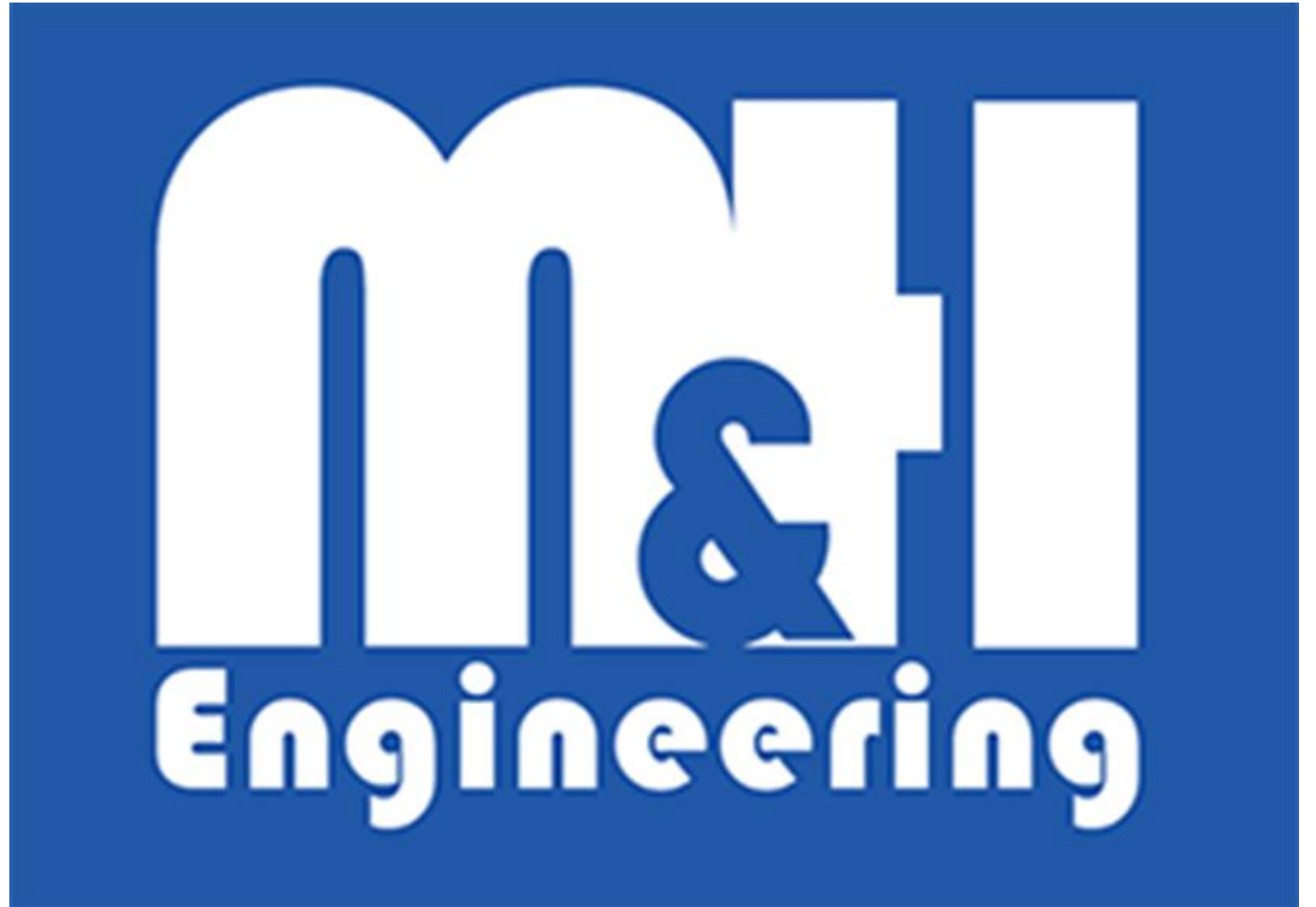


Presentation
by:
Barry McCooley

EPA Certified
Tier 4 Marine
Engines



The Need to Reduce Emissions.

As the new marine emissions regulations start to come into force around the world, regulators are looking for ever tougher emissions targets. There was a need for an engine manufacturer to come up with a solution to be used as a stepping stone towards Net Zero.

