

One touch.
Finest fuel.



GEA Westfalia Separator **CatFineMaster**

Auto-adaptive separator solution for safe marine fuel



Bunker Fuel – an Uncertain Resource

Marine fuels do not come in the quality they used to be. Not many years ago, whatever impurities and irregularities of consistence possibly appeared in bunker fuel could safely be handled by means of standard on-board purification procedures and established separator technology. This has changed with the increase in dangerously abrasive catalyst fines in marine fuels: an irrevocable, almost incalculable factor in marine risk management today.

Catalyst fines – cat fines for short – remain in marine fuels during refining, as a part of the mandatory cracking practice and the aim of reducing sulfur levels to ecological standards. Unfortunately, cat fines are highly abrasive and difficult to remove from on-board fuel even with diligent cleaning and purification procedures. Embedding in engine parts, they cause wear and destruction.

Growing uncertainty lies in the fact that ship owners, operators and crews never know in advance the acute threat from cat fines. Because of economic pressure on suppliers, insufficient standards and varying on-board conditions uncontrollable fluctuations occur in fuel quality and cat fine concentration. Even fuel that has been tested for safe cat fine levels can become re-contaminated on-board with residual cat fines from tank bottoms.

Ship owners need to act

Environmental regulations and established on-board processes no longer ensure highest fuel quality. New cracking methods increase the content of small cat fines in fuels that are even harder to remove. As a result,

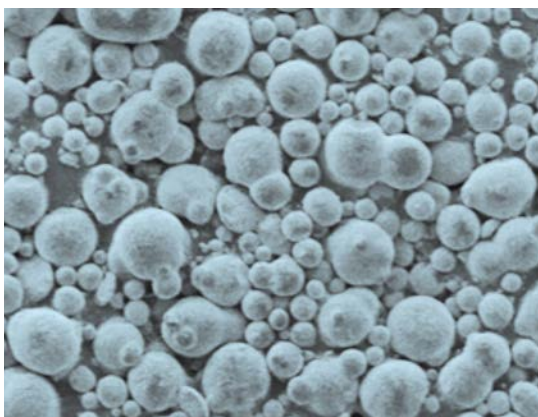
experts demand that all marine fuels, no matter from what source, should now routinely be regarded as critically cat fine-contaminated and treated as such before they enter the day tank and engine.

GEA has the solution

As a leading developer of marine fuel separators, GEA Westfalia Separator Group has recognized and analyzed the problematic turn in marine fuel quality ever since it became apparent. Because of that, GEA is now the first company on the market to offer a complete solution. It is the latest innovation in the wide-ranging GEA Westfalia Separator **seaprotect**solutions portfolio offering cutting-edge solutions for bilgewater, ballast water, scrubber water, sludge and fuel treatment.

One touch. Finest fuel.

GEA Westfalia Separator **CatFineMaster** is the first marine separator to ensure maximum cat fine removal and maximum fuel quality. It does this at the touch of a button, making on-board risk management as fail-safe as possible. In a future of uncertain bunker fuel quality, this GEA innovation makes it feasible again for ship owners and operators to protect their investment.



Cat fines, responsible for increased wear and scuffing in marine engines, are found in fuels containing blend components from catalytic crackers.



The abrasive characteristics of cat fines and their consequences are under intensive research, as the problem is bound to persist in the future.

