Hamworthy Pumps supplies various configurations of Fire Water Pump Packages (FWPP), including:

- Diesel/hydraulic driven system.
- Direct diesel driven system.
- Direct electric driven system, vertical or horizontal.

All systems can be delivered with either in-line centrifugal pumps or deep well submerged pumps. Hamworthy Pumps FWPPs are designed to be self-contained according to NFPA 20 regulations, while meeting the operational requirements of the marine, offshore, and onshore markets.

Hamworthy Pumps is able to supply its FWPPs according to NFPA 20 with a range of capacities, as follows:

- For in-line pump configurations, our capacity range is from 300 m³/h to 6500 m³/h.
- With a deepwell submerged pump configuration our capacity is up to 1800 m³/h.
- For all capacities the differential pressure availability is up to 18 Bar.

- We manufacture and assemble our FWPPs at our Singapore facilities, close to conversion and new building yards in South-East Asia, China and Korea.
- Full String Test capabilities at our assembly site.
- Wide range of FWPP configurations and capacities.
- Advice and consultations with the client during the pre-FEED, FEED and Detail Design stages.
- FWPPs for non-hazardous locations can be both containerized and open for fire compartment installation.
- One of the major reasons has been our ability to deliver much quicker than our competition.
- Worldwide service and spare parts network for support during installation and operation.
- Extensive reference list for both offshore and onshore FWPP installations.
- Classified by societies including ABS, BV, DNV GL, LR and able to comply with NORSOK.

Hamworthy Pumps has more than 100 years experience in the design and manufacture of pumps. Our development of system solutions to meet customer needs for fire water pump package installations is based on this extensive experience.

Fire Water Pump Packages (FWPP) are crucial for safety, and Hamworthy Pumps FWPPs meet the National Fire Protection Association’s NFPA 20 standard and class requirements.

Hamworthy Pumps service team provides reliable operational support for its oil industry customers, especially during emergency operations.
**DIRECT DIESEL DRIVEN SYSTEM (fig.1)**
The direct diesel driven system is applicable for fire pump installations beneath the low water line. A typical FWPP system for such an installation consists of the following as a minimum:
- Diesel engine
- Diesel driven fire pump
- NFPA 20 controller

**DIESEL/HYDRAULIC DRIVEN SYSTEM (fig.2)**
The diesel/hydraulic driven system is applicable for FWPP installations above the low water line, typically in a compartment below deck in the fore peak of a FPSO. A typical FWPP system for such an installation consists of the following as a minimum:
- Diesel engine
- Diesel driven booster pump
- Hydraulic driven lift pump
- Diesel driven hydraulic system
- NFPA 20 controller

The hydraulic driven lift pump is installed dry. Suction is from a sea chest and water is pumped to the booster pump that is connected directly to the main diesel engine. To reduce the risk of water hammers, a non-return valve is installed after the dry installed in-line lift pump.

**DIESEL/ELECTRIC DRIVEN SYSTEM (fig.3&4)**
The diesel/electric driven system is applicable for FWPP installations above the low water line, typically in a compartment below deck in the fore peak of a FPSO. A typical FWPP system for such a installation consists of the following as a minimum:
- Diesel engine
- Diesel driven booster pump
- Electric driven lift pump
- Diesel driven generator system
- NFPA 20 controller

The electric driven lift pump is installed dry. Suction is from a sea chest and water is pumped to the booster pump that is connected directly to the main diesel engine. To reduce the risk of water hammers, a non-return valve is installed after the dry installed in-line lift pump. The boost and lift pump configuration can also be changed to a full lift pump concept where the electric driven lift pump takes the full required pressure (fig. 4).

**DIRECT DIESEL DRIVEN DEEP WELL SYSTEM (fig.5&6)**
For installation on deck or on a jetty, a deep well submerged pump, in a caisson with an angle gear between the diesel engine and the pump, is a typical configuration consisting of (fig.5):
- Diesel engine
- Angle gear
- Diesel driven deep well pump
- NFPA 20 controller

The deepwell pump can also be driven by either an electric motor together with a diesel generator set, or by an hydraulic motor together with a diesel hydraulic set (fig. 6).

**ELECTRIC DRIVEN SYSTEM (fig. 7)**
The electric driven system is suitable when the FWPP is installed beneath the low water line. The fire pump can be supplied in both vertical and horizontal configurations. Depending on the size and requirement of the el. motor, the motor may be cooled with water taken from the fire pump or by air. A typical FWPP system for such an installation consists of the following:
- Fire pump
- Electric motor
- NFPA 20 controller/starter.

The electric driven system can also be supplied with a diesel generator set as shown in fig. 4.

