# OPTIMIZING ENGINE EFFICIENCY

## MIXED SPEED POWER SOLUTIONS

# LOOK AT THE BIG PICTURE

Consider your ship's various running modes: standby, transit, full power, and DP. In fact, your ship will spend most of her life operating outside of the main application for which she was designed. With so many different running modes requiring different amounts of power, why base engine selection on optimizing for just one – which represents only a fraction of your ship's total operational time?

## THERE'S A BETTER WAY

We've created a different benchmark for assessing your vessel's total performance requirements, which takes into account her full operational profile. This allows us to help you find the ideal combination of medium- and high-speed engines to keep your vessel running at optimal load levels, regardless of operating mode.

The mixed speed solution, available in either a mechanical/electric hybrid or pure diesel electric power configuration, is tailored to match your vessel's specific applications to give the best overall power, load response and fuel consumption.

With a mechanical/electric hybrid setup, medium speed engines and high-speed generator sets work together when full power is needed. In low load conditions such as standby and DP, the vessel will switch over to diesel electric mode, running solely off of the high-speed generator sets.

A full diesel electric layout is an efficient option when weight and space are concerns. Here, the medium speed engines handle the high loads, while high-speed engines provide fast load response in lower vessel power modes.

Whichever mixed speed option you choose, you can be sure that investing in an optimized engine solution at the design stage will pay dividends in reduced fuel and maintenance costs down the road, leading to an overall decrease in the cost of ownership for your vessel.


## USE OUR EFFICIENCY WORKSHOP

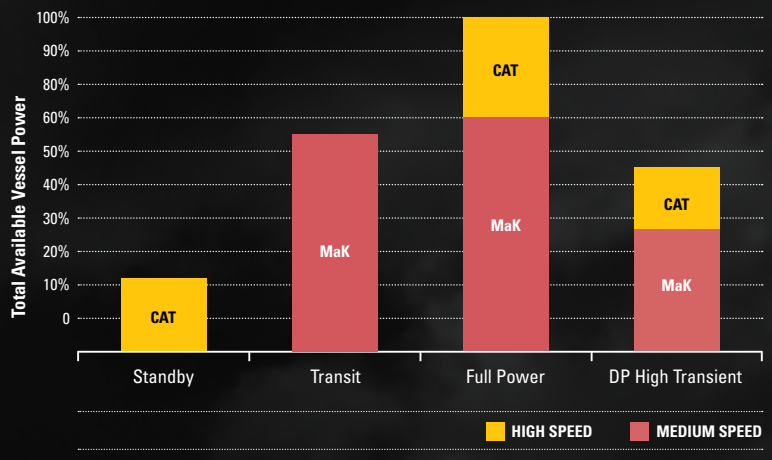
Contact Caterpillar Marine to schedule your very own Efficiency Workshop. Using your vessel's design, hull resistance profile, and operational needs as a base, we'll work with you to create a benchmark of total performance requirements to help you find your optimal power and propulsion solution.

## GO EVEN FURTHER

With controllable pitch propellers you can further increase your efficiency. During low- to medium-load operation, one propeller can be locked and feathered with its main engine offline while the other propeller and engine run at a more efficient load.

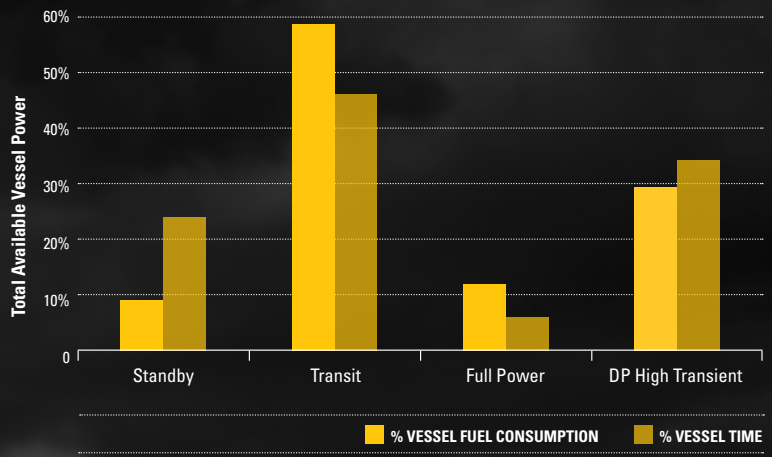
## RIGHT ENGINE MIX

- Combine different engines for superior efficiency
- High speed load response in transient modes
- Optimized mix at all loads



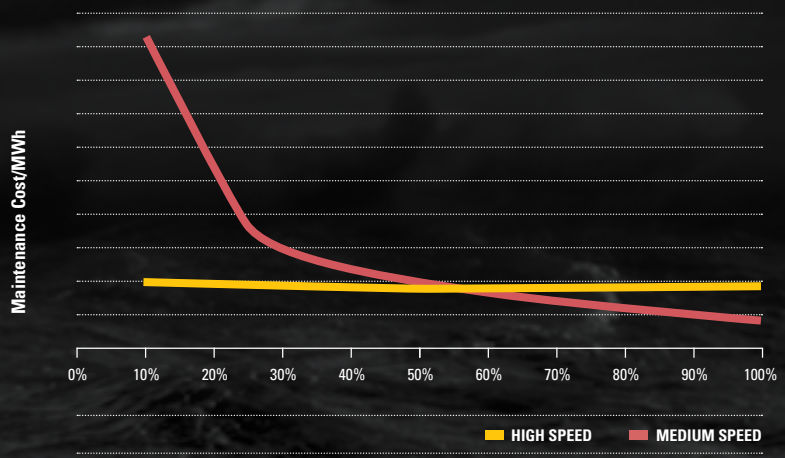

## REDUCED OVERALL FUEL CONSUMPTION

- Medium speed fuel efficiency at high loads
- Most vessel operation spent at low vessel loads
- High speed fuel efficiency at low vessel loads




