PYROBAN®

HOW TO REMOVE "PLATE TYPE" EXHAUST FLAME ARRESTORS FROM ATEX CATEGORY 3G ENGINES

WHITE PAPER

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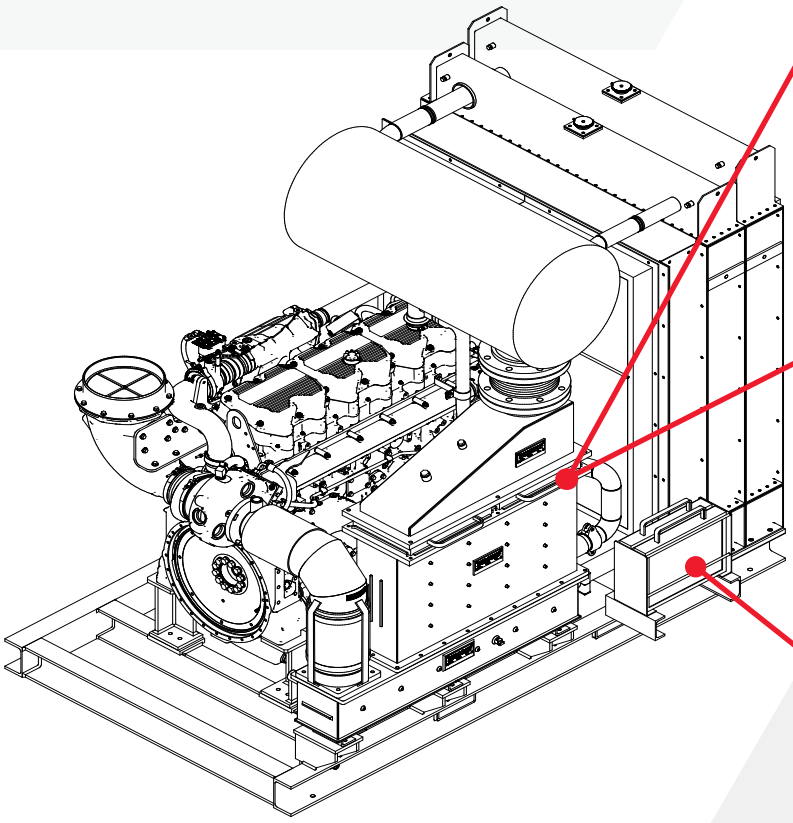
EXHAUST FLAME ARRESTORS

Exhaust flame arrestors are a critical component part of the explosion proof system found on diesel engines used in Zone 2 hazardous areas. They make the engine flameproof.

“Plate type” flame arrestors* have been the industry standard for decades.

Typical “plate type” exhaust flame arrestor



Exhaust flame arrestors

- Allow the engine exhaust gases to pass through small passages
- Stop a flame in the event of hydrocarbon gas ingestion. The heat of the flame is absorbed and the flame cannot survive or propagate

Dummy flame arrestors

- Dummy flame arrestors are for safe area operation

Example of a typical explosion proof engine which features air inlet shut-off valve, air inlet flame arrestor, water-cooled turbocharger and exhaust manifold, thermal control and treatment, exhaust gas heat exchanger, exhaust flame arrestor, spark arrestor and more

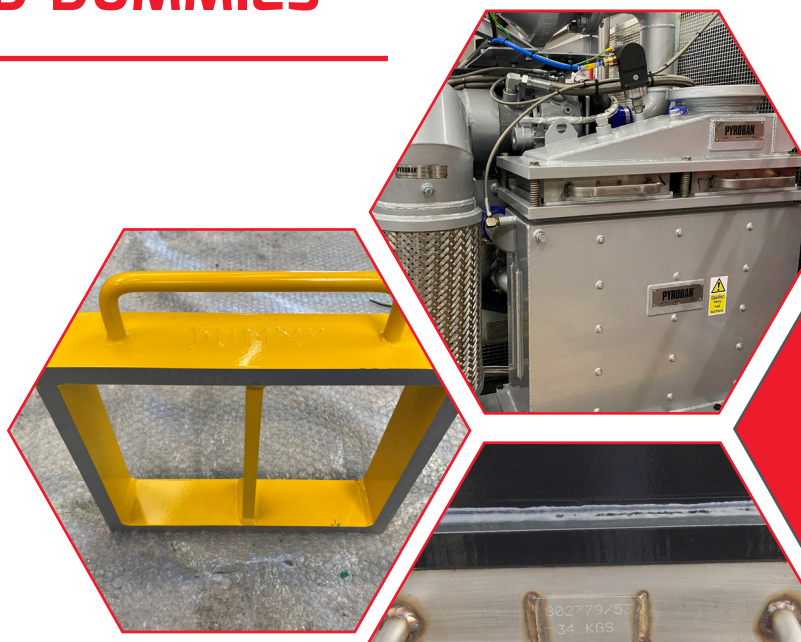
The potential ignition sources on an unprotected diesel engine include electrical, mechanical or static sparks, overspeed or flame transmission from inlet or exhaust, and hot surfaces.

