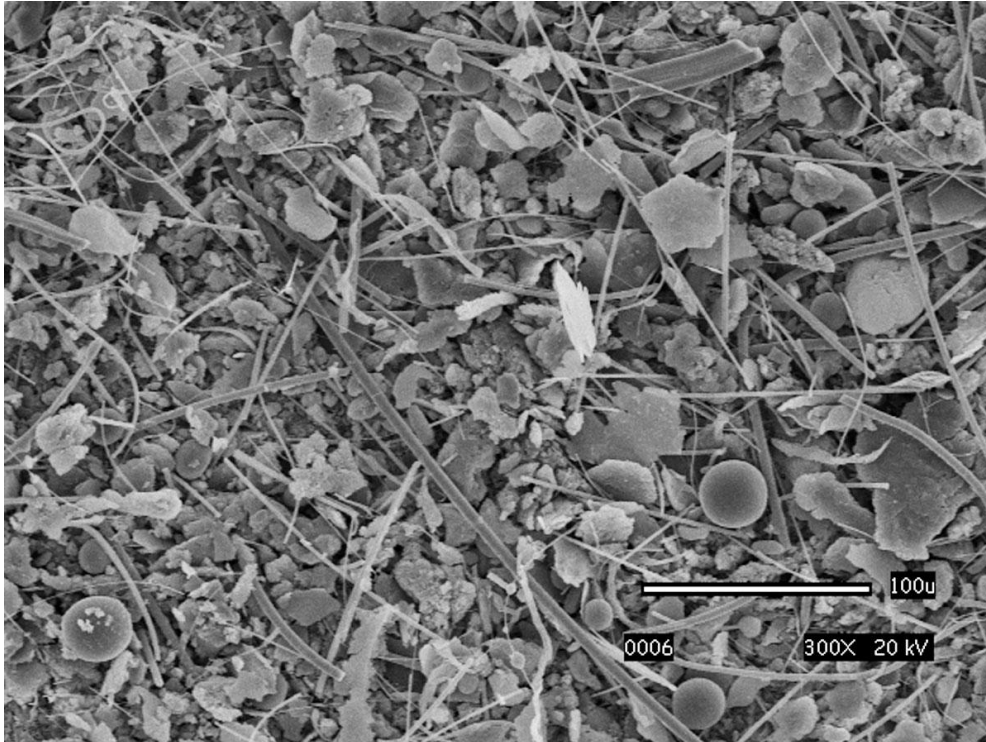# On-line, real time Particulate Contamination Detection

Particle Solutions

Resolver on-line

Pamas Particle Counting
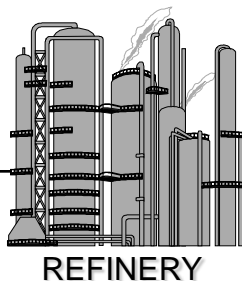
Facet International

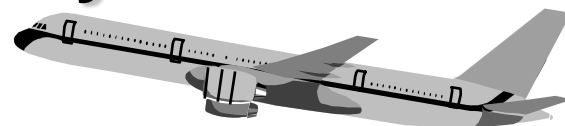**Briefing prepared for IATA Aviation Fuel Forum, 06/08 November 2012.**
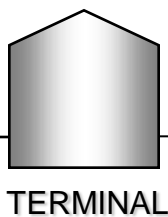
ath taken by aviation fuel from refinery to aircraft

Manufacture

F

REFINERY
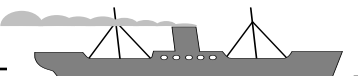
Particle counting by IP564, 565 or 577 required as a report only item introduced in Def Stan 91-91, point of production.

