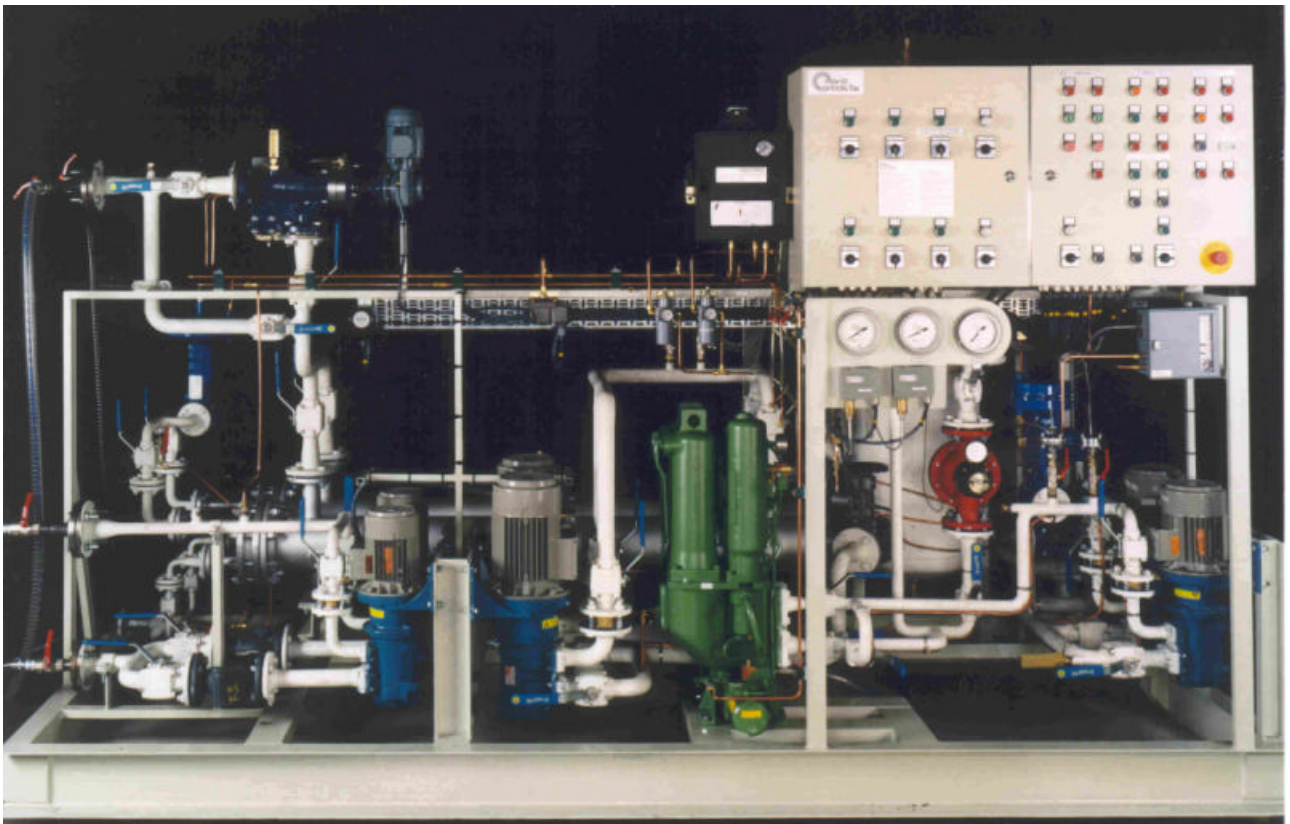
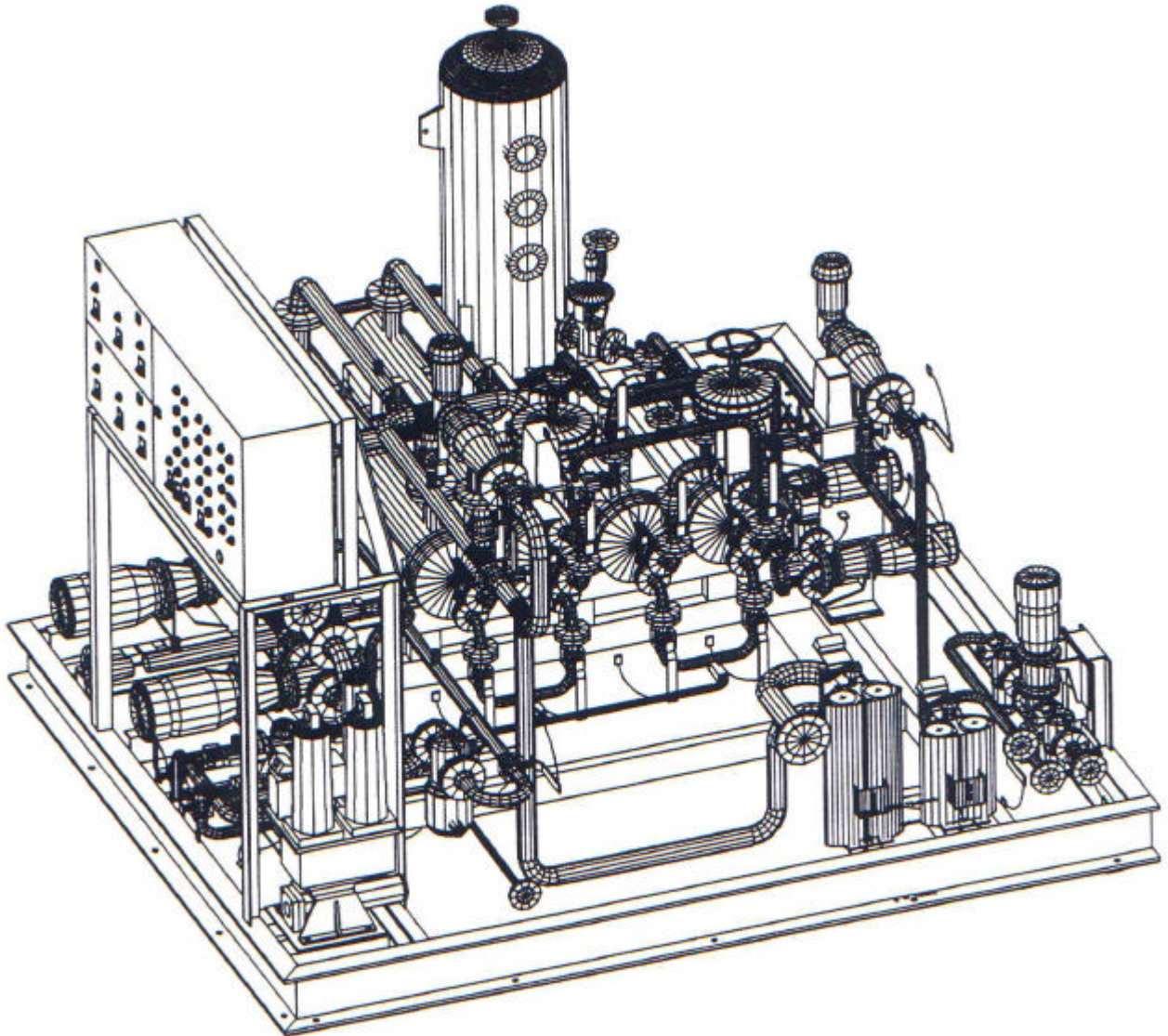