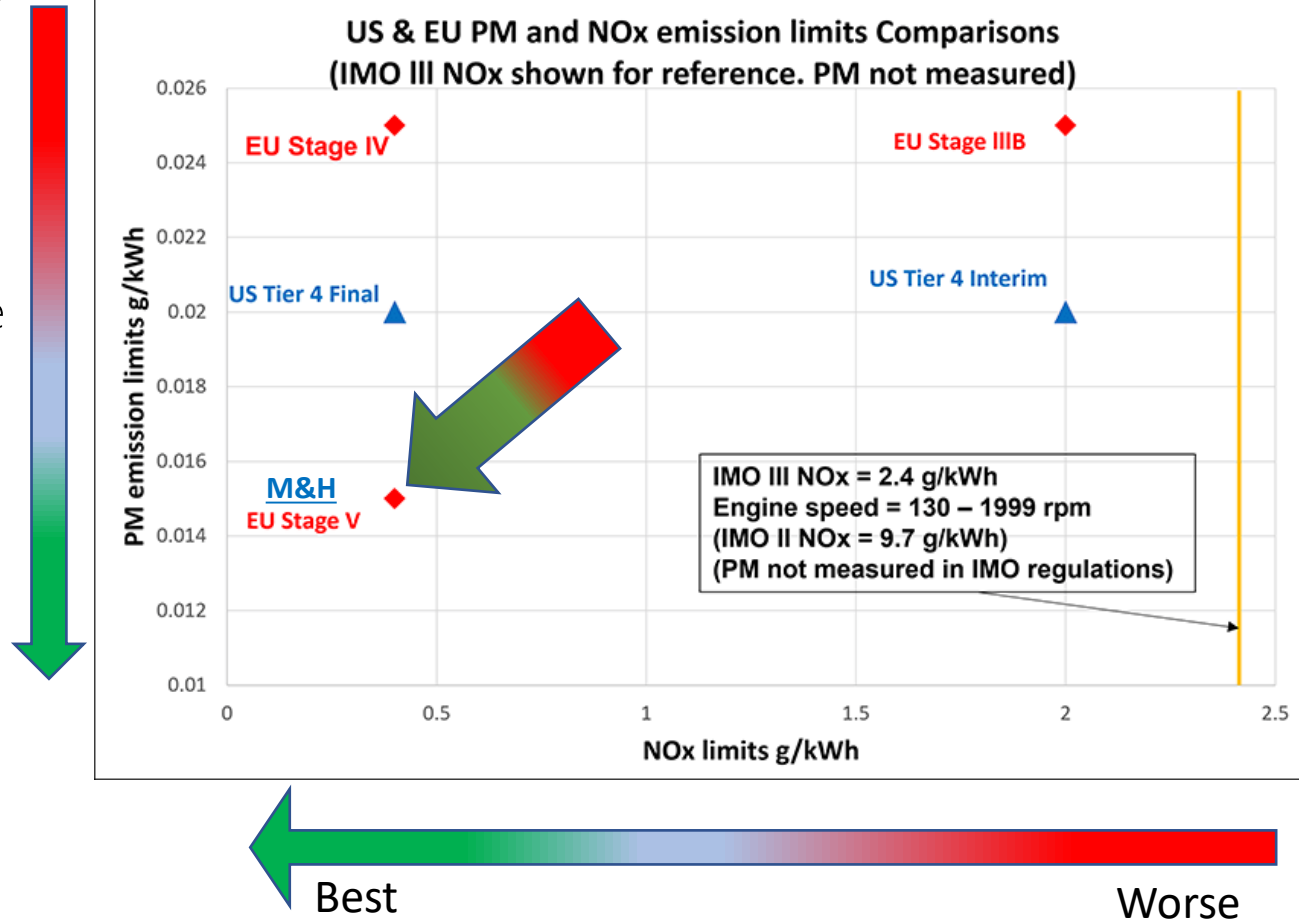
We engaged with engine manufacturers, we found that they were not actively looking at the marine market; the volumes were too small and investment too high. We were told it was "not possible" to build this engine.

Today, we have markets with regulations in force (EU and IMO), or due to come into force (CARB), yet there is no solution in the market for engines below 600kW that meet the customer's 3P's

Power, meets the power and torque requirements.

Package, will fit in existing vessels without the need to redesign and rebuild the engine room.

Price, is a viable option and allow the operator to be competitive.



The Opportunity.

