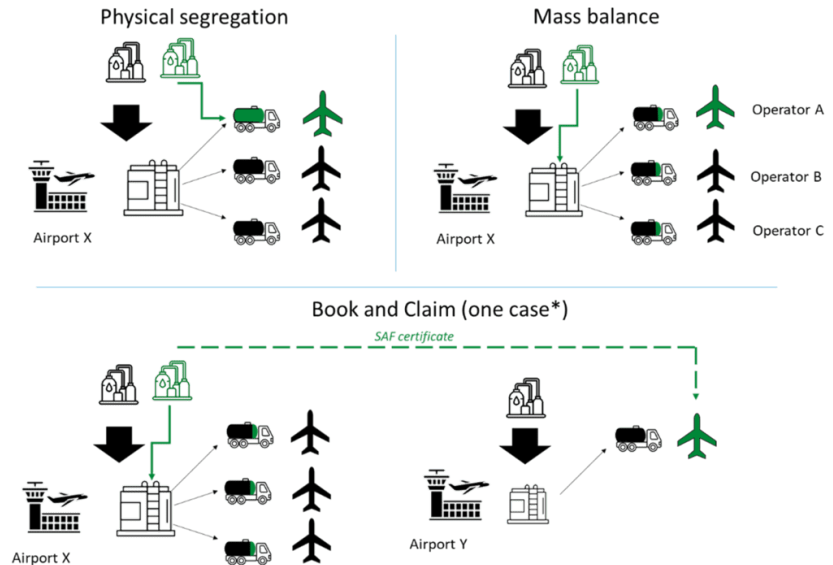
¿Book & Claim?

What is Book & Claim?

- Mechanism allowing SAF sustainability attributes to be sold and claimed separately from the physical fuel
- Discussed at EU level as a potential flexibility instrument under ReFuelEU and EU ETS
- Different views: airlines (more flexibility), fuel suppliers (physical consumption)

From a logistical point of view

- If B&C is adopted broadly before physical infrastructure exists → concentration risk.
- Without physical blending volumes guaranteed, business case for dedicated SBC tanks, mixers and pipeline modifications more difficult



EU ETS Proportionality factor: Changes that penalises pipelines

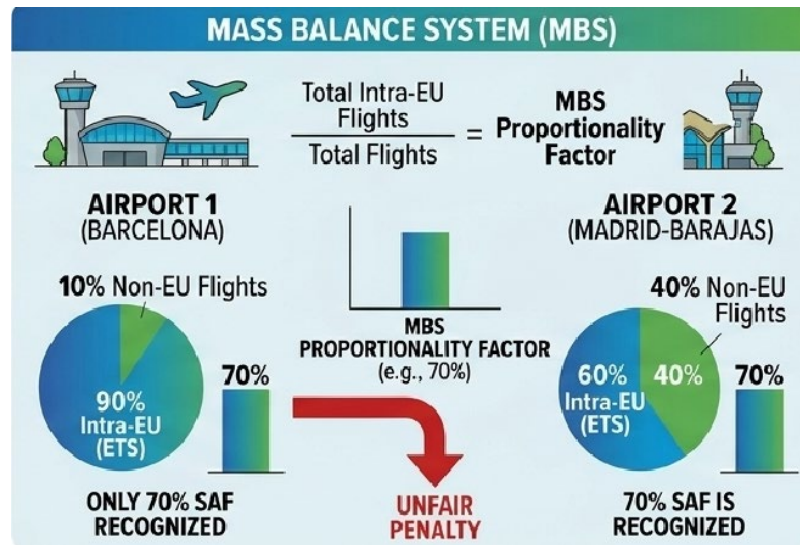
What is the proportionality factor

EU ETS applies a proportionality rule to SAF allocation at airport level. Only the share used for intra-European flights counts for compliance; the rest is not recognized.



What the new EU ETS guidance proposes (Feb 2026)

Template 5 & GD: when an airport is part of a Mass Balance System (MBS), a single ETS proportionality factor must apply to ALL airports in the MBS



Illustrative Example

Fuel consumption (2025)/% flight under EU ETS

Madrid: 3,562 M L (60% EU ETS flights)

Barcelona: 1,697 M L (90% EU ETS flights)

Bilbao: 110 M L (90% EU ETS flights)

Combined factor reduction:

Madrid: $3,562 \times 60 \% = 2,137$

Barcelona: $1,697 \times 90 \% = 1,527$

Bilbao: $110 \times 90\% = 99$

Combine factor Madrid-Barcelona: $(2,137 + 1,527) / 5,259 \approx 70 \%$

Combine factor Madrid-Bilbao: $(2,137 + 99) / 3,672 \approx 61 \%$

SAF reduction Barcelona:

SAF supply (6%) = 102 M L

- Airport level (90%): 92 M L
- MBS level (70%): 71 M L

Loss: 21 M L SAF

SAF supply (70%) = 1,188 M L

- Airport level (90%): 1,070 M L
- MBS level (70%): 832 M L

Loss: 238 M L SAF

Result: creates a clear distortion and sends the wrong signal to the market

EU ETS Proportionality factor: CO₂ Impact

Result: suppliers could shift from pipeline to truck or ship to avoid the penalty – increasing CO₂ emissions

Illustrative CO₂ impact: pipeline vs. alternatives (Huelva-Barcelona example, 1000 km)

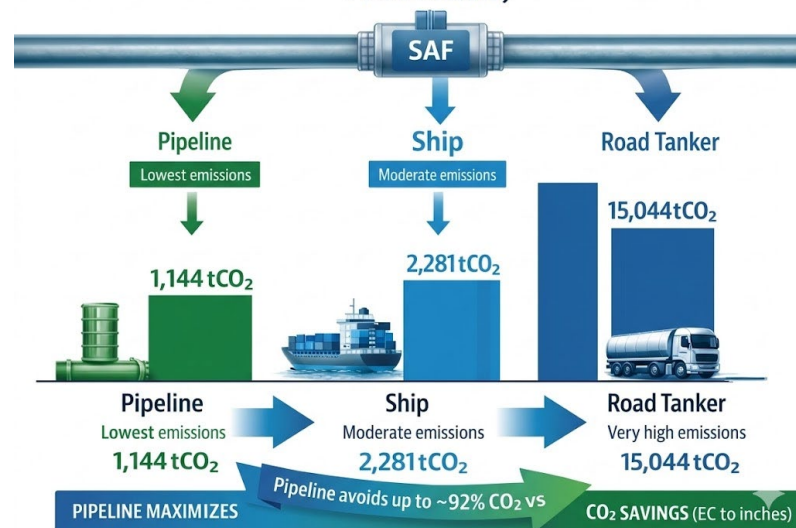
2026 (2% mandate):

Pipeline 33 tCO₂ | Ship 65 tCO₂ | Road tanker 430 tCO₂

2050 (70% mandate):

Pipeline 1,144 tCO₂ | Ship 2,281 tCO₂ | Road tanker 15,044 tCO₂

CO₂ Emissions Comparison by SAF Transport Method (2050 – 70% Mandate)



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Summary

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Key points



SBC blending is new territory: the standards are being built as the industry gains experience

Some regulatory proposals, if adopted, would affect SBC blending and pipeline use

Regulatory certainty on physical blending obligations needed before large capex

Things are moving fast: Important to be at the forefront, actively shaping standard and in conversation with regulators



Thank you