## REDUCED MAINTENANCE COST (MWh)

- Medium speed economy at high vessel loads
- High speed economy at low vessel loads
- Right engines for the right load



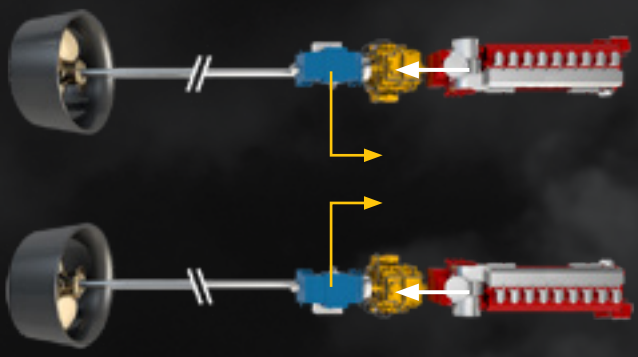
# EXAMINE THE DIFFERENCE

## THE STANDARD SETUP

Design focus is on full-power conditions. All other operating conditions are secondary.

### MECHANICAL DRIVE CONFIGURATION

- Direct mechanical drive
- Engines sized to meet full load requirements
- Low average engine load

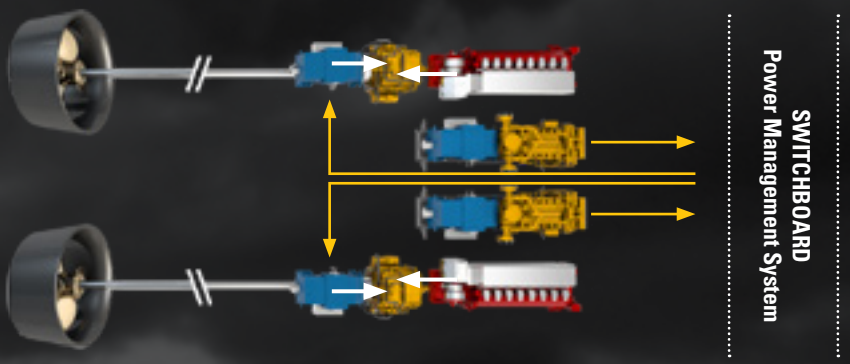


## THE MIXED SPEED SETUP

Design based on vessel's full operational profile. Better overall fuel efficiency & load response. Longer engine life.

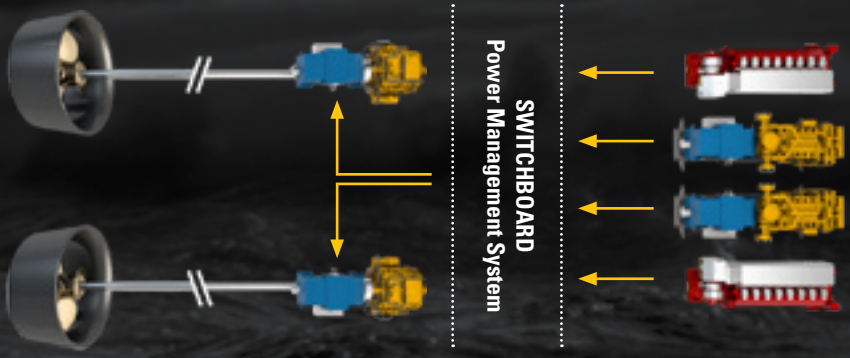
### MECHANICAL/ELECTRIC HYBRID

- Smaller direct drive medium speed engines
- Boosted by high speed generator sets during bollard pull
- 100% high speed generator sets during low load
- Eliminates need for 2-in-1 out gear box




### FULL DIESEL ELECTRIC

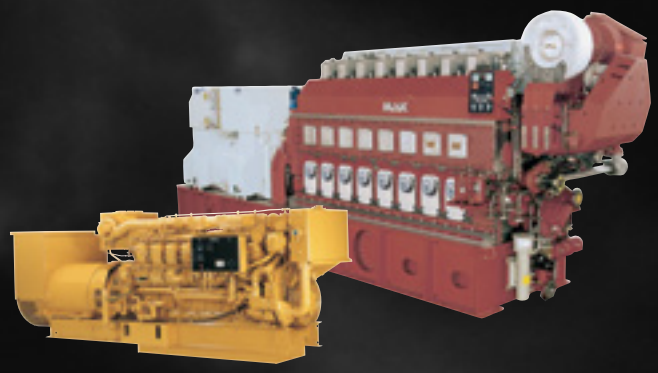
- Medium speed consumes high base loads
- High speed engines manage low and transient loads
- Efficient weight and space layout




ELECTRIC POWER FLOW  MECHANICAL POWER FLOW

# ENGINES MATCHED TO YOUR OPERATIONS

You need reliable power in all sea states. The Caterpillar mixed-speed power solution gives you performance the way you need it, when you need it. And with single-source support from the global Cat dealer network, you always know who to call.



## 15 MW VESSEL – CHANGE THE SOLUTION

4 x Medium Speed

2 x Medium Speed + High Speed Generator Sets

## 10 MW VESSEL – CHANGE THE BORE

2 x Larger Medium Speed

2 x Medium Speed + High Speed Generator Sets

## 5 MW VESSEL – INCREASE THE BOLLARD PULL

2 x Medium Speed

2 x Medium Speed + High Speed Generator Set

# BUILT FOR IT.™

**If you expect the highest standards of quality and need the greatest long-term value, choose Caterpillar Marine's high-performance, customized products and dedicated services.**

**That's how we are built – and you deserve nothing less.**

## TALK TO US

**marine.cat.com, catpropulsion.com**



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