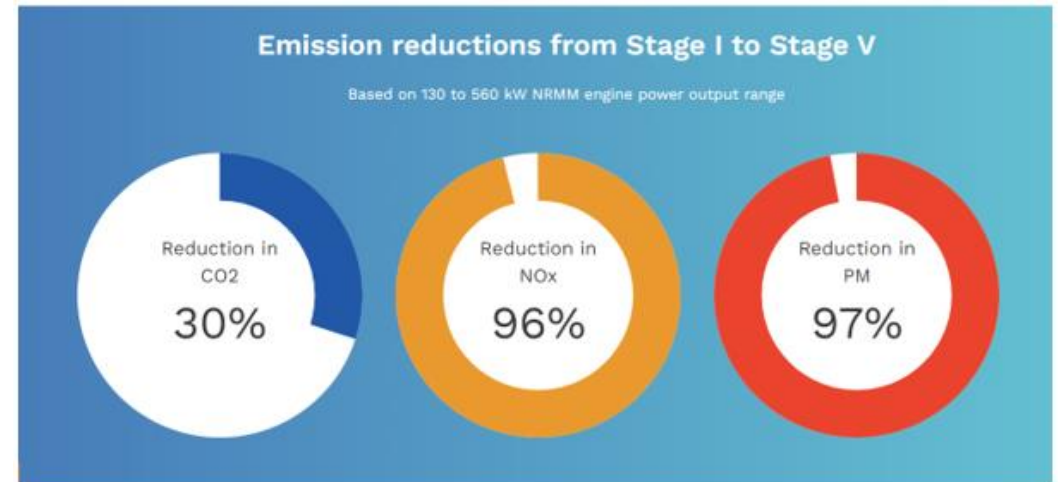
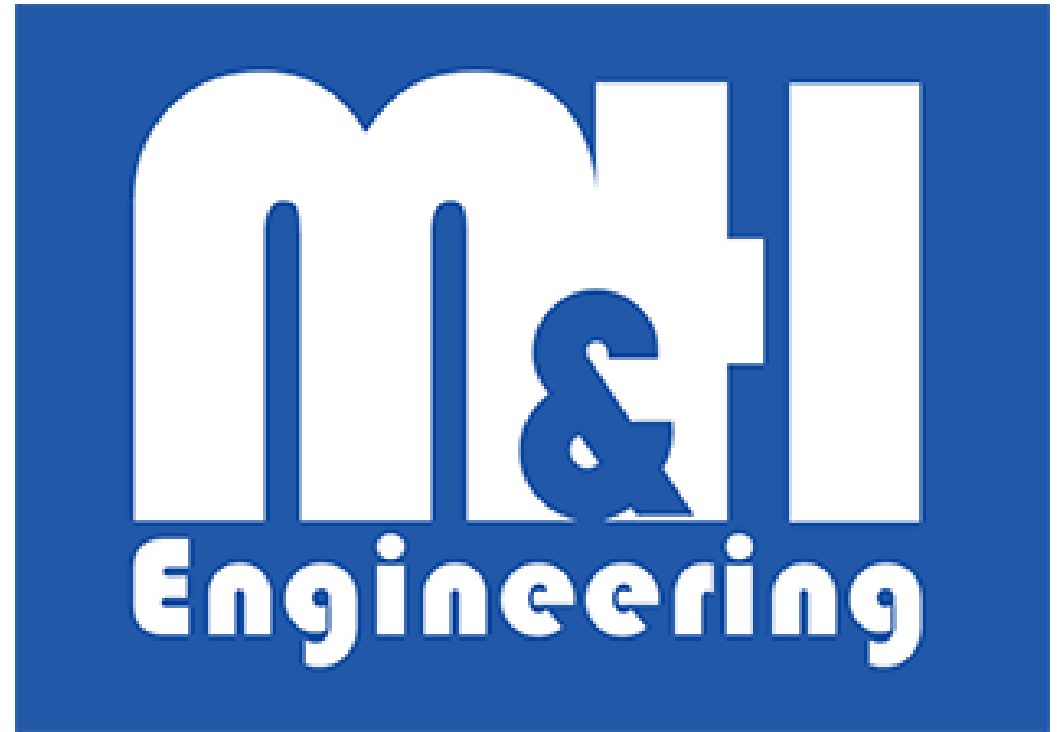
M&H Engineering decided to build a range of marine engines that would meet or exceed **all present and future marine emission regulations** globally. (55-317kW in phase 1 and 350-680kW phase 2).

