

## Commercial Advantage of this Proposal

If you could gain a commercial advantage by adopting a simple but effective marine diesel engine technology, what would it take to get you to consider the wise investment of this new but proven technology?

Modest fuel savings?

Increasing reliability of ships main engines?

How about reduced pollution emissions from your organisation's ships main engines?

What if you achieved a couple of extra days availability on your ship per year?

What about competitive advantage with quicker transit times?

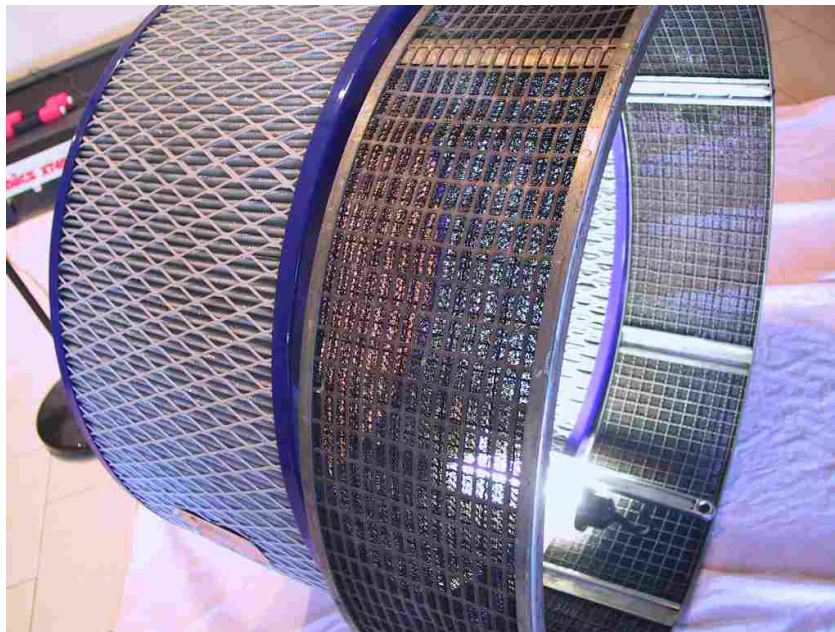
How does elimination of costly and unnecessary maintenance and downtime sound?

What about improved ship morale because your ship main engines work better and are easier to maintain?

PMAX Filters can achieve all of the above and more

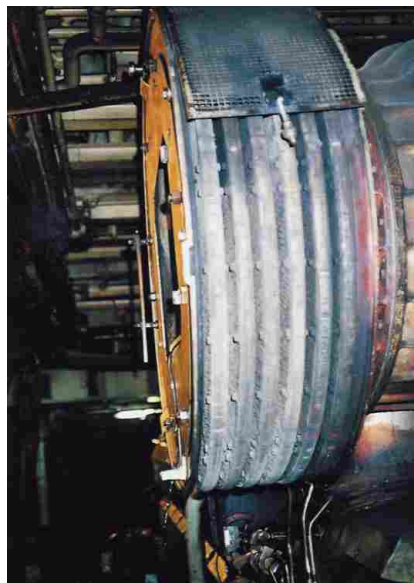
## Background Information

Most marine diesel engines rarely receive clean air for efficient combustion and optimum performance. Unlike air filters within the cars we drive, which utilise a paper filter, marine filters must withstand the engine room environment of potential spray of fuel, oil, and water coming in contact with the air filters, without destroying the filter. Therefore, to date diesel engine manufacturers offer metal (copper wire) gauze filters. These are more like a metal strainer rather than a filter. The picture below shows the contrast between the PMAX Filter and a typical gauze filter.



PMAX Filter vs typical gauze filter

## Typical Gauze Filters and Their Lack of Filtration Capability



Filters are a monthly cleaning routine. You may be surprised to learn the above filters are cleaned monthly. While others, the reality sets in with operators questioning “why bother?”


## Diesel Engines Fitted with PMAX Filters

PMAX Filters have been fitted in a 150 applications to date across a wide range of marine diesel engines on both ships main engines and diesel generators. After 4 years of in service operation and installation, there isn't a single marine diesel engine application that would not or could not benefit from the advantages of clean air supply to your diesel engines via the use of a PMAX Filter.

