

GEA Group

Product Line Standardized - Marine & Energy
Dipl.-Ing. Sven Mario Jadzinski – Head of Sales

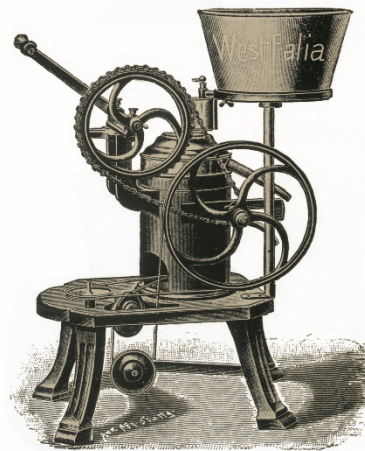
THURSDAY, DECEMBER 07, 2017



GEA Centrifuges

1893 wurde in Oelde die erste **Zentrifuge** gebaut – seither wird hier der Fortschritt in der mechanischen Trenntechnik bestimmt.

Die **Separatoren**, **Dekanter** und **Prozesslinien** bewähren sich weltweit in leistungsstarken Unternehmen jeder Art und Größe unter zum Teil extremen Einsatzbedingungen.



GEA engineering for
a better world

Core Products | Separators and Decanter



Zentrifugalseparatoren

- mit Trommeldurchmessern von 160 mm bis 1.050 mm
- Durchlaufleistung bis 500.000 l/h
- Partikelgröße ab 0,5 μm
- „Flüssigkeitsorientiert“



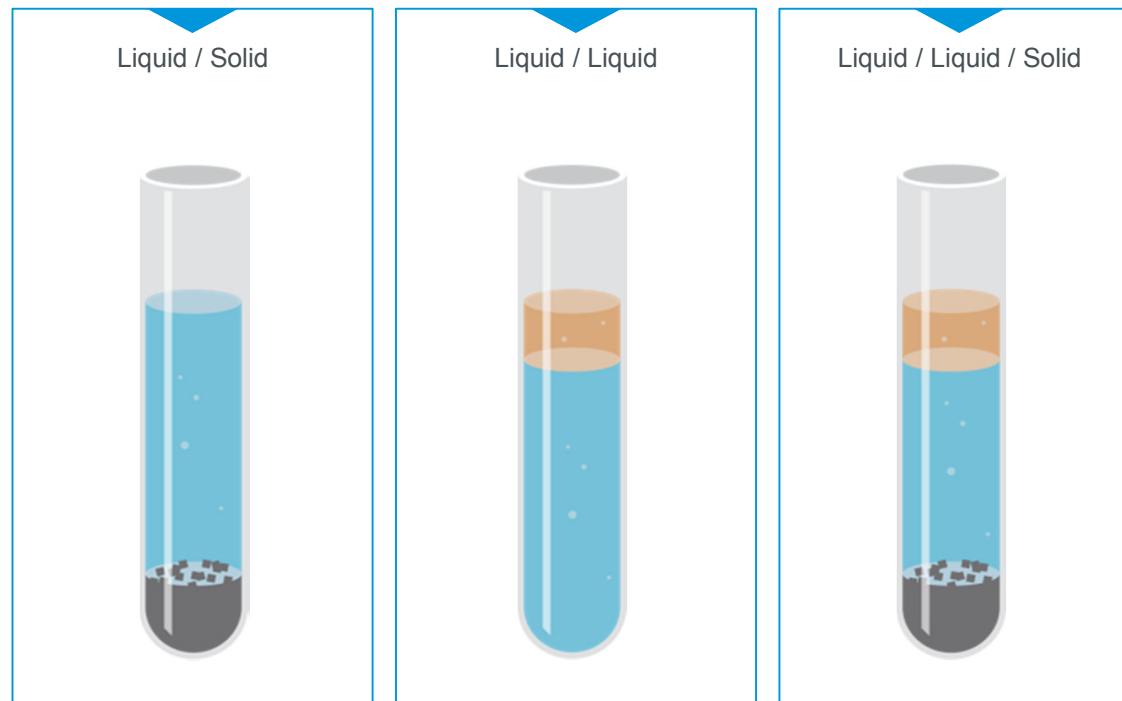
Dekanterzentrifugen

- mit Trommeldurchmessern von 200 mm bis 1.030 mm
- Durchlaufleistung bis 350.000 l/h
- Partikelgröße ab 5 μm
- „Feststofforientiert“