**** Sometimes called exhaust flame traps***

CLEANING, LIFTING AND DUMMIES

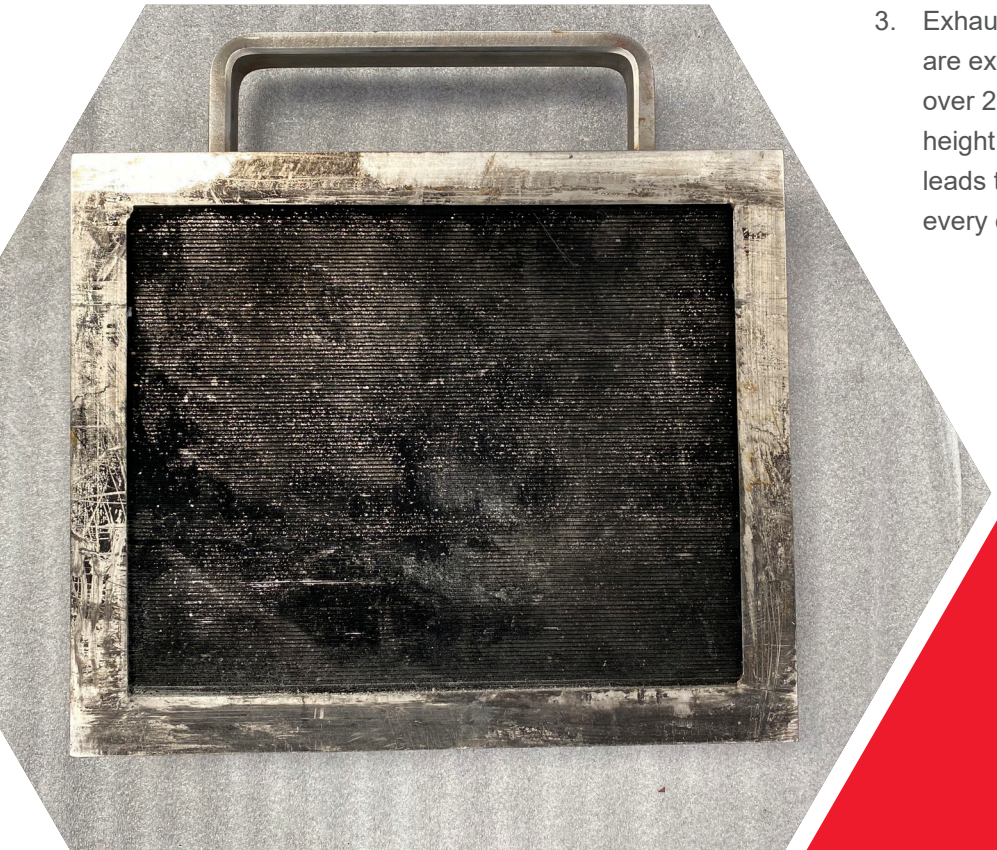
There are three main drawbacks with “plate type” exhaust flame arrestors

1. The exhaust gas has to flow through the restrictive narrow gaps in the flame arrestor, so it clogs up with soot very quickly. This means they must be removed every 8-12 hours of operation to be cleaned. This causes downtime affecting the efficiency of the operation offshore.
2. “Dummy” flame arrestors are usually shipped with an explosion proof engine which are an empty casing. These are only supposed to be for testing purposes and for when the engines are used in safe areas. Wrongly using a “dummy” in a Zone 2 hazardous area exposes the operation to sources of ignition and invalidates the whole Pyroban Zone 2 system certification.



