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KNOWLEDGE CENTER · FUNDAMENTALS

Understanding Product Segregation

Why a few ppm of the wrong contact can re-grade a cargo — and the three-layer defense terminals build against it.

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Petroleum products are chemistry with a price attached. Jet fuel that picks up traces of gasoline is no longer jet fuel; ultra-low-sulfur diesel contaminated by high-sulfur fuel oil can fail specification at parts-per-million levels. In a terminal storing many grades for many owners, keeping every molecule in its lane is the discipline called product segregation — and it is a system, not a hope.

What is actually at risk

- **Specification failure** — sulfur, flash point, octane, freeze point and color limits can be breached by tiny admixtures, downgrading a cargo's value or rendering it unsaleable into its intended market.
- **Safety-critical grades** — aviation fuel is the extreme case: contamination is treated as a flight-safety issue, with dedicated infrastructure and filtration as the norm.
- **Commercial identity** — commingling product owned by different parties, or branded/additized grades, without contractual basis creates ownership disputes no measurement can resolve.

Layer one: hardware

Segregation starts in steel. Terminals group tanks by product family — light distillates, middle distillates, residual grades, crude — with dedicated pumps and lines where flows justify them. At the manifold, double block-and-bleed valve arrangements put two closed valves and a monitored bleed between incompatible services, so a single passing valve cannot silently cross-contaminate.

Layer two: procedure

Where hardware is shared — as some of it always is — procedure takes over:

- 1 **Verified line-ups.** Every movement runs on a written valve line-up, prepared and independently checked before pumps start.
- 2 **Line displacement and interface management.** A line that carried grade A is displaced or pigged before carrying grade B; on multiproduct systems, the interface (the mixed zone between batches) is cut into the tank that can absorb it.
- 3 **Service-change protocol.** Re-grading a tank is a documented project: cleaning to a defined standard, inspection or verification, and updated tank service records — never an operational improvisation.

Layer three: evidence

Segregation is finally proven, not asserted. First-foot samples — drawn when the first product enters a changed tank — verify the new service before the full parcel commits. Routine and pre-movement samples, sealed and retained, provide the audit trail; if a specification question arises weeks later, the sealed sample is the arbiter.

Hardware makes contamination difficult. Procedure makes it unlikely. Evidence makes it detectable and attributable. Terminals need all three.

Questions that reveal a terminal's real discipline

- Which product families share lines, and how are interfaces managed on them?
- What does your tank service-change procedure require before a new grade is accepted?
- When was the last first-foot sample failure, and what happened next?
- How is my product protected from commingling with other owners' stock — contractually and physically?



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An operator with genuine segregation discipline will answer from written procedures. Vague reassurance — "we're always careful" — is precisely the answer that should worry a cargo owner.

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