FUEL SUPPLY UNIT



Foremost in expertise and know-how



MAR-IN CONTROLS Fuel Supply Units are supplied for projects all over the world and have an excellent reputation in marine and industrial market. These units are designed by experts who, by going through years of technological developments, have gained a lot of experience in all aspects of application engineering. No effort is spared to keep Mar-In Controls Fuel Supply Units in the most advanced form. Highest priority is given to quality assurance and material certification.

- Being experienced supplier of marine and industrial instrumentation & control systems, Mar-In Controls equips its Fuel Supply Modules with the most suitable components and instrumentation. In this way a long-lasting and trouble-free performance is guaranteed.
- Application of the most modern automation technology makes Mar-In Controls Fuel Supply Units unique in the international market of shipbuilding and power industry. The use of automation has made it possible to achieve a high degree of simplicity and smoothness in operation.
- Designing of the Mar-In Controls Fuel Supply Modules is done with the help of the latest computer aided design (CAD) technology. The technical drawings are 3-dimensional, making it possible to design a compact and easy to operate fuel supply modules. While designing, all the care is taken to ensure a logical order of different components and to achieve easy accessibility.
- Mar-In Controls has the tradition of maintaining a close contact with the customers and have an open heart for your suggestions (if any). No stone is left unturned to satisfy your demands.
- Although Mar-In Controls Fuel Supply Modules require minimum service, its global network of service centres ensure an excellent after-sales and support service.
- The units can be delivered with the desired classification certificates.
- On board the ships and the land installations (power plants etc.) Mar-In Controls Fuel Supply Units have proved their value, quality, efficiency and reliability and enjoy a good global reputation.

Application

Mar-In Controls Fuel Supply Modules are applied to prepare Heavy Fuel Oil (H.F.O) for the diesel engines. These Modules certify the most economical and smooth running of the diesel engines and have proved to be the best tool to regulate the pressure and viscosity of the heavy fuel oil to the values demanded by the diesel engines.

With a significant price difference between heavy and lighter fuel oils the ship-owners, the charterers and the power plant authorities are attracted to the less expensive and low quality heavy fuel oils. Treating this low grade heavy fuel oil with pre-engineered self contained Mar-In Control's Fuel Supply Modules, before feeding it into the engine, ensures constant pressure, filtration, degassing and correct injection viscosity at all the times. In this way the combustion efficiency is optimised, resulting in low fuel expenses and low gases emission. The pre-treatment of the heavy fuel oil gives the engine a high degree of smoothness, making it reliable and durable.