Principles of Separation

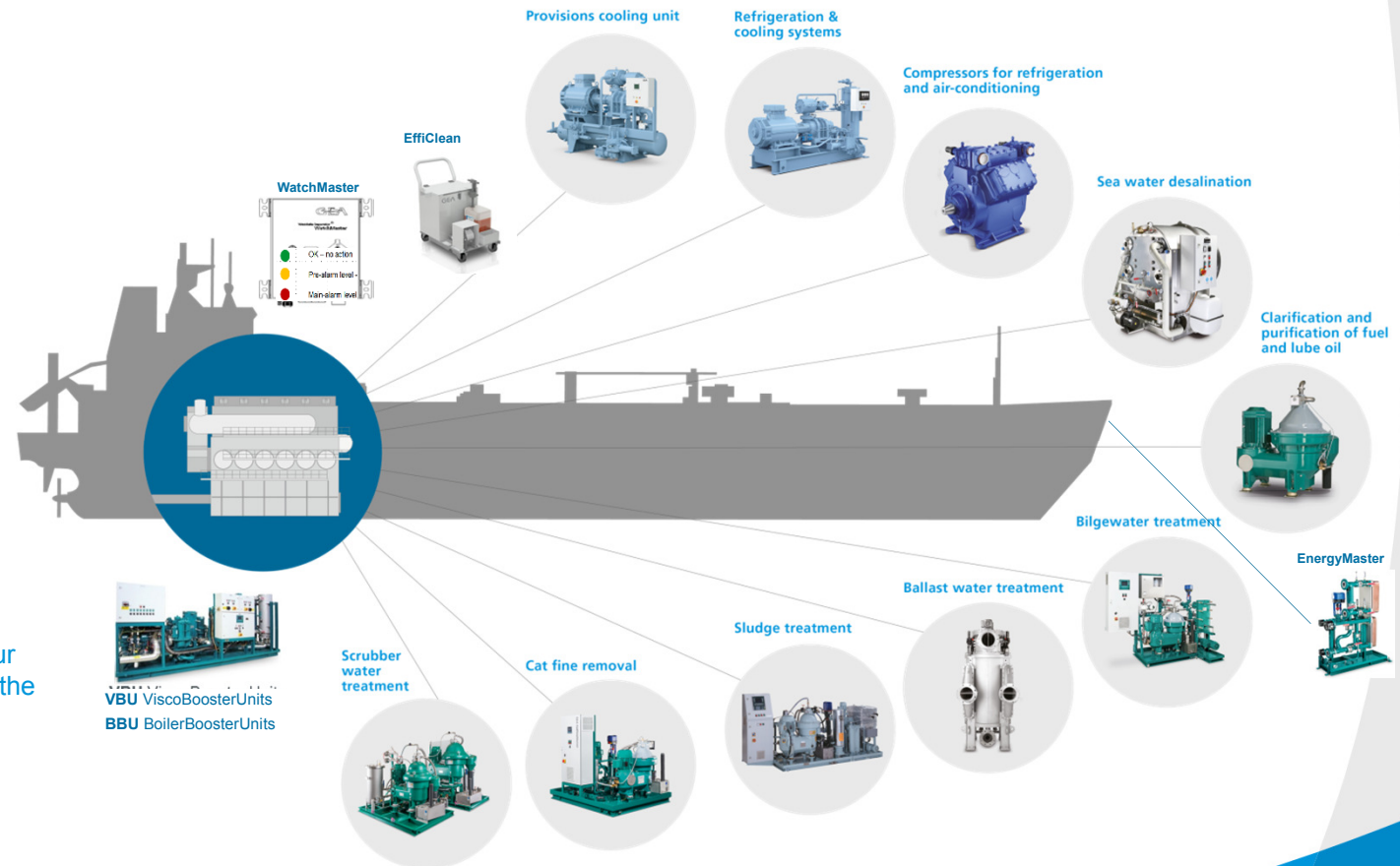
Difference in Density : Separators and Decanters can be used for:



Productlines | Applications



PL Marine & Energy | Product Suite



GEA SERVICE FOR YOUR CONTINUED SUCCESS
 We build, maintain and improve our customers' equipment throughout the full life cycle.



GEA CFM | CatFineMaster - Advanced Fuel Treatment

CFM | Cat Fines Pose growing Threat

Ever since catalytic cracking processes were developed to **squeeze more product from crude stock**

The problem is not going away...
Recent reports from **Fuel Oil Bunkering Analysis and Advisory Service (FOBAS)** have found significant problems with cat fines in engines and bunker fuel respectively.

Given the damage cat fines can do to engines, this is highly significant



A cutaway of an MAN liner and piston with damage to the piston rings



CFM | Cat Fines Pose growing Threat

This problem is only likely to get worse once the 2020 global sulphur cap comes into effect. An increase in the use of ULSFO and a potentially greater variance in local fuel blends **mean the cat fine problem has the potential to become more serious**

This is due to their use in the creation of low-sulphur fuels.
Seems to be a direct correlation between ULSFO global demand and engine damage by cat fines



CFM | Cat Fines – Risk of Damage

Damage caused by cat fines can lead to significant costs,
Price of replacing just **one liner** estimated at US\$ 65,000 for spare parts alone.

This can escalate to more than US\$1M when the labour and the accompanying expenses of:

- Downtime
- Repair and **off-hire**
- Multiple cylinders are affected



Engine worn out in less than 100 hours by catalytic fines

Ship type: All with 2-stroke engine Size (GT): Any Year built: Any

Background

DNV has over the last years seen an increase in engine damage due to catalytic fines, even though the bunkered fuel has been in accordance with ISO 8217 marine fuel specification and fuel treatment is standard procedure and implemented for all vessels. Recent damage, that can be traced back to catalytic fines occurred after only 100 running hours, making the engine totally inoperable. All pistons and liners were totally destroyed and had to be changed.