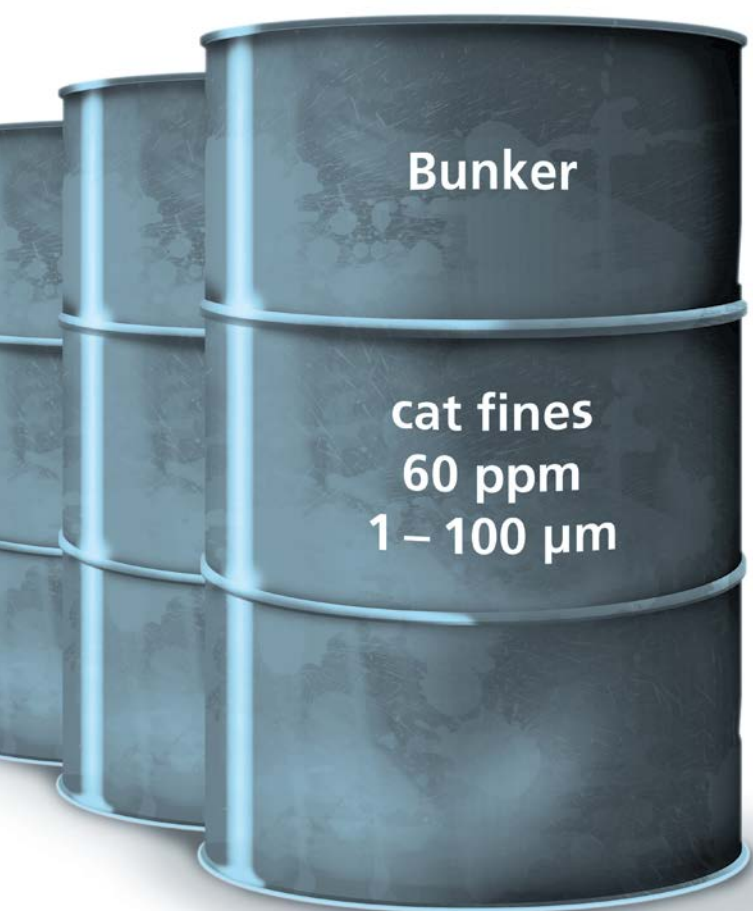
The Silent Threat: Cat Fines

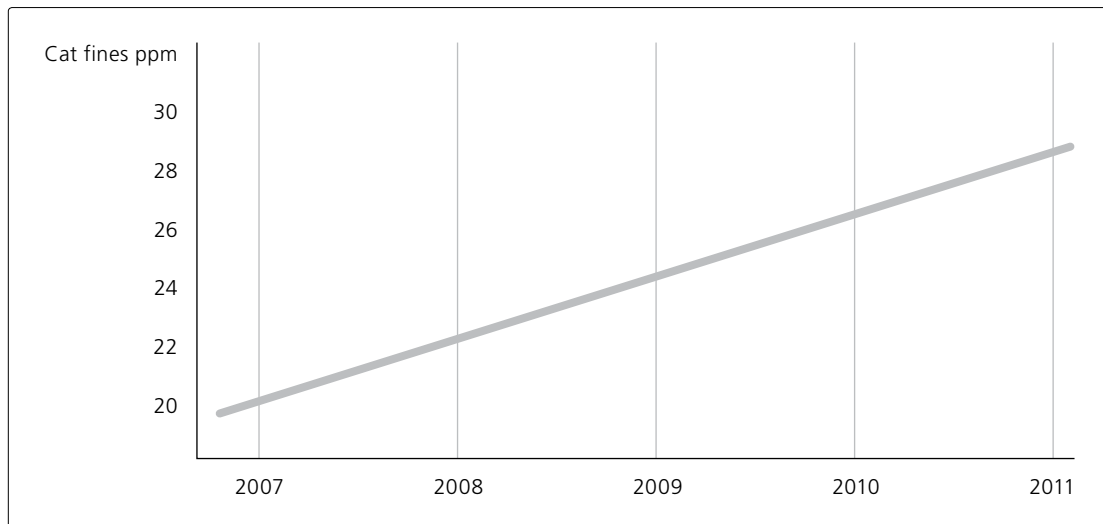
Maritime vessels and marine engines represent substantial investments. So does every piece of cargo and every scheduled sea transport. Any profit from that can be put into question by accelerated wear on – and the possible destruction of – ship's engines. Cases of severe damage from cat fine attack – the name most fitting for this phenomenon – are rapidly increasing around the world. Insurers have recorded increasing incidents of engine failures in recent years, wiping out multiple billion USD, and that is just the loss in machines.

Cat fines create accelerated wear to engine parts, on account of their hardness and high abrasive potential. The result can be a drastically shortened engine service life, severely compromising the ship's availability and return on investment. Sometimes cat fine attacks result in unforeseen engine shutdown, with all its negative impact on the ship's mission and safety.

Cat fines entering the engine create wear by so-called 3-part abrasion: The sliding surfaces made of cast iron are the most sensitive, as the cat fines have a tendency to embed into natural porosities of the cast material structure and create wear on the counterpart. Cylinder liners, piston ring grooves and piston rings become the most affected components.

In a recent study of high cylinder and piston ring wear cases, 90 % of cases of accelerated wear were found to be the result of cat fines embedded in the liner surface. Damage even after a short period of time was found to be the result of too high cat fine content led to the engine. Inefficient on-board fuel treatment and residual cat fines in on-board tanks are decisive causes of that.





