

Waterjet Propulsion Delivers Reliability and Survivability

MJP OVERVIEW

Marine Jet Power offers a range of waterjets specializing in stainless steel, mixed flow propulsion. Purposely designed and engineered for demanding, high speed applications, the X Series waterjet is the latest result of unique in-house expertise and the experience of over 30 years.

Commercial operations utilising MJP systems include fast passenger ferries, windfarm support vessels, offshore surveying, fire fighting and towing. Military and government end users with uncompromising demands for heavy-duty design include navies, coast guards, border guards, marines and special forces. MJP waterjets are specified on patrol vessels, landing craft and high speed interceptors to deliver speed, manoeuvrability and reliability in dynamic situations.

INTRODUCTION

A major challenge for the builders of next generation fast craft is delivering platforms that balance high performance hulls with the increased demands on power and propulsion systems. Composite and aluminium structures have become stronger, while vessel occupants are protected from wave impacts by shock mitigation seating. As speeds and mission expectations increase, it is essential that critical engineering evolves to avoid single points of failure at sea.

Rated for commercial and military applications, Marine Jet Power waterjets are designed and engineered to provide consistent high performance across a wide range of sea states and operating conditions. Combat craft need proven reliability and hostile situations may mean that survivability of the propulsion system is critical to the vessel and crew along with mission success. MJP focus on delivering the most efficient and durable waterjet systems to meet extreme requirements.

Vessels roles are changing to meet new scenarios in challenging environments. Besides military, homeland security, border protection and law enforcement, there are ongoing initiatives around the world that require fast response craft. Many lessons learned from riverine operations translate well to shallow water operations, as they present similar hazards to navigation as those encountered in a river system.

Use of hard wearing keel pads and hull coatings allows craft to slide over obstructions and areas with little water. These features enable operators to patrol in previously inaccessible areas and extend the working life of the craft. The propulsion system also needs to be capable of running in often uncharted waters with the ability to withstand unexpected events.

MJP waterjets are designed for durability and hard work in harsh environments. High efficiency propulsion enables reduced fuel consumption and increased range for patrol vessels, whilst high performance in a tactical situation can deliver the speed needed to intercept, outrun or out manoeuvre the opposition.



Shock and Survivability

In combat, threats to a vessels survival include collision with other vessels, debris in the water and underwater explosion. Withstanding the effects of underwater blast is an extreme engineering challenge for builders of vessels, components and equipment. With water jet propulsion units, a major part of the structure is located outside the vessel and is in direct contact with the water. When blast occurs the situation becomes very complex as the waterjet unit will be affected by two shock pulses. One shock pulse is transmitted through the hull of the vessel, another is from the direct pressure wave in the water.

Proximity to an underwater explosion plays an important role in the dynamic behaviour of a marine structure. If an underwater explosion occurs close to the vessel, the resulting pressure wave can cause significant damage. All vessel appendages are vulnerable to the effects of a shock wave. A conventional propeller with shaft and brackets may flex from shock waves, becoming misaligned or detached.

MJP designers have considered how to engineer waterjet units to prevent components from being displaced or deformed when exposed to extreme forces. Besides over engineering the complete waterjet, the objective is that individual materials can withstand shock pulses and maintain the seal between unit and vessel. Most importantly, the waterjet needs to continue to function and provide propulsion.

A 2019 report shows that the MJP waterjets can withstand significant underwater blast and remain in operation. A CSU-1050 waterjet unit was demonstrated to withstand a shock pulse according to I.N. Shock Grade A Curve. The deformation and stresses in the MJP waterjet structure are shown to be small compared with allowable values.

Ultra Jet



MJP Ultrajet Series are rated for commercial and military operating conditions. The Ultrajet Series feature a single-stage high-efficiency axial-flow pump with a variety of options to suit the vessel design and mission. A wide range of impellers match most marine diesel engines from 100 to 1340 kW (134 to 2172 hp) per jet with the appropriate direct drive or reduction gear ratio.

Manufactured from marine grade aluminium, the MJP Ultrajet is both compact and lightweight with high quality standards. The fully integrated design provides ease of installation and maintenance. With durability a priority, the Ultrajet is able to withstand use in harsh environments and shallow waters. Low vibration and waterborne noise is particularly important for military applications.

X Series



Born from the proven MJP mixed flow pump, the all new MJP X Series provides users with more power in a lighter unit that burns less fuel, which delivers both increased range and reduced operating costs. The X Series is a true mixed flow pump making it possible to select a smaller jet, thereby reducing the weight by up to 10% compared to axial flow jets. The unique technology behind the X Series reduces power demand by up to 20%, enabling manufacturers to select lower installed power without increasing displacement. Current models are 280, 310 and 350 which equates to approximately 12 metre to 22 metre LOA with additional models in development.

Designed for applications in excess of 50 knots, the X Series has an optimized footprint that allows for greater flexibility in the vessel design and construction. Its compact design offers one-piece installation making mounting to the hull as simple as bolting in. All hydraulics are pre-installed, with no need for additional equipment or piping. The X Series cast aluminium bucket has been designed for decreased stopping distance and increased manoeuvrability.

CSU Series



The Compact Steering Unit (CSU) is a well-proven mixed-flow all duplex stainless steel waterjet. Featuring a classic design with superior performance and long service life, the CSU is well suited for military and government applications, large commercial craft and passenger ferries. Power options are 2500 kW, 3000 kW, 4000 kW, 6000 kW. The MJP Electronic Control System offers complete control of the jet position and engine RPM control, thereby controlling all vessel motions.

The CSU design delivers precise harbour manoeuvring which reduces risk of damage in restricted berths. At maximum vessel speed, the CSU can be effectively crash stopped to avoid collision and thereby improve safety and control. With durability a priority, the CSU and all MJP waterjets are able to withstand use in harsh environments and shallow waters.

DRB Waterjets for U.S. Army MSV(L)



Marine Jet Power has been selected by Vigor as the propulsion provider for the U.S. Army's Maneuver Support Vessel (Light) project. The new generation of landing craft for the U.S. Army will feature triple drive MJP 750 DRB waterjets. In total, MJP will deliver 45 shipsets over the next 10 years.

Selected for its superior shallow draft maneuvering capabilities, the 750 DRB waterjets are constructed from duplex stainless steel offering the latest advancements in MJP's proprietary mixed flow technology. Featuring an inboard hydraulic system and an integrated electronic control system, the selected propulsion package has been optimized to fit the needs of the U.S. Army MSV(L).

Control Systems

Marine Jet Power offers a wide range of control systems, from purely mechanical solutions up to the most sophisticated customized electronic controls. Options include additional steering stations, integration of rudders, interceptors, auto-pilot and bow thrusters.

For autonomous maritime applications MJP can provide interfaces for unmanned and DP-controlled vessels. A "Black box" Voyage Data Recorder (VDR) connection is available. Remote-control system service access is possible through the Remote Access Module.

Based in Sweden, MJP is a global supplier with a geographical presence in the EMEA region, North & South America and the APAC region. Military and coast guard clients around the world include the U.S. Coast Guard, U.S. Army and many large government contracts in the APAC region.

Designed for organisations that need to operate and succeed in the most demanding maritime conditions, MJP offers a modularised and scalable portfolio of waterjets with extensive global support ranging from initial design and installation to an industry leading 5 year warranty.

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