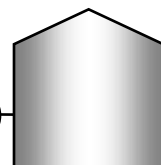IP1598, 2nd edition (with "verification tests") published 2012, should allow migration of particle sensor technology to Airport

Distribution

TERMINAL

F

Supply
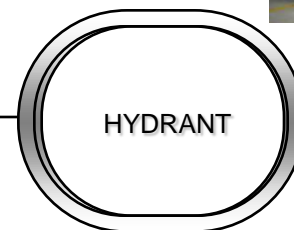
M F

AIRPORT STORAGE

F

REFUELLER

HYDRANT DISPENSER

HYDRANT

Assumed to be Jet here

Update on DefStan 91-91 Particle Counting Requirement:
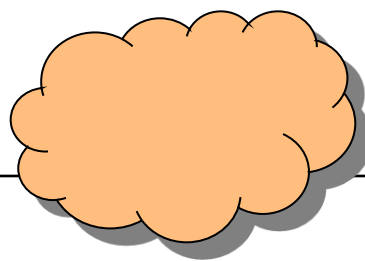
Report only → → Limit specification

Problem: Water droplets and dirt particles have different limits and both are counted equally by APCs

Solution (remove cloud) -

Holly Springs trials of Cosolvent & Resolver demonstrated that water droplets can be removed from the total contamination load without affecting the dirt distribution. EI Report may be available any time soon!

→ Modify IP564, 565 & 577 by introducing Annex B – Cosolvent/Resolver step
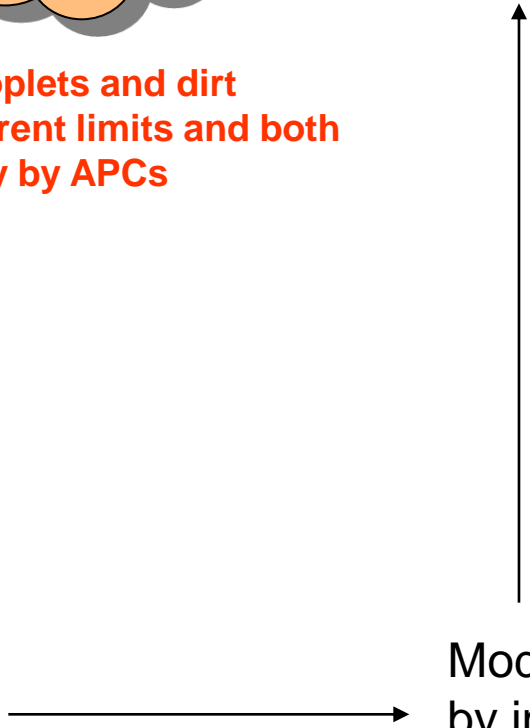
A quantitative ISO 4406 Limit <u>Proposal</u> for DefStan 91-91:

Using >4 micron, >6 micron & >14 micron particle sizes:

- 19:17:12 or less (or equivalent actual counts/ml) will be considered clean and dry.

- 21:21:19 or more (or equivalent actual counts/ml) will be considered to be unacceptably contaminated.

- Fuels falling between these limits, shall be treated with either Resolver (2% treat rate) or Cosolvent (5% treat rate) to identify the actual levels of particulate and water. The treated sample shall be <19:17:12 to be considered clean.

Can this logic translate from the laboratory to the field?