Example of a “dummy” flame arrestor

Example of a 34kg exhaust flame arrestor

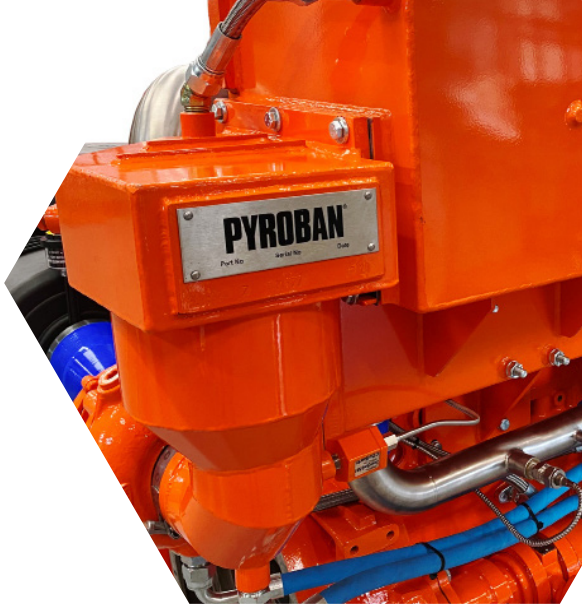


3. Exhaust flame arrestors look small, but they are extremely heavy. They typically weigh over 25kg and are usually located above waist height making them hard to handle safely. This leads to manual handling compliance issues every day that they are changed.

   The working temperature is 200degC and so manual handling is a challenge. To compound this the chemicals that are needed to clean the flame arrestor must be disposed of correctly.

Example of a “plate type” exhaust flame arrestor ready for cleaning

HOW TO REMOVE EXHAUST FLAME ARRESTORS FROM YOUR OPERATION



There are now two different ways to eliminate the “plate type” exhaust flame arrestor from the explosion proof diesel engine design.