With the new requirements related to the use of low sulphur fuel in certain areas and the fact that low sulphur fuels have a higher average amount of catalytic fines, we expect to see more of this kind of damage; and care should therefore be taken to ensure that the fuel treatment and tank cleaning is operating



Figure 1



CFM | Viswa Lab Report - MX - Manzanillo

 Published on : 11th Feb 2015



Viswa Lab reports that in the last week of January 2015, they have identified very high catfines (102 ppm, 103 ppm, and 105 ppm) in 3 samples bunkered in the port of Manzanillo, Mexico.

These levels of catfines could cause very serious damage to the machinery.

The fuels are out of spec when compared to the ISO 8217:2005 or ISO 8217:2010/2012 standards.

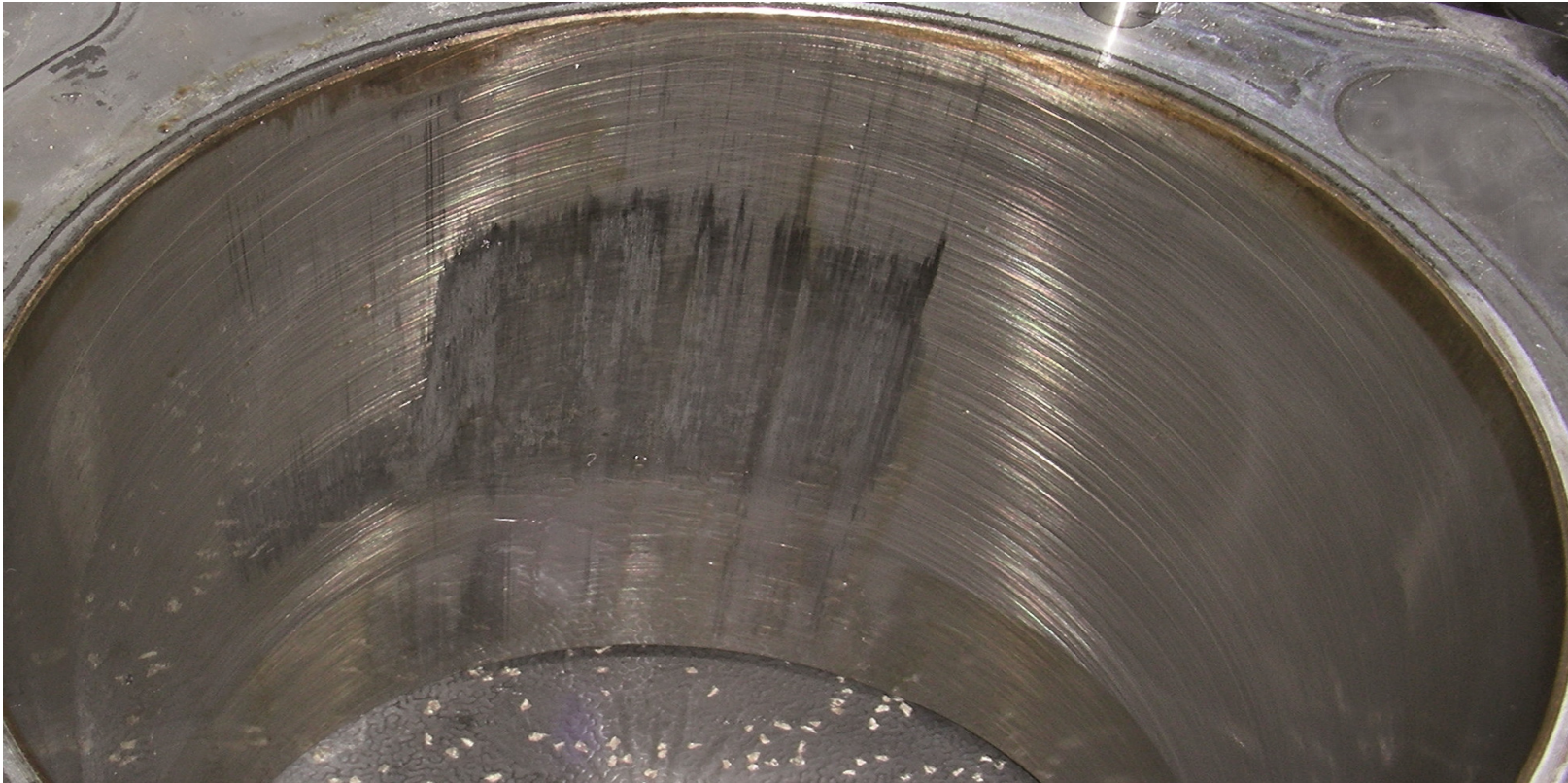
Even with purifier efficiency of 80%, the catfine value would be higher than the 15 ppm limit recommended by engine manufacturers.