The global levels of cat fines in commercial marine fuel oil have been on the rise for years, with no change in trend to be expected.

Small size, great destruction

Although much overlooked until recently, cat fines smaller than 10 μm (microns) have been found to significantly contribute to the failures. This is unfortunate because current changes in cracking processes mean those smaller cat fines are becoming more common in commercial fuels – and the smaller they are, the more difficult they are to separate from the fuel.

Critical trends in fuel supply

In most cases damage to ship engines is not the result of running on off-spec fuel. Also bunker fuel qualities according to the current ISO 8217 specification with a cat fine content of up to 60 ppm (parts per million) could endanger engines. Many experts claim that in the treated fuel even a level of 15 ppm is not sufficient enough to ensure safe operation of marine engines. Given the nature of decreasing cat fines the maximum level in the treated fuel should be 5 ppm.

More and more Emission Control Areas (ECA) are being established in the world's coastal zones. To fulfill the environmental regulations and achieve the mandatory low sulphur levels the number of cat fine related engine wear situations is expected to further increase in the future.

If ships and ship engines are to be protected from this threat, a reliable on-board solution for separating cat fines from marine fuels is necessary. To be sufficiently effective, such a solution should keep cat fines larger than 3 μm at a maximum level of 5 ppm in the fuel.



Remains of cat fines in the fuel oil entering the engine account for a considerable part of the wear to the combustion chamber components.



One touch. Finest fuel.

GEA Westfalia Separator **CatFineMaster** is the first marine fuel separator unit engineered to the mechanical specifications that ensure maximum cat fine removal and maximum fuel quality in every situation.

One touch of the button starts the process. The system takes all relevant criteria into account – especially the acute fuel demand, and pre-configured energy-saving settings. All the decisive functional parameters, such as the variable separation temperature and the variable separation flow rate are then automatically set for maximum separation performance.

A radically simplified menu has been designed for fail-safe operation.

The entire separator unit has been developed for reliability and ease of use, with an optimized footprint in the engine room. GEA Westfalia Separator Group engineers have worked closely with engine developers and other experts to create a solution that provides full support to ship owners, operators and crews against damage from cat fines and low-quality fuels. In this way, GEA is making a contribution to promoting the safety of marine operations and return on investment in marine enterprises.

GEA Westfalia Separator CatFineMaster at a Glance

The unit can be fitted to any ship under construction. On-board upgrades and retrofits of existing machines are available for ships in operation.

- Hot separation = maximum separation efficiency
- Variable flow = maximum separation efficiency and energy saving
- GEA Westfalia Separator **IO** = one touch operation avoids operating mistakes and provides efficiency programs
- CFR = optimized separator size comparison based on profound regulations
- GEA Westfalia Separator **unitrolplus** = flexible adjustment to difficult and changing conditions of the in-feed
- GEA Westfalia Separator **hydrostop** = virtually oil-free discharge (no product loss)



Maximum Cat Fine Removal

Cat Fine Content < 5 ppm. No Cat Fines > 3 µm.

Two parameters are decisive when it comes to achieving maximum removal of cat fines and other unwanted solids in fuels: separation temperature and throughput capacity. GEA Westfalia Separator **CatFineMaster** has been engineered to operate with both parameters at an optimum performance level in every situation.



CatFineMaster: the first on-board solution exactly engineered to the mechanical specifications for maximum cat fine removal and maximum fuel quality.



GEA Westfalia Separator Group units are the best partner of a ship's engine, safeguarding high-investment components from wear and destruction.

Hot separation

Increasing temperature effects lower viscosity and density in fluids. According to Stokes' Law, discovered in 1851 by the physicist George Gabriel Stokes, this increases the settling velocity in a separator. Separating even smaller particles that would otherwise remain in the fuel is much easier.

The design of the **CatFineMaster** has been optimized for hot separation up to 110 °C in order to exploit this effect to the greatest possible extent, for maximum performance and reliability in cat fine removal.

Variable flow

Lower flow rates of fuel in the separator unit mean longer separating times, which is another effective means to achieve higher separation efficiency for maximum removal of particles. To make the most of this option, the **CatFineMaster** features a unique and highly innovative control function to adapt the feed to the amount of fuel actually required for engine operation at a given time. This means the flow rate will always be at the optimum in terms of separation efficiency and energy savings.



Accountable CFR (Certified Flow Rate) configuration

GEA Westfalia Separator Group delivers the separator unit exactly tailored to the machine dimensions the customer needs, based in a fully accountable and easy-to-compare manner on the CWA 15375 standard.