1. REPLACEMENT PART

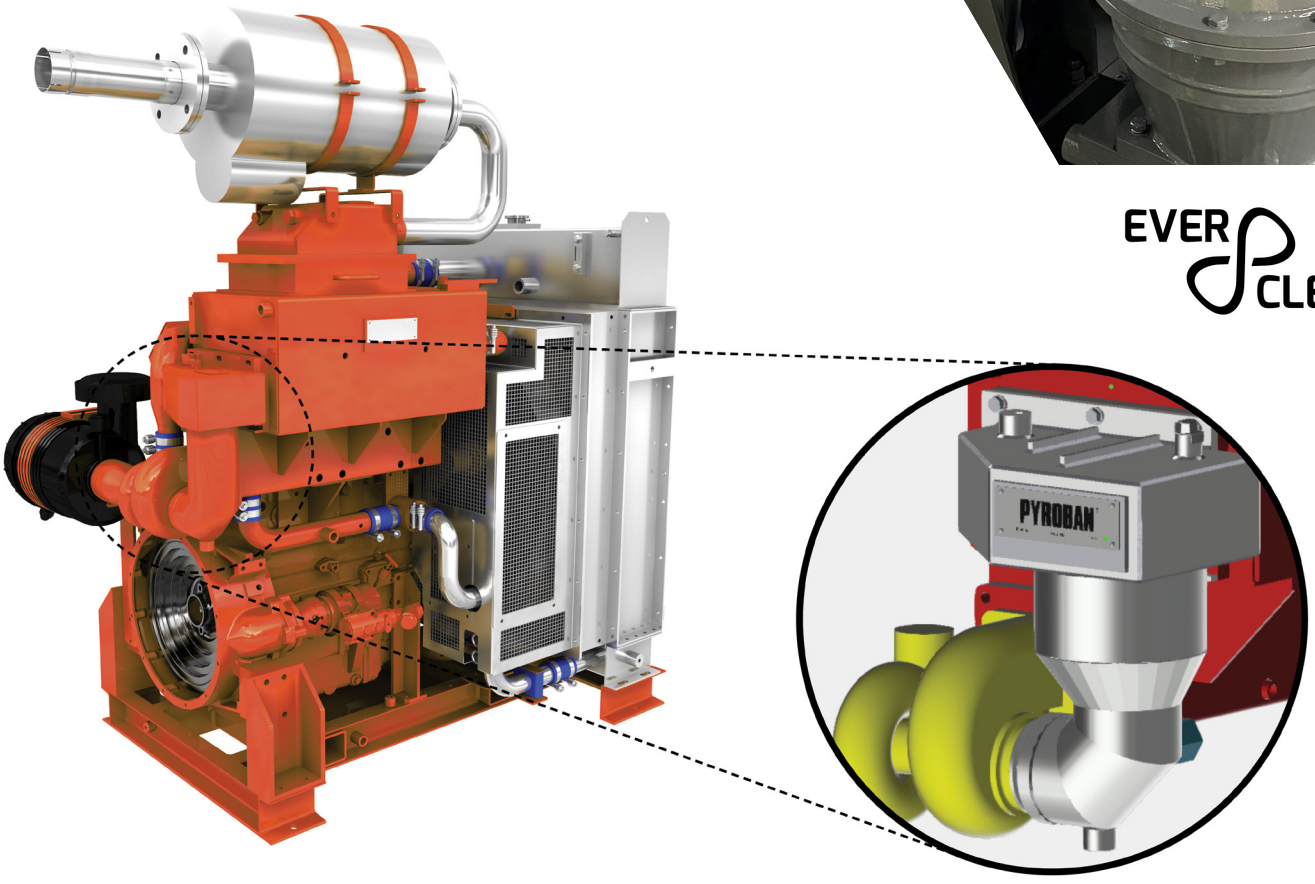
A replacement part can be bolted into the exhaust system between the turbo and gas cooler, on the hot side of the exhaust flow.

The technology known as Ever Clear™ was launched in 2020 as a direct replacement for the “plate type” flame arrestors.

They are low in cost and can easily be fitted in the field to existing equipment or as part of a refurbishment programme.

This means that the typical maintenance requirements every 8-12 hours are removed as soon as it is fitted.

EVER CLEAR™



Backwards compatibility to existing ATEX certified Pyroban equipment

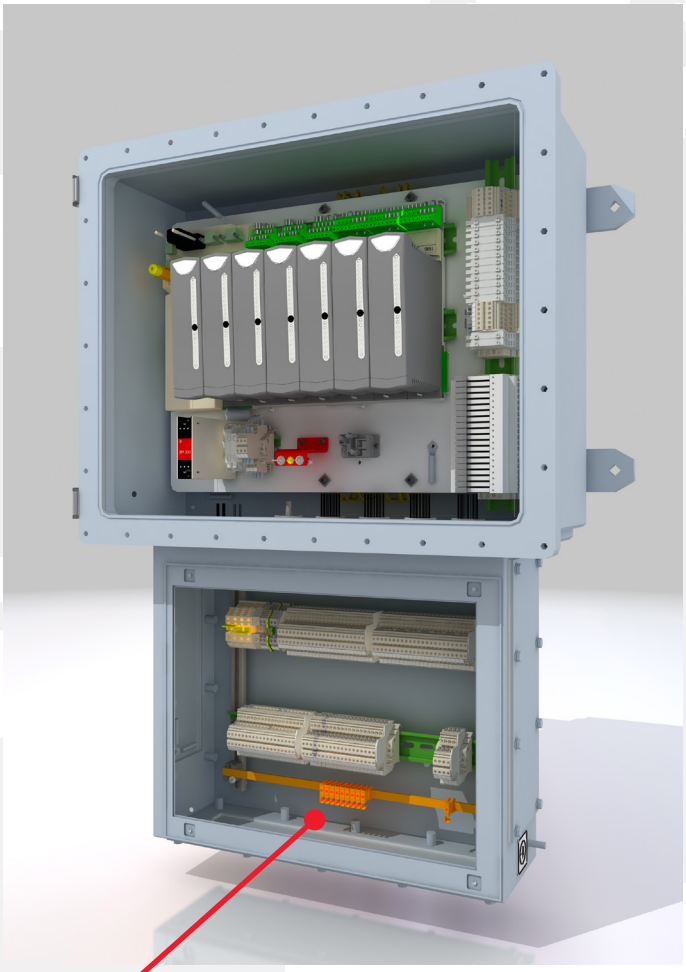
2. ACTIVE CONTROL SYSTEMS

As a more advanced alternative, it is possible to take an active approach to the overall safety system and combine safety shutdown with diesel engine control and monitoring. This is known as Ex SCS™.