We developed a range of marine engines to meet Stage-V and Tier 4 requirements (exceeding IMO III).

Through innovation and new concepts we have been able to solve the challenges that other OEM's say are not possible. The aftertreatment will not cause high temperatures in the engine room, can pass through wooden and fibreglass bulkheads safely and correctly.

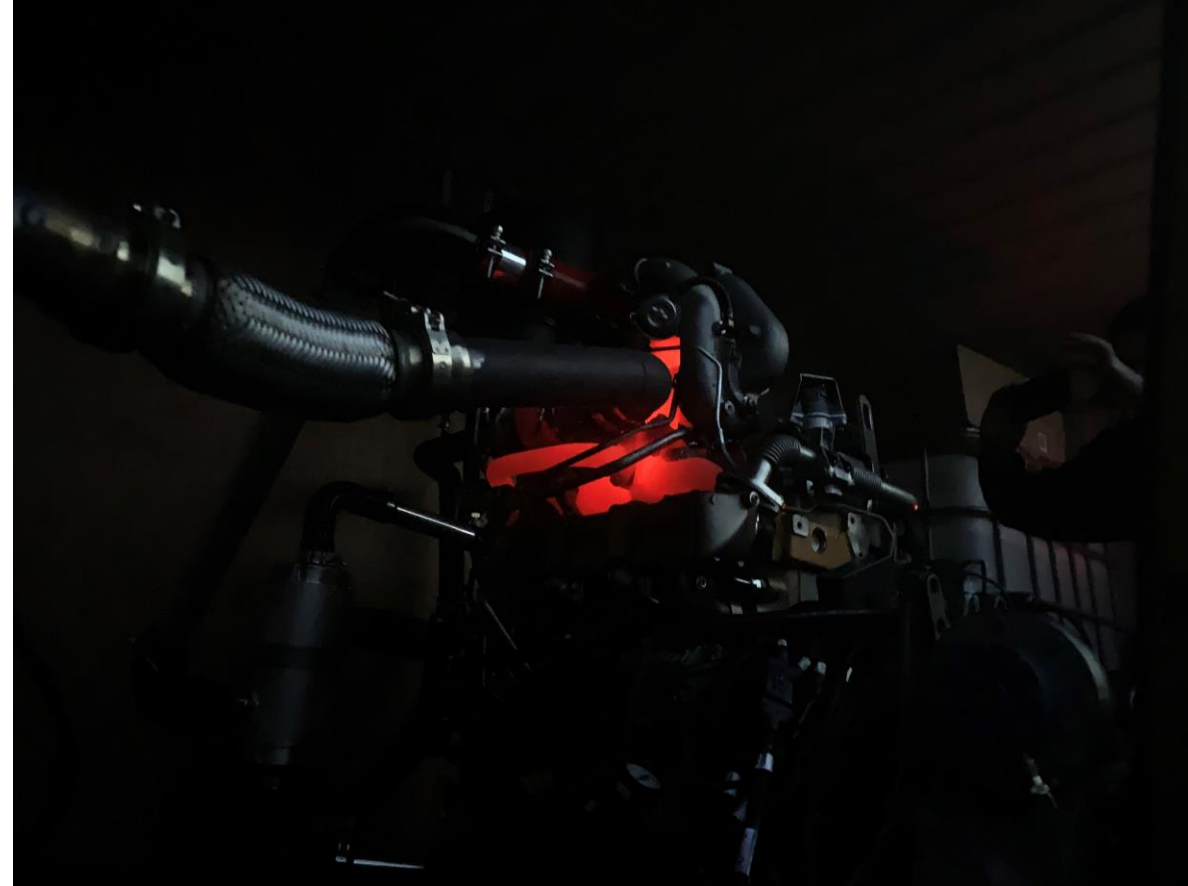
Designed as a re-fit engine package. Aftertreatment can be remotely mounted if required. **No hot surface temperatures.**

Designed to operate at sea safely without compromising the vessel or handling.