Maximum Fuel Quality Proven and Reliable Separator Technology

The heart of the GEA Westfalia Separator **CatFineMaster** is a modern self-cleaning **centrifuge** separator. The built-in patented GEA Westfalia Separator **unitrolplus** sensor system automatically monitors for water and solids content to provide for maximum fuel quality – even under the most extreme conditions at sea.

The system thinks for itself and can even be operated without supervision, even eliminating manual setting errors. The water content is checked and controlled by the Water Monitoring System (WMS). The Sludge Space Monitoring System (SMS) checks the solids space for separated particles such as cat fines, sand, abrasives and rust.

Automatic bowl ejection at precisely defined volumes minimizes oil losses. The bowl's hydraulic system GEA Westfalia Separator **hydrostop** ensures extremely short ejection times with maximum outlet diameter and minimum oil losses. The solids are discharged highly concentrated. Disposal is made simple to reduce costs, with environmental considerations fully taken into account.

A complete system, ready for connection

CatFineMaster is a compact, self-contained package system. All elements necessary for safe and efficient fuel treatment are mounted ready for connection in a space-saving arrangement on a sturdy foundation frame.

The design makes possible space-saving installation direct in corners or against walls. It is also possible to install several modules side-by-side to form a complete plant. **CatFineMaster** is completely assembled and function tested by GEA Westfalia Separator Group; faulty installation of single operating components on site is thus eliminated. The unified design also saves money and makes maintenance easier.



Maximum Ease of Operation

Simplicity and fail-safe usability were the thoughts behind the development of the new control system GEA Westfalia Separator **IO**. This system makes it as easy and user-friendly as possible to operate the GEA Westfalia Separator **CatFineMaster** and to manage its functional options.



For easy viewing under all conditions, the operating menu is presented on a black background, displaying color-coded information and self-explanatory icons to guide the user intuitively. The display is divided into logical sections, all reduced to the essentials. The navigation screen offers only those options and details relevant at a given point. The operator or any other crew member – whether expert or not – can assess the operational status of the separator at one glance at all times.

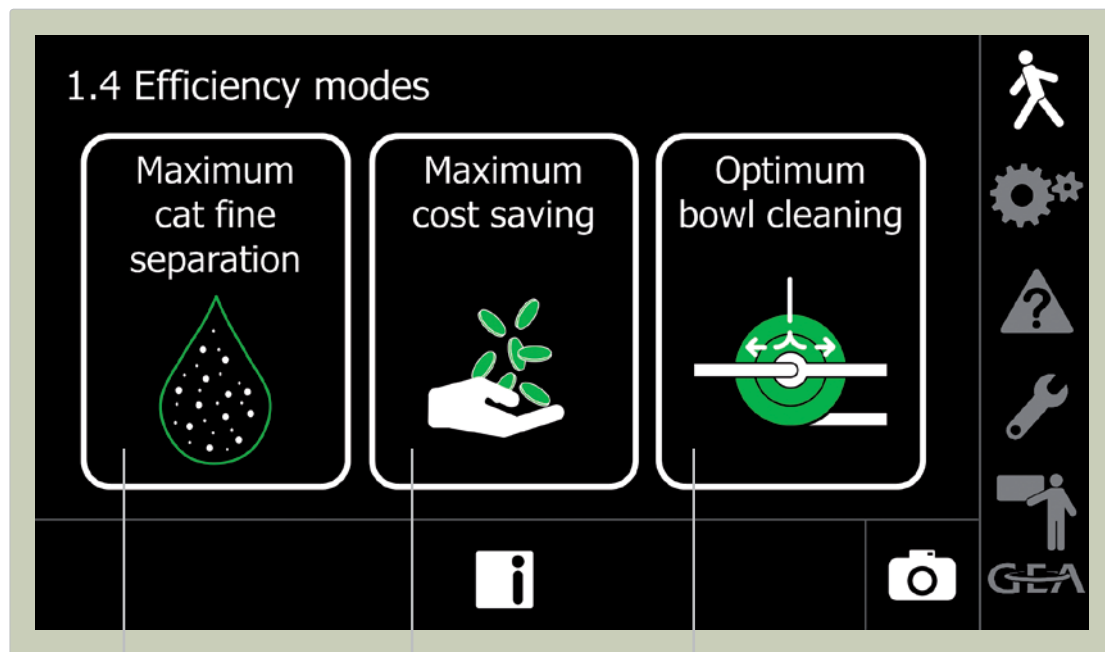
An additional menu bar on the right-hand side offers access to special control sections, for commissioning, servicing, troubleshooting or maintenance.