Gas detection is introduced into the engine inlet tract at a certified position and also within the equipment DNV 2.7-1 enclosure.

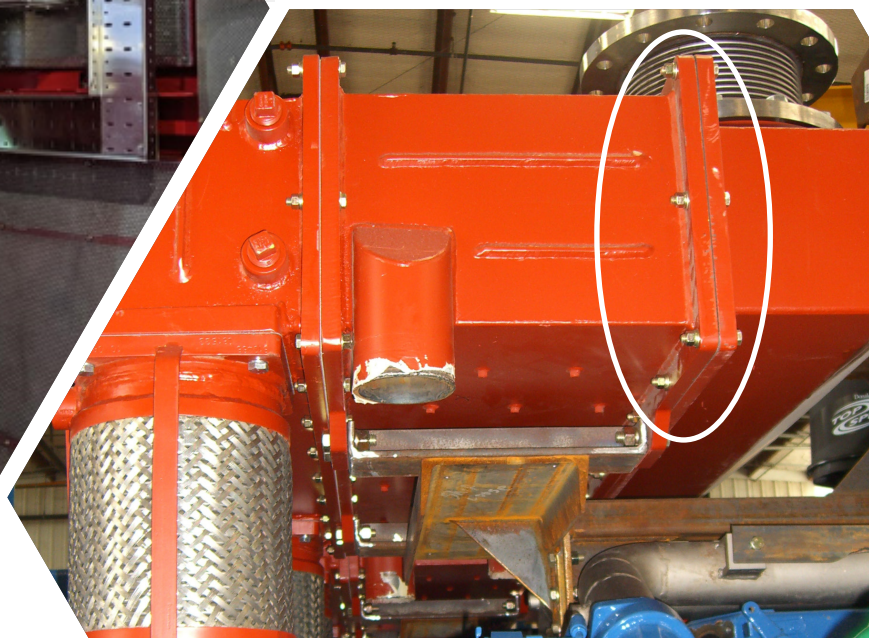
A safety shutdown is then triggered on detection of a flammable gas in the engine air inlet or in the atmosphere, diesel engine over speed, high exhaust gas and coolant temperatures, low oil pressure or if there is a manual emergency stop activation for example.

This active approach makes it easy to incorporate additional driven equipment controls such as pumps, generators, transmissions, or the well head platform's DCS (distributed control system).



Ex SCS™

There is no need for any type of exhaust flame arrestor, as seen here



CASE STUDY

Pyroban's Ever Clear™ drives down maintenance costs on Malaysian rental firm's ATEX generators

Pyroban's Ever Clear™ long-life flame arrestor has been successfully deployed with long standing Pyroban customer Rotorniaga in Malaysia. Rotorniaga serve both peninsular and east Malaysian operations with their Zone 2 rental generator sets equipped with Pyroban Zone 2 engines and alternators.

Based in KSB, Mr Mohd. Imriqis Suhaimee, MD of Rotorniaga commented: "We've been using Pyroban since 2009 and have had a long-standing relationship. The original Pyroban coolers were upgraded in 2021 with the Ever Clear™ solution."

"I've had the Ever Clear™ system on trial for the last year and have been so pleased with the 1000 hours plus (on local fuel) and we've achieved a 50% reduction in carbon deposits in the gas cooler," he says.

"I'm going to switch all my Pyroban equipped generators to use Ever Clear™ in 2022 during a deep equipment refurbishment programme I'm running. Pyroban is driving down cost from my maintenance activities, whilst increasing safety and up-time. This is exactly what I need and value as a responsible business owner," he confirms.