PMAX Filters can be customised to fit on most, if not all, diesel engine types and configurations. Below are some of the diesel engine brand names that have been fitted with a PMAX Filter to date.









|                    |            |
|--------------------|------------|
| Akasake            | Nigata     |
| Bergen             | NohabPolar |
| Cummins            | Paxman     |
| Crepelle           | Pielstick  |
| Daihatsu           | Ruston     |
| Deutz              | Sulzer     |
| MAN B&W            | Wartsila   |
| MaK                | Wichman    |
| MTU                | Yanmar     |
| Mirlees Blackstone |            |

## PMAX Filters Technical Specification

|   | PMAX Air Filter   | Conventional Gauze Filter                                   |
|---|---|---|
| Comparison  |   |   |
| Filtration particulate size   | 15 microns  | 1 – 3 millimetres   |
| Material Properties<br>- Fabric, and<br>- Corrosion protected Steel                           | Fabric properties - High strength, non-ravelling, resist distortion, do not propagate snags or cuts. Material does not disintegrate.  | N/A   |
| Temperature Resistance  | 260°C   | N/A   |
| Flammability  | “Class 1 ... normal flammability... these textiles are generally accepted by the trade as having no unusual burning characteristics,” when tested under the USA Department of Commerce Flammable Fabrics Act 45° Burn Test (CS 191-53 revised). | N/A   |
| Chemical and Environmental Resistance   | Resistant to - water, fuel, oil, cleaning solvents, alkalis and diluted acids. Also resistant to insects, mildew and bacteria.  | N/A   |
| Durability  | Washable, easy to clean, long life.   | N/A   |
| Pressure drop across clean filter<br>- at low speed<br>- at full power<br>- maximum allowable | Nil<br>20 - 30mm H <sub>2</sub> O<br>100mm H <sub>2</sub> O   | Nil<br>10 - 20mm H <sub>2</sub> O<br>100mm H <sub>2</sub> O |
| Inlet air surface area  | 600%  | 100%  |
| Shape   | Circular, square or as required.  | N/A   |

## Success Stories

4 examples from 150 success stories

| Before  | After  |
|---|--|
|    |    |
|   |   |
|  |  |
|  |  |

## Commercial Considerations

|  | PMAX Air Filter   | Conventional Marine Air Filter   |
|--|---|--|
| Filters proven in service on marine diesel engines since                         | September 2000  | N/A  |
| Duration internal components of diesel engine kept clean                         | 4 yrs (24,000 hours) and counting                         | 500 hours  |
| Maintain engine efficiency/performance   | Yes   | No   |
| Maintain engine boost pressure up  | Yes   | No   |
| Maintain engine exhaust temperatures down  | Yes   | No   |
| Prevents engine wear from airborne abrasive particles                            | Yes   | No   |
| Manometer – visual aid to show when air flow is restricted due to dirt build up. | Yes   | Not common   |
| No of segments   | Manufactured either split or in 1 piece (fit for purpose) | Multiple segments are cumbersome to handle.  |
| Marine Diesel Engine Applications  | All   | All  |
| No of filters in operation on marine diesel engines                              | 150   | Heaps  |
| Use within RAN Ships   | On main engines for 2 different class vessels             | Unknown  |
| Oil contamination / consumption  | Significantly cleaner oil.<br>Reduced oil consumption.    | Oil analysis shows presence of abrasive and unwanted particles.<br>Oil consumption above OEM specifications. |
| Payback period   | Less than 6 months  | N/A  |

## Summary

Air filtration in the marine diesel market is not necessarily seen as a problem as the increase in oil consumption, the routine but expensive maintenance and the drop in engine performance are accepted to be the norm for the marine diesel engine.

This brief proposal shows that these undesirable, costly, inefficient and environmentally unfriendly paradigms can be easily overcome and moved to a position that is known to be a significant commercial advantage. Therefore, Baker & Provan would like to discuss this proposal with you to explore if our PMAX Filters can be of benefit to your vessels as they have been to other industry operators in your market.