Practical Application – **RESOLVER-online**

Pipeline/Vessel

Resolver

Resolver 2 injector system, high pressure proportionating pump

Sample splitter

Static Mixer

Static Mixer

Calibrated matched pair of on-line automatic particle counters

APC 1

APC 2

Total contaminant detection

Particulate detection

Pamas
Particle
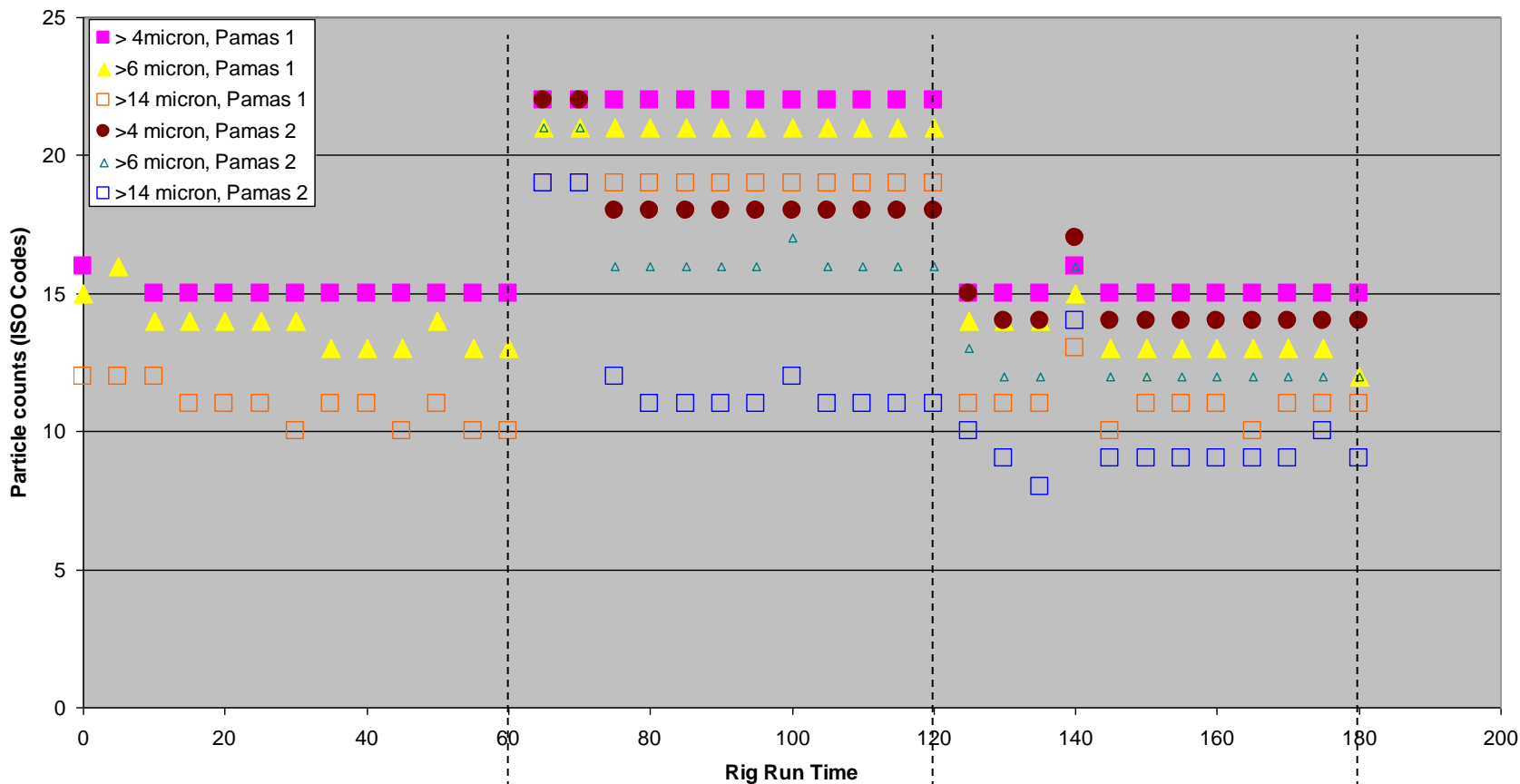**Counting**

Particle counts

APC 1

APC 2

time
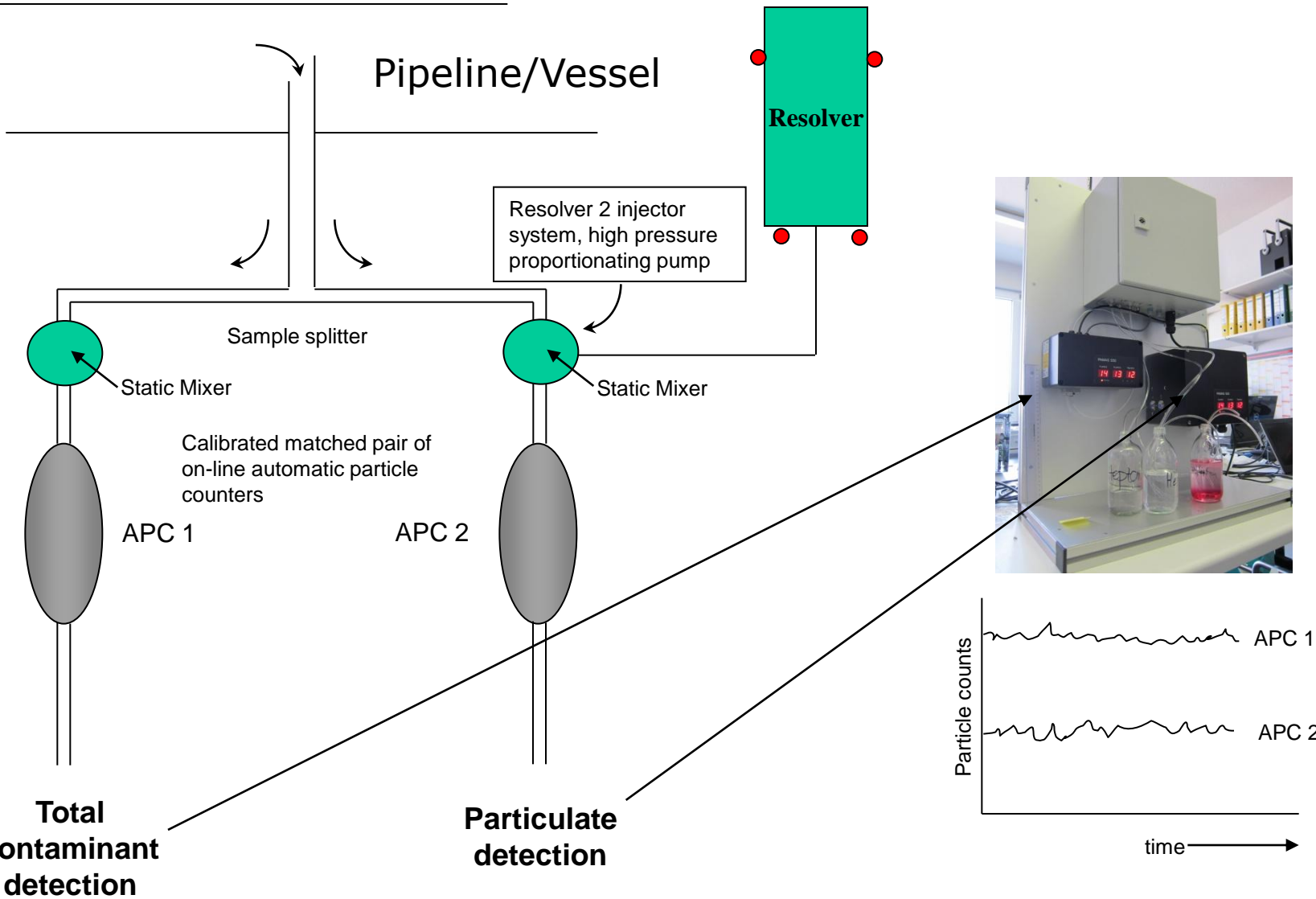
APC 1 yields total counts including both particles and water droplets

APC2 yields particulate material only. The difference is water

Facet International Rig Test data:

Facet Rig data: Pamas APCs/Resolver on-line

Legend:
- ■ > 4micron, Pamas 1
- ▲ >6 micron, Pamas 1
- □ >14 micron, Pamas 1
- ● >4 micron, Pamas 2
- △ >6 micron, Pamas 2
- □ >14 micron, Pamas 2

Y-axis: Particle counts (ISO Codes)
X-axis: Rig Run Time

Baseline fuel – no water and no Resolver

15ppm Water contamination and Resolver injection

No water but Resolver still injected

Summary & Conclusions:

- Particle counting limit setting within DefStan 91-91 is proposed

- Water sequestration technology enables separate dirt/water assay

- This technology can be used in the field in an on-line, real time application

- Preliminary results on a full-scale test rig are good.

- The next step is to perform a witnessed EI1598 verification test.

Particle Solutions Ltd   Pamas Particle Counting   Facet International