Having a non-electrical passive solution to eliminate the intensive cleaning intervals on exhaust flame arrestors is a real benefit in Asia where clients prefer mechanical engines and have existing fleets of equipment.

CASE STUDY

Cat® C18 ATEX engines packaged with Ex SCS for North African refinery

In late 2021, Pyroban® completed the production, certification, and testing of two Cat® C18 diesel powerpacks for Zone 2 hazardous area operation. Featuring the Ex SCS™ control system, the ATEX powerpacks do not need exhaust flame arrestors which has eliminated daily cleaning requirements.

Destined for a production and pumping application in North Africa, the two HazPak™ units are built in accordance with ATEX and all necessary standards including EN1834-1:2000.

With a 50 degree C ambient the radiators and surface temperature thermal signature have been under particular design scrutiny, with the thermal signature reduced with the application of Pyroban's patented SCTB (Soft Compound Thermal Barrier) to the turbo compressor scrolls.

In addition to the "explosion proof" Pyroban kit the packages have been fitted with Pyroban's Ex SCS™ engine control system which not only protects the engines but also features additional analogue and digital inputs for monitoring pump oil temperature, bearing temperature and gearbox vibration, all items commonly encountered on API pumps. The ATEX engine control system features infrared gas detection and is a 100% stand-alone safety control system for ATEX 2014/34/EU compliance.

This API centrifugal pump application features the colour 15" touchscreen HMI which gives an enhanced viewing and control experience for operators working offshore in often difficult environments. Viewable under direct sunlight the resistive touch screen is operable with a gloved hand. It's ideal where there are few restrictions on control panel size and permits a clearer layout.

Pyroban supplied the radiator to gearbox coupling and integrated the Ex SCS™ system into the ATEX powerpack package known as a HazPak™. The pump packager then integrated the complete HazPak™ and control system with their sub-base, speed increasing gearbox and centrifugal pump.

Pyroban collaborated with the NOC client and EPC to ensure that the specification and documentation requirements have been adhered to.

The complete explosion proof engine package from Pyroban includes an air intake shut-off valve, ATEX certified spark arrestor, water-cooled turbocharger, exhaust manifold as well as an exhaust gas heat exchanger and other components. There is no plate type exhaust flame arrestor typically associated with daily cleaning to unclog the build up of soot from the exhaust system.

"With either approach, operators can now get on with the job, enjoy longer operation and reduce unproductive downtime.

Furthermore, operators are no longer exposed to sources of ignition if a 'dummy arrestor' is used.

Manual handling and environmental compliance issues also disappear because you have taken away the need to regularly change and solvent clean the heavy flame arrestors.

Rob Double, Business Development Director, Pyroban Ltd"

EVER CLEAR™

Ever Clear™ Exhaust (ECE) Flame Arrestors developed by Pyroban are a direct replacement for the plate type flame arrestors found in Pyroban explosion protected diesel engines.

Costing as little as half the annual cleaning costs of a plate type exhaust flame arrestor, they are suitable for new, or existing, Pyroban protected turbo diesel engines above 100bhp. Tested in accordance with EN1834-1:2000 and suitable for T3, IIA & IIB gas groups.

Ex SCS™

Pyroban's Ex SCS™ is an active approach combining flame arrestor elimination, safety shutdown and diesel engine control and monitoring into one flexible package. It features infrared gas detection and is a 100% stand-alone safety control system for ATEX 2014/34/EU compliance.

A colour touchscreen HMI (Human Machine Interface) displays the current safety status and the diesel engine control and monitoring screens can also be integrated. For example equipment controls, pump sensors, as well as fire and smoke detectors can all be fed into Ex SCS™.

IEC IECEx

sira CERTIFICATION

ABOUT PYROBAN

Pyroban provide explosion protection solutionsfor materials handling equipment and diesel engines.

For 50 years we have been at the forefront of the industry developing products to protect your people, your site and equipment when operating in hazardous areas.

QUALITY

Additional to the ISO9001:2015 quality standard certification, each Pyroban Group company attains the required level of 3rd party certification for the business markets it serves including ATEX, IECEx, UKEx, GB and NEC.

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