Viswa Lab cautions users while ordering fuels in Manzanillo. Users should insist on getting catfine values before ordering the fuel. Viswa Lab further encourages users to refer to analysis reports to improve purifier efficiency for maximum removal of catfines.

Source : www.viswalab.com



CFM | Damages caused by Cat Fines



CFM | Shipowners Wish List

- Cat Fine content less than 10 ppm
- Max. Cat Fine Size $\leq 3\mu\text{m}$
- Within Engine Operating Guidelines
- Extended life time of crucial engine parts
- Stable Ship Availability
- Short Return of Investment
- No Unforeseen Engine Shutdown
- Online Monitoring by CatGuard as Option



CFM | MAN Diesel & Turbo revised Guidelines



7. Cat-fines (Al+Si)

As in heavy fuel oil (HFO), cat-fines may also be found in the new types of fuel with less than 0.1% S (ULSFO, see Section 3). Cat-fines are small, very hard particles from the refining process. They can wear the engine fast and it is highly recommended to use the fuel cleaning and condition system in an adequate manner to clean the fuel and remove the cat-fines.

The traditional diesel systems on board are dimensioned to operate on low-viscosity fuel at rather low temperatures. Compared to HFO cleaning systems, the separator and preheater are smaller dimensioned and the electrical equipment might not be certified safe equipment. As the viscosity of the distillates

and the new types of fuel with less than 0.1 %S (ULSFO) is very different, it is important to pay attention to the recommended temperature for the different fuel types during the cleaning process, see Table 8.

The cleaning systems must be designed for operation at the higher temperatures and lower recommended flow. Too low a temperature and too high a flow through the separators during cleaning will result in insufficient removal of water, cat-fines, sludge and other contaminants (Fig. 9).

The cat-fine level should be kept as low as possible before engine inlet and maximum level is 10 ppm (Fig. 10).

Fuel type	Min. fuel temperature in the separator
Distillates	40-50°C
ULSFO	98°C
HFO	98°C or higher



GEA CFM | CatFineMaster - Advanced Fuel Treatment

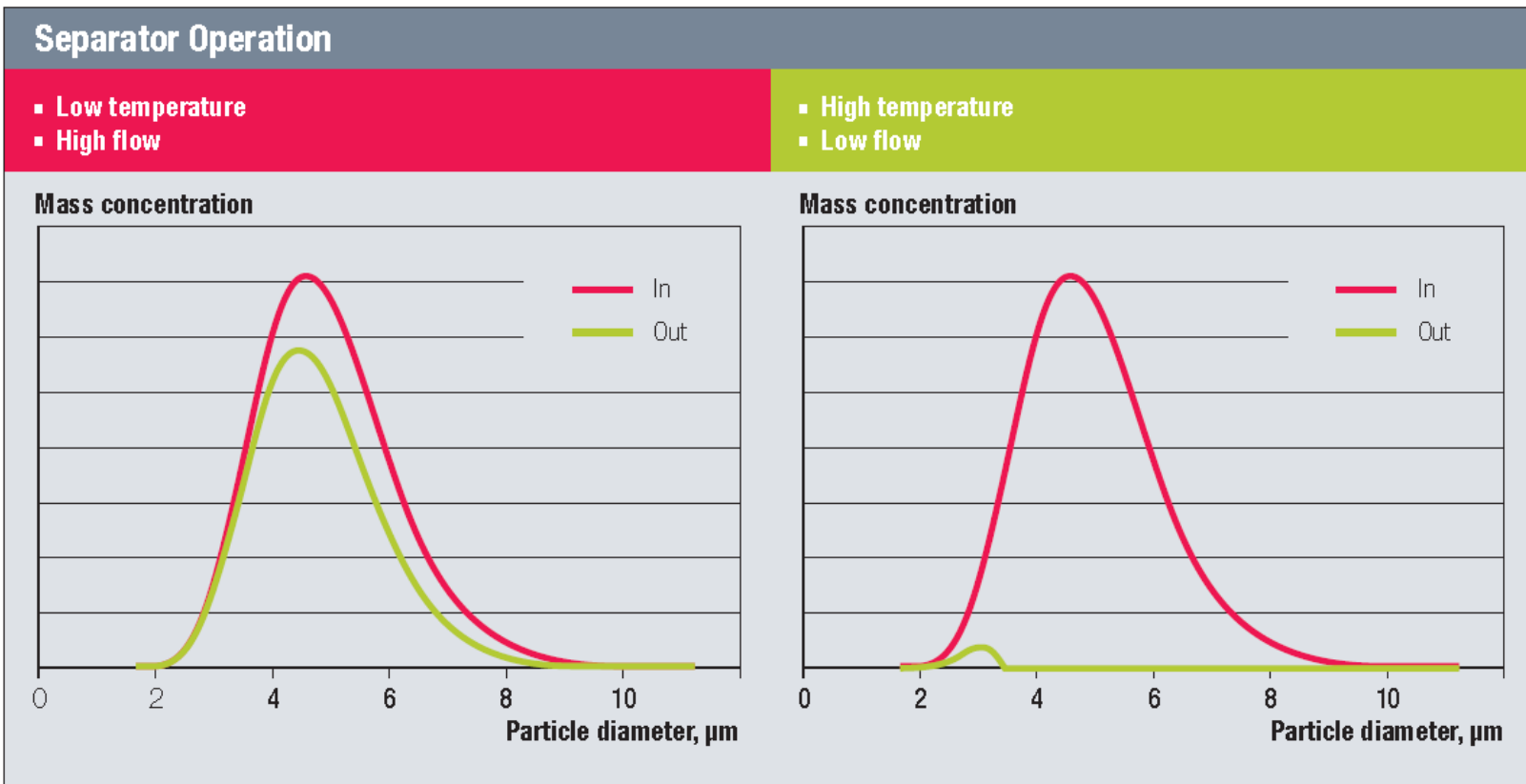
Guidelines for Operation on Fuels with less than 0.1% Sulphur