A set of special assistance systems has been built into the **IO** unit. These systems provide additional information, such as operating manuals and self-learning tools, as well as innovative extra control functions.

Efficiency modes

An especially important assistance system integrated into the GEA Westfalia Separator **IO** is a set of three different efficiency mode presets unique to the **CatFineMaster**. They can be activated, deactivated or combined at one touch:

All three modes activated



Selects optimum separation temperature and pump speed, for cases of high cat fine contamination

Controls flow rate for cost-optimized operation according to the engine's actual consumption

Adds special bowl flushing sequences in case of high contamination with very small particles in order to maintain maximum separation efficiency



A Partnership for Your Investment

Adding a future-proof cat fine separation solution for fleet administrators and owners to protect their investment.

Marine technology experts from GEA Westfalia Separator Group are ready to assist every customer in planning the optimum solution, taking all technical, economical and administrative conditions into account.

Expert presentations, consultations and panels on fuel supply management can be organized on request at international fairs and technology meetings, at customers' sites, or at GEA Westfalia Separator Group contact locations around the world.

The Upgrade Option

For marine vessels already in operation, the technical standard and level of protection offered by the GEA Westfalia Separator **CatFineMaster** can be achieved in two ways:

- Upgrade of existing GEA Westfalia Separator Group equipment
- Retrofit of other existing separation equipment