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Hamworthy Pumps in-line configurations for fire water pumps have the following features:
- Double suction impellers with low NPSHr enable the pump to operate at 150% capacity without cavitations.
- Ni-Al bronze used as the standard material. Other materials, such as Duplex and Super Duplex SS, are available as options.
- Double volute.
- Lightweight, compact and robust design.
- Mechanical shaft seal as standard, other seal arrangements are available on request.

The deepwell pumps used have the following features:
- Multi stage, single suction vertical deepwell pump.
- Material in 316L, Duplex or Super Duplex SS.
- Capacities up to 1800m³/h.
- Pump design in accordance with API 610.
8. DIESEL HYDRAULIC FWPP SYSTEM

The NFPA 20 controller ensures that the pump operates according to the regulations given in NFPA 20. The FWPP system is supplied self-contained, and is in accordance with strict operational requirements such as when in fire mode, the controller will only start the fire pump when:

- The fire main pressure drops below the set value of the pressure switch
- Receiving a fire & gas signal
- Receiving a manual start signal, either locally or remote
- A wiring failure occurs (fail-safe design)
- Likewise in fire mode, the controller will only stop the engine when:
  - Engine overspeeds
  - Local stop button is pushed

ACCESSORIES
In addition to the main equipment, such as the diesel engine, pumps and NFPA 20 controller, Hamworthy Pumps can include the following accessories:

- Diesel tank complete with valves and instrumentation
- Jockey pumps and pressure vessel with pressure controllers
- Room coolers with hydraulic/electric driven fan
- Foam pump and tank
- Separate engine cooling system
- Fire Rated Enclosure for weather protection, non pressurized container
- Fire Rated Enclosure for hazardous installation, pressurized container

Figure 8 gives a typical schematic drawing of a Diesel Hydraulic FWPP system.

STARTING SYSTEMS
Two separate starting systems should be installed as per NFPA 20 requirements. The following three types are available:

- Electric starting with batteries
- Pneumatic starting with pressurized air
- Hydraulic starting with pressurized hydraulic oil

The starting system most frequently used for complying with the regulations is the double electric starter. This is the most cost effective solution. All starting methods can be used in combinations.
EXPERIENCE AND SUCCESSES

FPSO PAPA TERRA
Scope of supply:
2 x Diesel-hydraulic skids (lift & boost)
Q = 1700m³/h, H = 130m
Power: 1097kW @ 1800 rpm
Pumps: CAD350 & CB32
1x Direct diesel skid
Q = 1700m³/h, H = 130m
Power: 970kW @ 1800 rpm
Pumps: CB32
Shipowner.........................BW Offshore, Norway

FPSO KNARR
Scope of supply:
2 x Diesel-hydraulic skids (lift & boost)
Q = 2450m³/h, H = 140m
Power: 900kW @ 1800 rpm
Pumps: CAD450 & CC500M
2x Direct diesel skids
Q = 2450m³/h, H = 140m
Power: 1900kW @ 1800 rpm
Pumps: CC500H
Shipowner...............Teekay Petrojarl, Norway

BULWER REFINERY
Scope of supply:
2 x Diesel-hydraulic skids (single lift)
Q = 1358m³/h, H = 97m
Power: 857kW @ 1800 rpm
Pumps: CL300, 3.8M length
“Short” CL300 pumps submerged in Brisbane river from jetty. Powered by remotely located diesel hydraulic-skids
Customer..................................BP, Australia

The manufacturers reserve the right to alter the specification and data to incorporate improvements in design. Certified drawings will be issued on request.

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Website: www.hamworthy-pumps.com

CONTACT US

Hamworthy Pumps Singapore Pte Ltd
15 Benoi Crescent
Singapore 629978
Singapore
Tel: +65 6261 6066
Email: SGPumpSales@hamworthy-pumps.com

Hamworthy Pumps UK Ltd
Unit 4C New Fields Business Park
Stinsford Road, Poole
Dorset BH17 0NF
Tel: +44 (0) 788 6851102
Email: gb pumps@ hamworthy- pumps.com

Hamworthy Pumps Singapore Pte Ltd
15 Benoi Crescent
Singapore 629978
Singapore
Tel: +65 6261 6066
Email: SGPumpSales@hamworthy-pumps.com

Hamworthy Pumps UK Ltd
Unit 4C New Fields Business Park
Stinsford Road, Poole
Dorset BH17 0NF
Tel: +44 (0) 788 6851102
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CONTACT US

Hamworthy Pumps Singapore Pte Ltd
15 Benoi Crescent
Singapore 629978
Singapore
Tel: +65 6261 6066
Email: SGPumpSales@hamworthy-pumps.com

Hamworthy Pumps UK Ltd
Unit 4C New Fields Business Park
Stinsford Road, Poole
Dorset BH17 0NF
Tel: +44 (0) 788 6851102
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