SL2014-593/DOJA
December 2014

Concerns

Owners and operators of MAN B&W two-stroke marine diesel engines and Holeby GenSets.

CFM | MAN Diesel & Turbo revised Guidelines

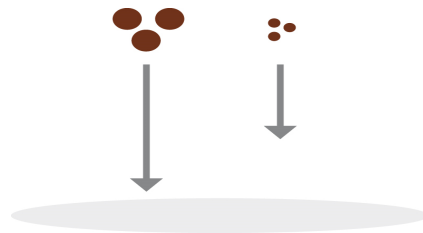


CFM I Overestimated Settling Effect

The smaller the size and mass of particles, the weaker the impact of gravity

Higher separation temperature makes the fluid less viscous and will enhance separation performance

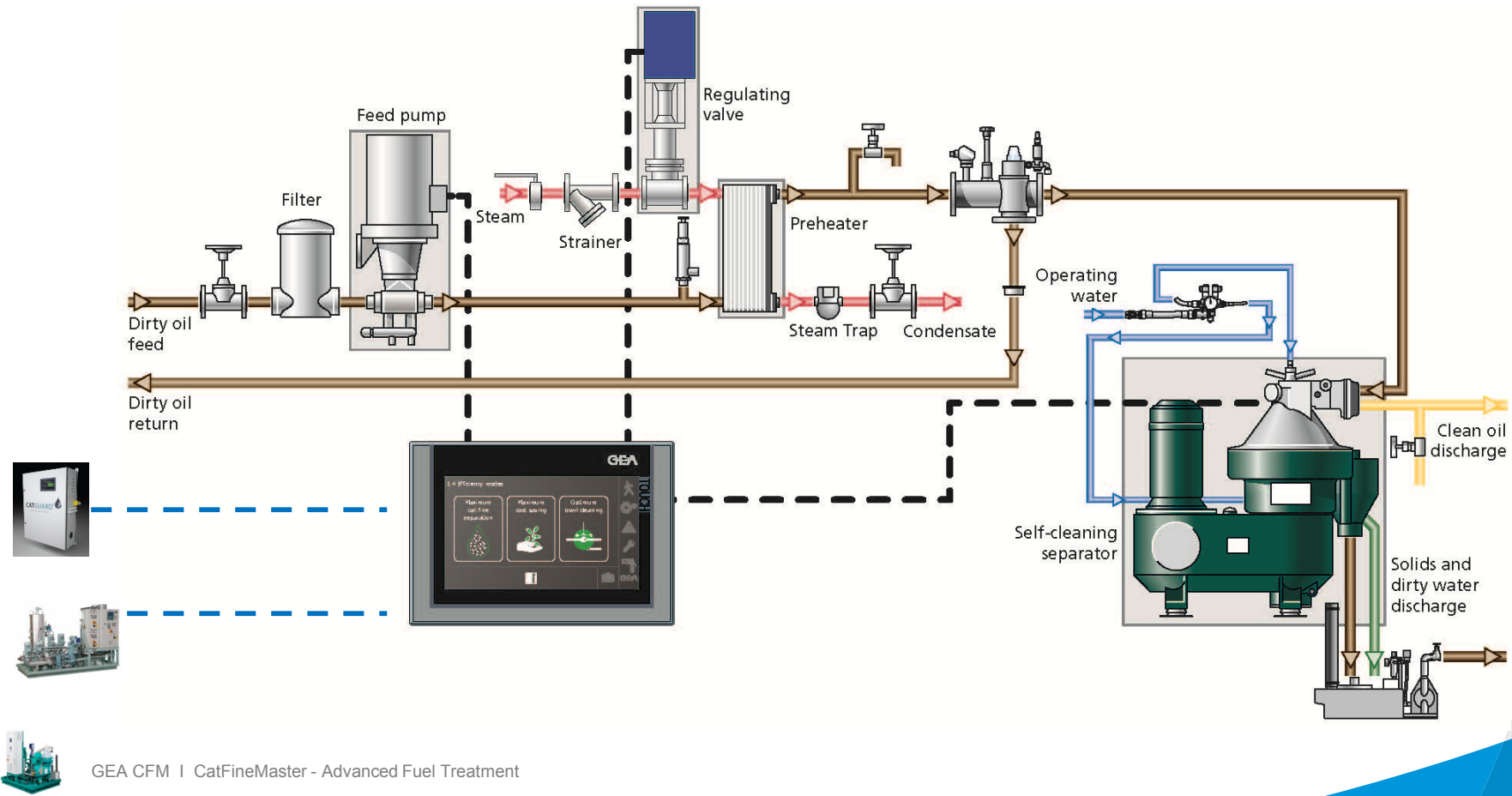
Settling effect is often overestimated



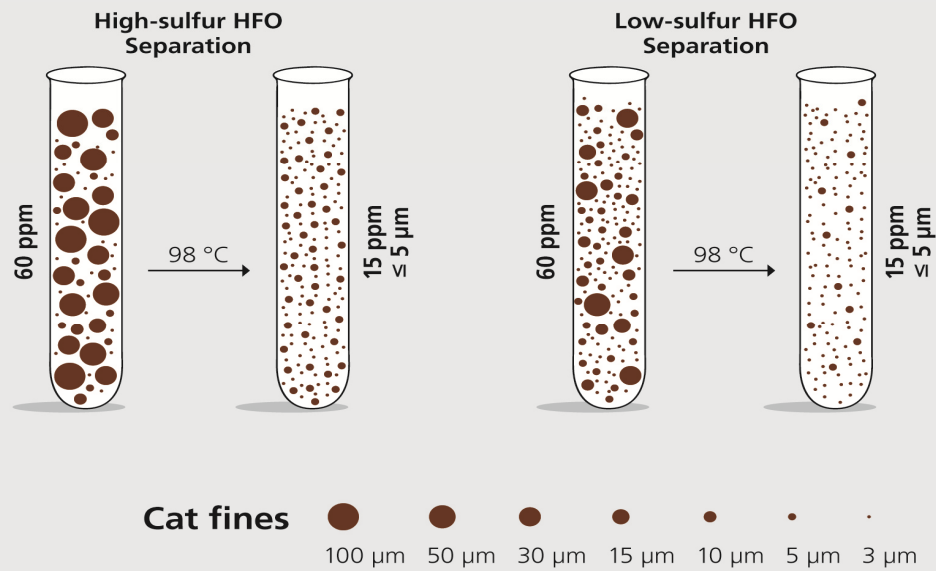
5 μm particles take 115 days to sink 1 meter in IF 700 HFO @ 98degC
3 μm particles take 230 days to sink 1 meter in IF 700 HFO @ 98degC