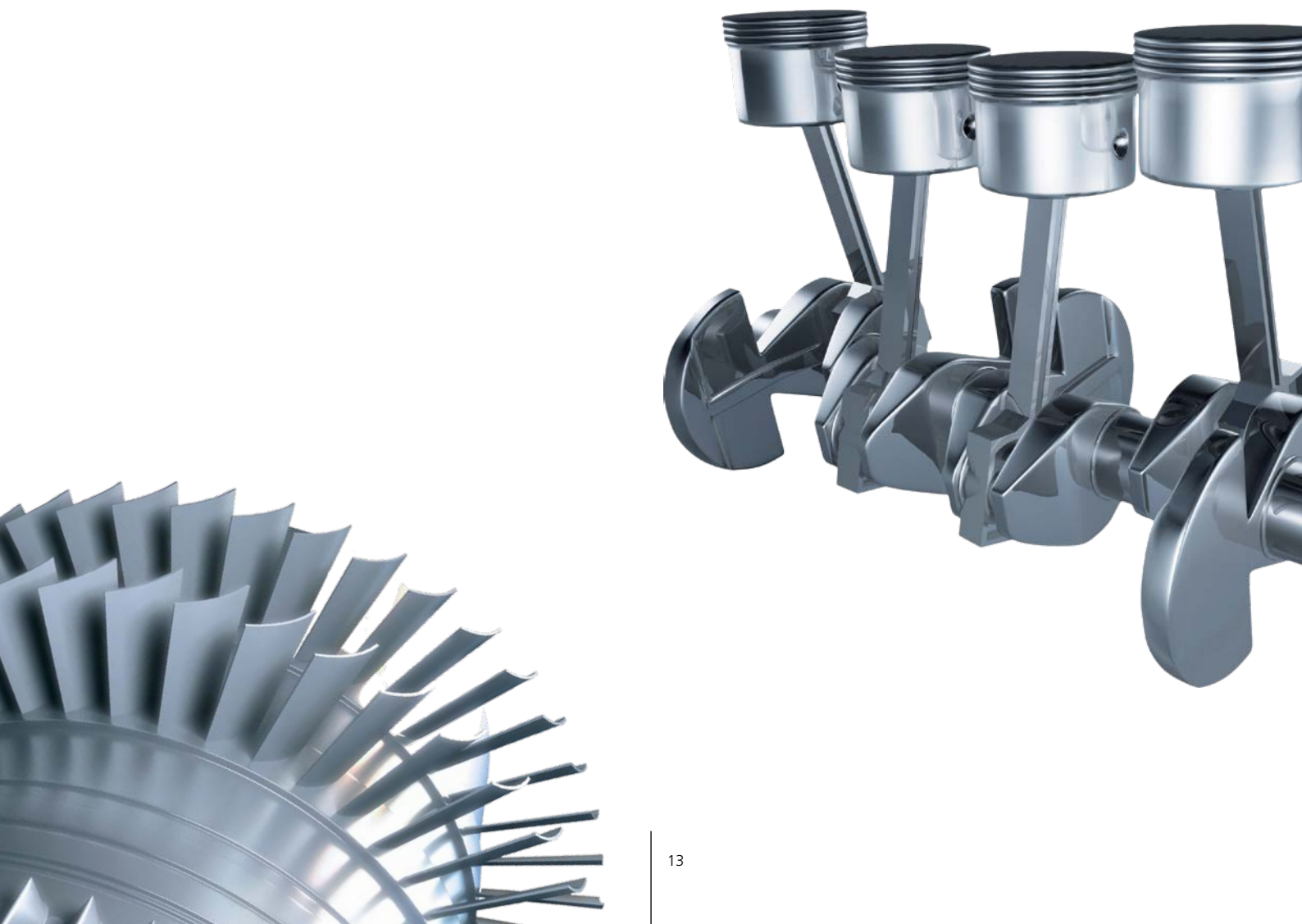


Always a GEA Solution

The new GEA Westfalia Separator **CatFineMaster** is a highly efficient solution to protect the performance, safety and economy not only of marine engines but also of marine and land-based power generator systems.

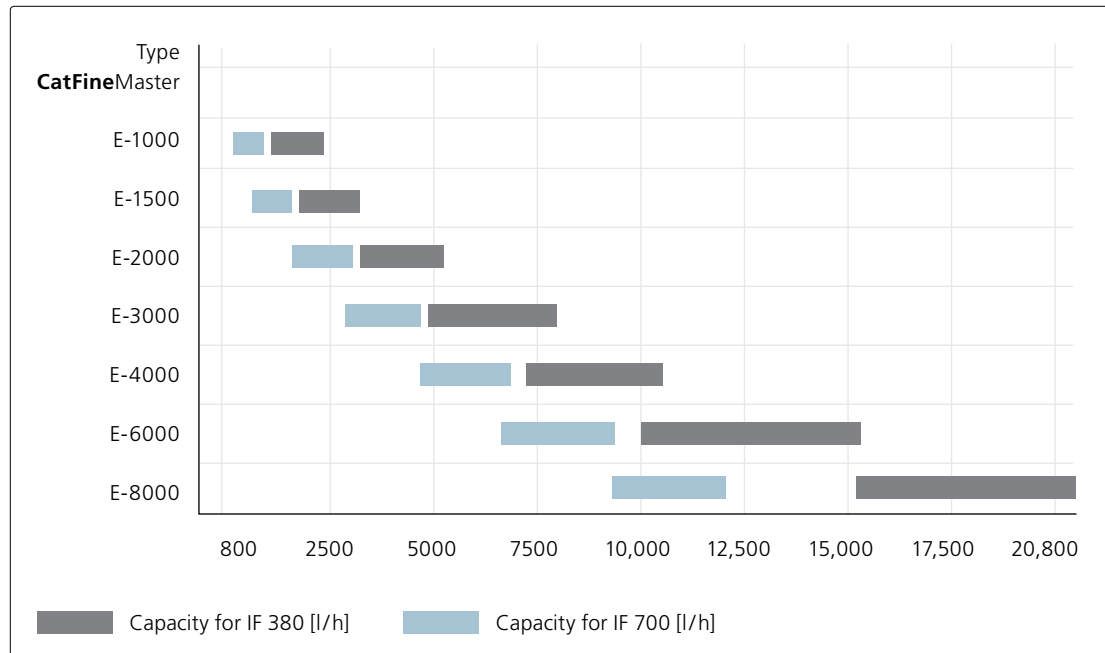
Pioneering separator technology from GEA Westfalia Separator Group safeguards high-investment mechanical systems, shielding engines and turbines from aggressive particles in fuel oils, regardless of source, reducing service downtimes, failures and replacement costs.

Available from GEA Westfalia Separator Group are continuously operating, self-cleaning separators and ready-to-connect systems – all backed by decades of experience, craftsmanship and the global GEA Group.



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"







We live our values.

Excellence • Passion • Integrity • Responsibility • GEA-versity

GEA Group is a global engineering company with multi-billion euro sales and operations in more than 50 countries. Founded in 1881, the company is one of the largest providers of innovative equipment and process technology. GEA Group is listed in the STOXX® Europe 600 Index.

GEA Mechanical Equipment

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