

## New Ultra Low Lube Oil Power Assemblies for EMD 645 and 710 Engines

Electro-Motive Diesel has continuously improved the performance and dependability of its diesel engines for over 85 years, and continues to lead the industry with the introduction of the newly designed UL™ Power Assembly. With this new product, EMD has combined a hardened upper bore liner with a specially engineered bore profile, and exclusive ring design – achieving superior output and excellent emissions performance with very low oil usage. This proprietary system results in up to 50% savings in engine lube oil consumption compared to standard power assemblies, and is available for both EMD 645 and 710 engine models.

The EMD engine research team has performed detailed analyses and extensive iterative testing to develop the most advanced combination of product enhancements for the UL Power Assemblies. These features include: an advanced cylinder head design, induction hardened valve seats, flat head valves, new valve rotators with matched valve springs, redesigned connecting rods, and improved cylinder liners and pistons.



### Maximum Life Cylinder Head

New UL power assemblies include the Maximum Life™ cylinder head which provides unmatched reliability and durability for the most demanding service. The new ML™ head casting builds upon the robust Diamond 6™ head design.

Its patented Tangent Flow features improve both coolant flow and structural integrity – eliminating fire-face cracking. And induction hardened valve seats provide a durable valve sealing surface that improves valve sealing and reduces wear.

### Benefits of EMD UL Power Assemblies

- Cut lube oil consumption by 50%
- Eliminate fire face cracking of cylinder heads
- Reduce valve and valve seat wear
- Extend engine bearing life and durability
- Minimize gasket failures before overhaul

**Valve Seats** - Induction hardened valve seats offer the most durable valve sealing surface available. EMD has patented a technique that creates the desired seat hardening while eliminating surface micro-cracks previously common to this process. Uneven wear is virtually eliminated.

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**Exhaust Valves**

- The flat head exhaust valve design eliminates the previous "cup" in the valve head for improved thermal fatigue life. Reduced surface area results in less heat absorption. A decrease in valve head deflection by 50% reduces stress and valve seat wear. The flat head valve also includes a hardened stem tip that extends below the contact area of the keepers – diminishing the chance of dropped valves.



**Valve Locks** - Also known as keepers, the new valve lock design is improved by increasing the amount of clamp load that is distributed onto the stem of the valve. With the increased grip, spun valves are a thing of the past.

**Valve Rotators** - Valve rotators on the cylinder head introduce a controlled rotation of each valve. The rotation of the valves eliminates uneven wear on the valves and seats. This improves valve sealing, extends the life of the valves, and reduces the occurrence of hard starting. Due to the increased height of the rotator, a new valve spring is also included to maintain the proper spring load on the valve system.



**Improved Valve Guides** - For marine applications, valve guides employ a new material and hardening process, offering reliable service in the most highly corrosive environments. In fact, their corrosive resistance has been improved by a factor of 18 versus previous designs – eliminating crankcase over pressure due to leaking valve guides.

**Connecting Rods** - The fork connecting rods have undergone a redesign using the latest analytical modeling tools to optimize the stiffness of the rods at the fork end, for longer bearing life. This "controlled deflection" design incorporates: increased cross sectional area in the U-slot region, larger ribs on the back of the basket halves, and a redistribution of material – reducing basket deflection by 50%.

The blade connecting rods have also been redefined with improved slipper surface finishing. Optimized machining processes for the loading surface have improved bearing life and increased durability.

**Thrust Washer** - EMD has developed a tapered thrust washer design with significantly improved wear characteristics. Through years of use, this proprietary design has proven to reduce thrust washer wear – especially into the carrier platform relief groove. And cracked thrust washers are virtually eliminated.

**Cylinder Liner** - The EMD hardened upper bore (HUB) cylinder liner sets benchmarks for reliability and durability. An improved ground boring method starts the process by creating the straightest liners in the industry. The liners are then surfaced with a proprietary, overlapping laser hardening operation that ensures a continuous depth of hardening throughout 100% of the upper bore area.

**Pistons** - The tin-plated pistons used in UL Power Assemblies are the industry standard for performance and reliability. Tin plating provides the best break-in and operational wear characteristics, with unsurpassed protection against scuffing. And the hardened upper ring groove is another EMD innovation – achieving extended useful life between overhauls.