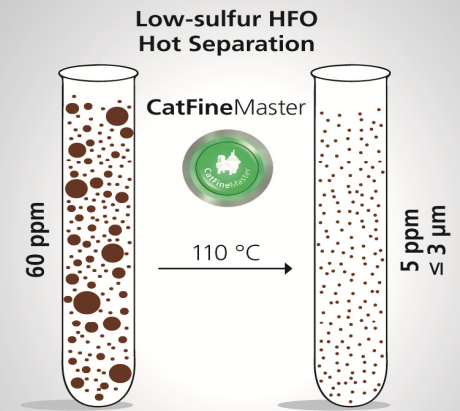
CFM I PID



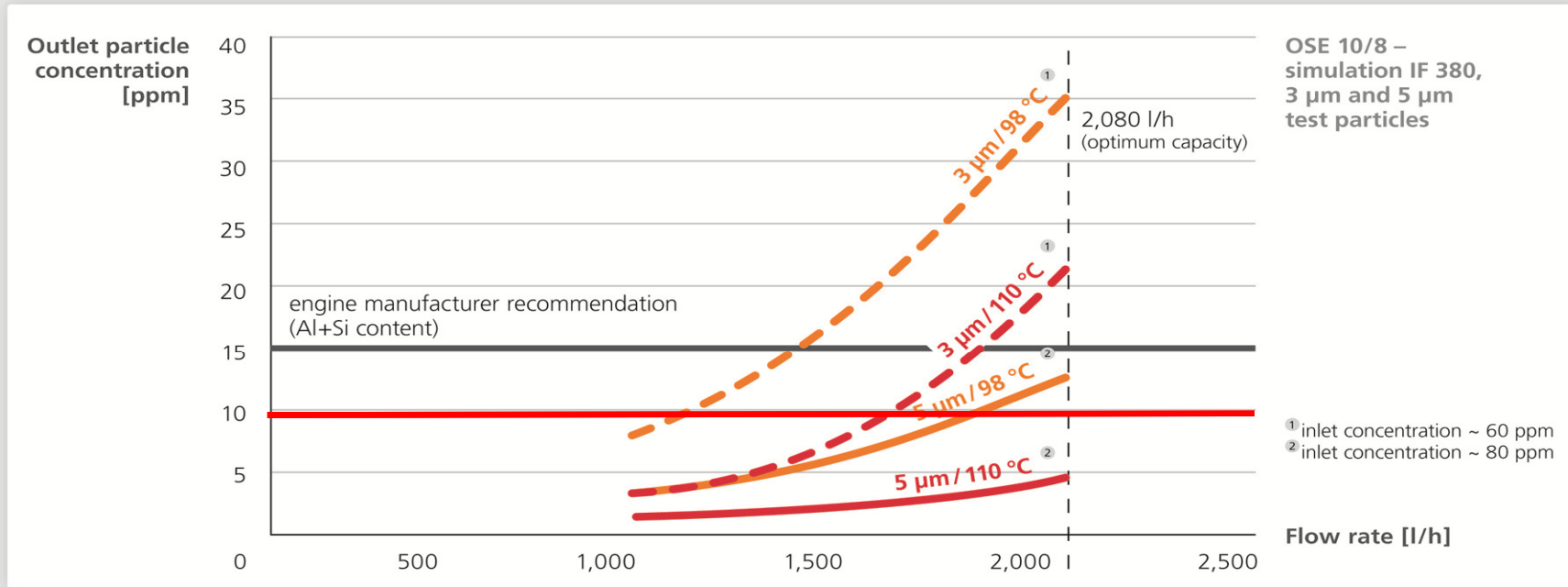
CFM | Advanced Process Results



- Reduced viscosity
- Increased settling time
- Better removal of particles



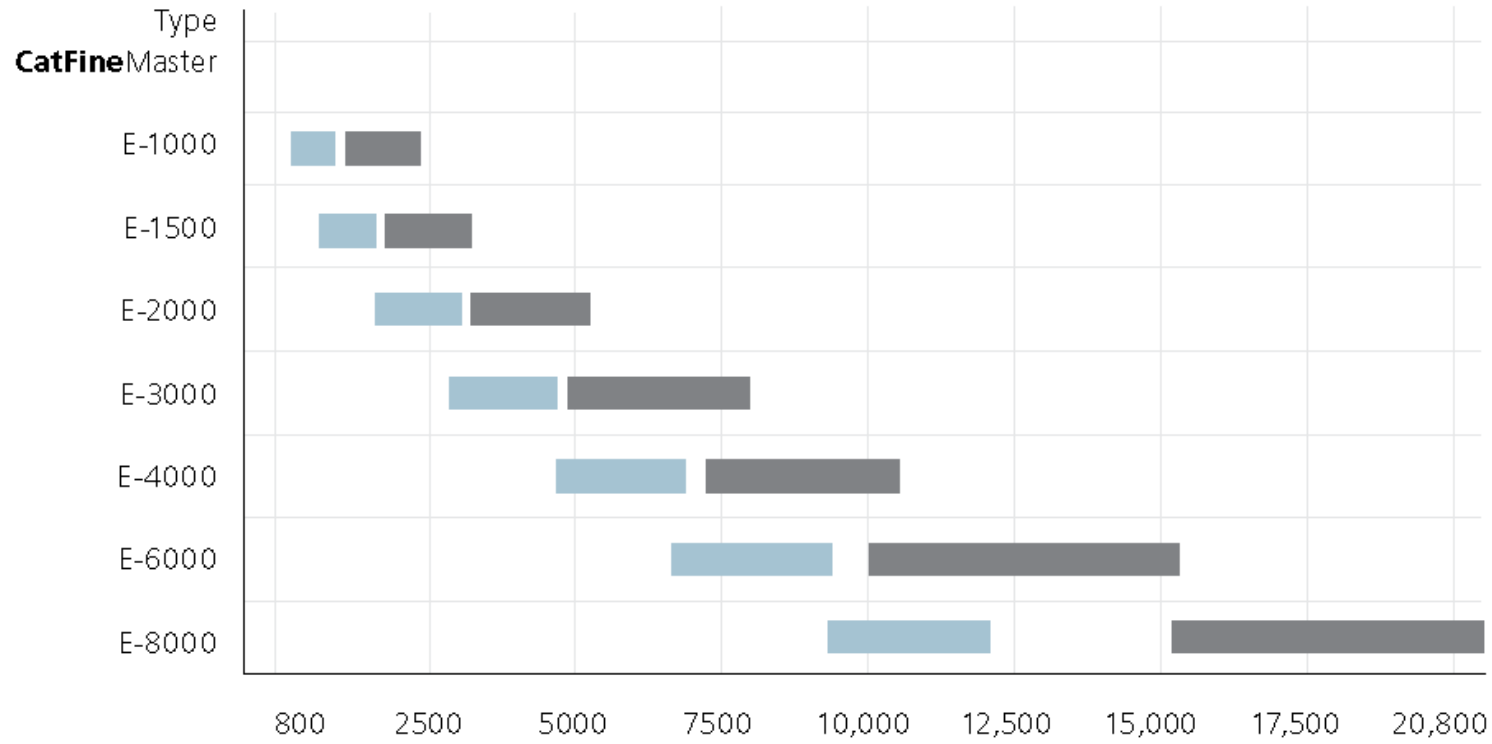
CFM | Advanced Process Results



Empiric tests with standardized test oils and particles show that higher separation temperature achieves lower outlet particle concentrations, especially at advancing flow rates and with particles < 5 μm.