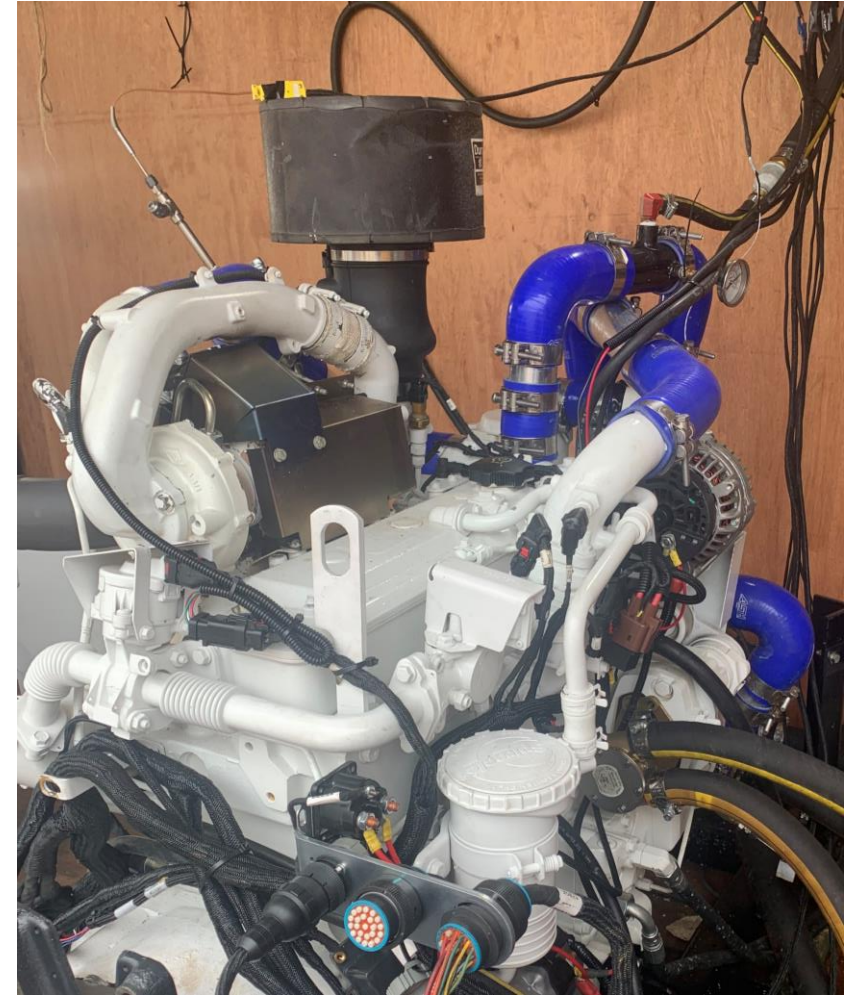
The Challenge.

- To build a marine engine with dual EU Stage-V and EPA Tier 4 certification and make it a marine engine that would be accepted worldwide.
- To overcome the high exhaust manifold, turbo and after treatment temperatures, to give low surface temperatures acceptable to marine applications.
- Deliver a compact and optimised aftertreatment package much smaller than the IMO III solutions other OEM's are offering today, so that retro-fit would be possible.
- To comply with all present and known future marine emission regulations in one engine range.



The Solution.

- We have exceeded the requirements and set the new standards for marine engines on a worldwide accepted platform.
- We have taken technologies from a wide range of industries and mixed them into the M&H solution.
- We have proven, if needed, we could take the engine to its limits and/or to worst-case marine situations, and still be within all requirements.
- We have a worldwide telematic system so that we can proactively support these engines wherever they are.
- Most importantly a compact aftertreatment package that's the size of 2 x 25litre drums.
- We also have these engines as Hazardous Area engines for the petrochemical barges and Hazardous Applications.



Engine Power Range.

M&H engines can use the full power and torque curve, allowing the engine to deliver full power at lower rpm and reducing the need for deep reduction gearboxes, thus give significant fuel cost savings. These engines are more efficient than the previous engines.

Confirmed Power Range, delivery.

