



Use case I Commercial passenger ferry

Comparison specifications:

Ferry	Medium load	25 years	2 x 2,560 kW / 1,800 rpm
			
Application	Load profile	Avg. lifespan of the ferry	Engine

Peer group comparison: *mtu* 16V 4000 M65L vs. competitor engine

Time Between Overhaul (TBO) in hours calculated:

<i>mtu</i> 16V 4000 M65L		22,000*
Competitor engine		13,000

TBO in years calculated, based on 2,500 operating hours p.a.:

<i>mtu</i> 16V 4000 M65L		9 years*
Competitor engine		6 years

* *mtu* engine overhaul is recommended when TBO hours are reached or after 25 years at the latest, whichever occurs first.

69%
more operating hours than competitor between overhauls

TWO
overhauls during the 25-year operating lifecycle**

** depending on load profile and yearly operating hours

OPTIMIZED TBO REDUCES TIME-CONSUMING OVERHAULS

Lifecycle cost optimization of *mtu* Series 4000 M65L marine engines

Executive summary

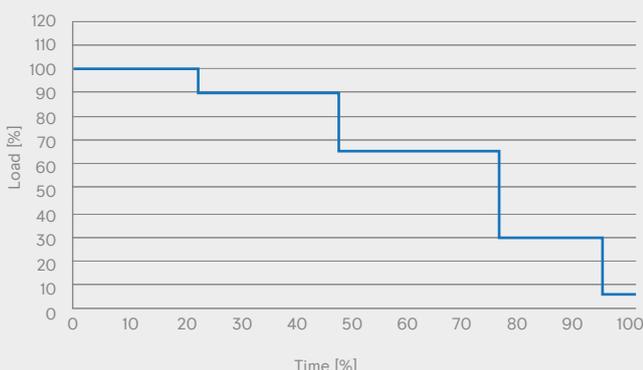
Engine overhauls mean downtime and loss of revenue. *mtu* Series 4000 M65L engines, however, have a much longer TBO than a comparable competitor, as the following use case illustrates. Assuming an average commercial passenger ferry lifespan of 25 years and 2,500 operating hours per year, there practically are only two general overhauls required instead of four compared to the competition.

Who: Commercial passenger ferry operator

Why? Ferry readiness and availability with minimal maintenance are essential requirements for transport operations. Long downtimes for maintenance mean a loss of income and higher costs.

- Main benefits:**
- Lifecycle maintenance cost optimization
 - Reduced ferry downtime
 - More operating hours out of one engine lifecycle before major overhaul

Assumed load profile for the comparison



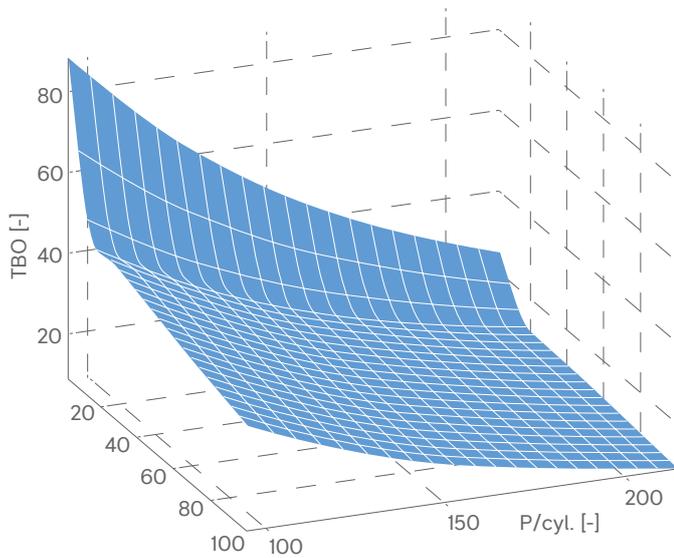
TBO OPTIMIZATION CALCULATION

A real data analysis of overhaul intervals using latest algorithms

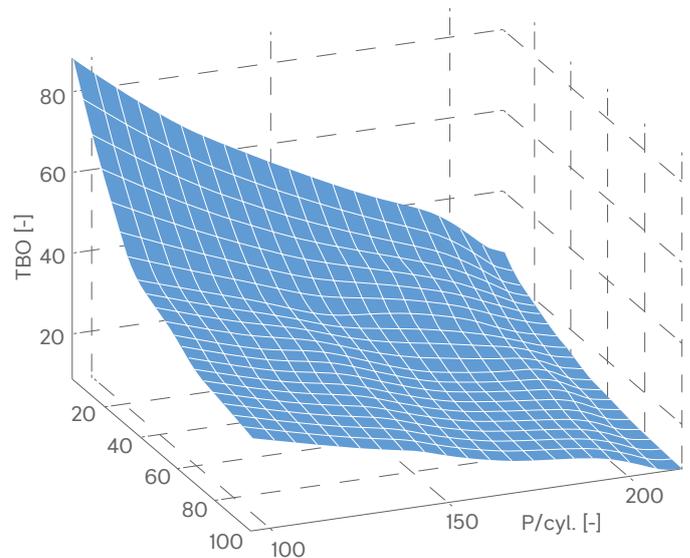
We have combined 25 years of experience with the digital analysis of field data from over 50,000 data sets from 18,000 engines and used state-of-the-art calculation methods to optimize the load bands of the *mtu* engines.

The load factor (LF) represents the average load of an engine, the load indicator (LI) describes the high load share in a load profile.

Load Indicator (LI)



Load Factor (LF)



The representative load profiles describe the average load profile per load band that best describes each load band. The real load profiles that can be assigned to this load band can therefore be above or

below the representative load profile in the individual values. The load band in which most of the engines of an application operate in the field is marked as standard.

Results of the comparison

Competitor engine

Power: 2,560 kW / 1,800 rpm
Operating hours: 2,500 (p.a.)
Average lifespan: 25 years
TBO: 13,000 hours

Requires four overhauls
after 6, 12, 18 and 24 years.

mtu Series 4000 M65L

Power: 2,560 kW / 1,800 rpm
Operating hours: 2,500 (p.a.)
Average lifespan: 25 years
TBO: 22,000 hours

Requires two overhauls
after 9 and 18 years.