CFM I Capacities



Capacity for IF 380 [l/h] Capacity for IF 700 [l/h]

GEA CFM I CatFineMaster - Advanced Fuel Treatment

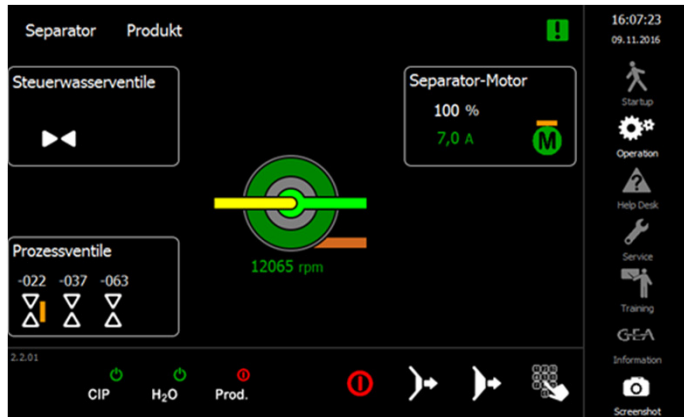
CFM | Technical Data



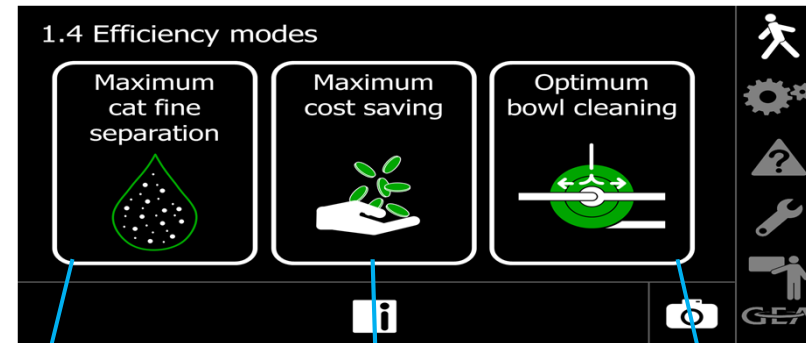
Technical data			CatFine-Master E-1000	CatFine-Master E-1500	CatFine-Master E-2000	CatFine-Master E-3000	CatFine-Master E-4000	CatFine-Master E-6000	CatFine-Master E-8000
Electrical supply	Connection voltage	V	380-690	380-690	380-690	380-690	380-690	380-690	380-690
	Frequency	Hz	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Centripetal pump	Clean oil	bar	2	2	2	3	3	3	3
	Connection								
	Inlet	DN	25	25	40	50	50	50	50
	Outlet clean oil	DN	25	25	40	50	50	50	50
	Return to tank	DN	25	25	40	50	50	50	50
	Heating medium (steam)	DN	15	20	25	25	25	25	25
	Compressed air	DN	¼"	¼"	¼"	¼"	¼"	¼"	¼"
	Operating water	DN	¾"	¾"	¾"	¾"	¾"	¾"	¾"
	Outlet sludge	DN	½"	½"	½"	½"	½"	½"	½"



CFM | HMI - I/O Panel



HMI touch panel
To select three modes



Adjusts flow rate according to
real fuel consumption

110 degC product
Temperature for high
cat fine contamination

Special bowl flushing
sequences in case of
high contamination



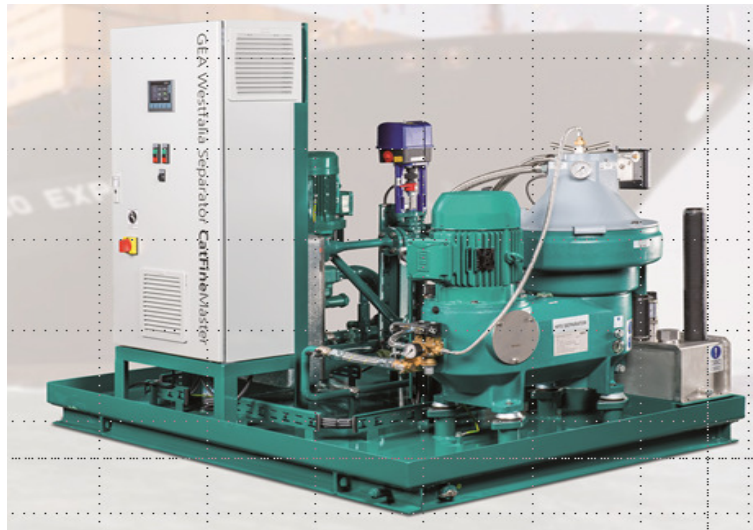
CFM | Movie



GEA CFM | CatFineMaster - Advanced Fuel Treatment

CFM I System Features at a Glance

Maximum Cat Fine removal and highest fuel quality



- Hot separation up to 110 degC
- Variable flow
- OSE technology with CFR
- Newbuildings and upgrades
- I/O touch panel
- CatGuard as an option





engineering for
a better world



gea.com