4.5 Litre T₄ / Stage-V from 55kW to 129kW @2400rpm. Orders taken Jan 2022 for Delivery Aug 2022

6.8 Litre T₄ / Stage-V from 104kW to 224kW @2400rpm. Orders taken March 2022 for Delivery Oct 2022

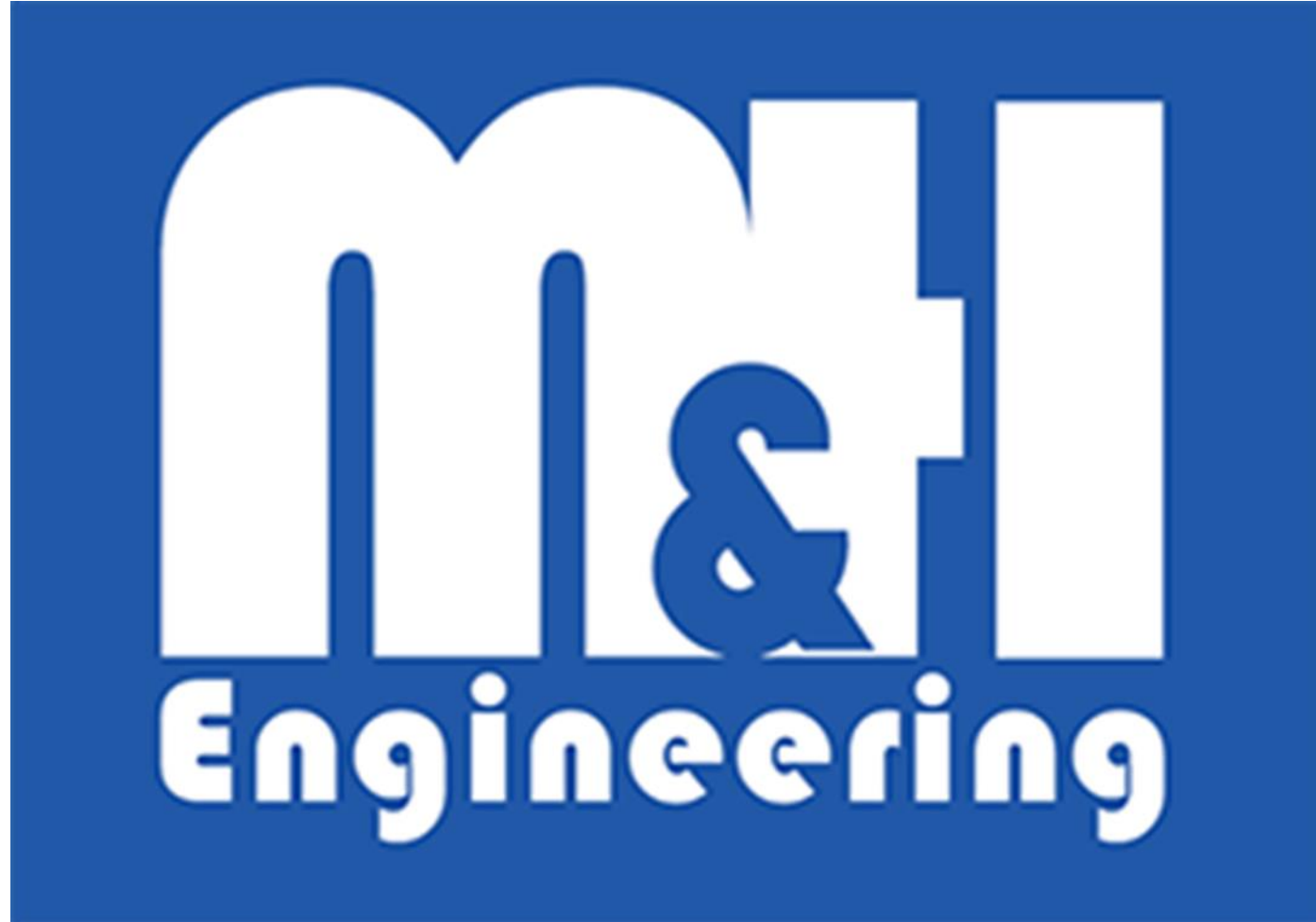
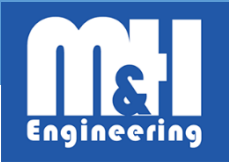
9 Litre T₄ / Stage-V from 250kW to 317kW @ 2200rpm. Orders taken Dec 2021 for Delivery July 2022

In Development 2022, to be confirmed.

14 Litre T₄/Stage-V from 300kW to 510kW @ 2100rpm. Orders taken Aug 2022 for Delivery March 2023

18 Litre T₄ / Stage-V from 513kW to 680kW @ 1900rpm* Orders taken Nov 2022 for Delivery June 2023

* TBC



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