Application Areas

Mar-In Control's Fuel Supply Units are applied on board the ships and by power generation plants.

Designing

Mar-In Controls Fuel Supply Modules are designed according to the customer's demand, taking into consideration the:

- type of vessel
- type of engine
- lay-out of the engine room

Description of a typical Mar-In Controls Fuel supply Unit

The flow diagram of a typical Mar-In Controls Fuel Supply Unit, which has been applied several times, is given on page 8. In this particular case only a main engine is connected to the fuel supply unit. The change over 3-way valve makes it possible to feed the engine with M.D.O or H.F.O., as required. The position of this valve is indicated by the related lamp on the control box. A short description of the applied components and their working is as follows:

Aa. Duplex Filter for the H.F.O.

Depending upon the selected position of the change over 3-way valve, M.D.O or H.F.O. is taken from day tank to the Fuel Supply Unit through this filter. By a Duplex filter the regeneration of the contaminated filter elements is possible without interrupting the filtration process or shutting down the unit. Duplex filter is provided with a differential pressure contact indicator which, through the control box, generates a differential pressure alarm when the differential pressure reaches a pre-set value. The alarm situation is indicated on the control panel by the related light. Should an alarm occur, a manual switching-over to the bypass filter is always possible with the help of a valve lever.

Ab. Feeder pumps

Two screw pumps, of which one is running and the other is stand-by, serve to increase the pressure of the fuel oil which has left the day tank under gravity. The capacity of each pump is 130 to 150% of the maximum engine consumption.

In case the running pump fails and the pressure drops below a pre-set value, the stand-by pump will take over automatically and at the same time a low pressure alarm and a general alarm is generated. Automatic switching over to the stand-by pump and the generation of low pressure alarm is accomplished by the pressure alarm switch (Al. 1), installed downstream the feeder pumps. The alarm situation is indicated by its concerned light on the control panel. A switch with M(annual) and A(automatic) positions, facilitates the operation of the pump in manual or automatic mode.

Pressure across the pumps is maintained by a pressure control valve which is regulated by the pressure control system, described in paragraph Ac.

To protect the pumps against excessive high pressure, they are provided with safety valves.

Ac. Pressure Control System

To have a smooth operation of the engine and other components and to prevent pressure fluctuation, the pressure in the system should remain constant. The pressure control system, consisting of a PI pressure indicating controller (Ac.1) with diaphragm seal, an air-filter/regulator (Ak.3) and a pneumatic operated control valve (Ac.2), ensures a constant system pressure. The Proportional and Integral action of the controller prevents pressure variation as will occur with direct operating mechanical pressure regulating valves. The diaphragm seal prevents solidification of H.F.O. in the capillary tube or bourdon tube of the pressure control system.

Ad. Fuel Flow metering System

The flow metering system comprises of a flow meter itself (Ad.1), a differential pressure indicator (Ad.2) and a bypass valve (Ad.3). The system serves to measure the quantity of fuel consumed. In case of flow meter blockage the differential pressure switch will generate an alarm and the bypass valve will be opened automatically to maintain a continuous fuel flow. The flow meter can be equipped with an impulse transmitter and amplifier to facilitate connection to a computer or a remote counter.

Ae. Degassing / mixing tank and level switches

For the smooth and accurate operation of the engine and other components, it is extremely important that the system remains air-free. Gases, formed as a result of heating, mixing and other treatment process of the HFO, force the fuel level inside the degassing tank to drop. By a certain level, the mid-level switch initiates the opening of the degassing valve (Ah.) and the gases are routed to the HFO day tank. In case the gases don't escape and the fuel level drops further, a low level alarm will be generated by the low-level switch.

By a high level alarm the fuel level is brought back to normal by opening the related valve manually or automatically(option).

Opening of the degassing valve and generation of low/high level alarm is accomplished automatically through the PLC. The spring loaded valve (Ag.) prevents undesired pressure drop in the degassing tank. The unconsumed H.F.O. from the engine is brought back through the return line into the degassing tank, where it is mixed up with H.F.O. coming from the day tank. The degassing tank therefore serves the purpose of a mixing tank also. As a result of engine manoeuvring the return flow may cause a sudden temperature variation in the mixing tank, making viscosity measurement and control system unstable. Mar-In Controls has solved this problem by designing a mixing tank with precise capacity.

Ai. Booster pumps (circulation pumps)

Two screw pumps, one of which is running and the other is stand-by, serve to let the fuel oil circulate through the heaters, the self-cleaning filter unit and the viscosity control system to the engine.

In case the running pump fails and a pressure drop below a pre-set value occurs, the stand-by pump will take over automatically and at the same time a low pressure alarm and a general alarm is generated. Automatic switching over to the stand-by pump and the generation of low pressure alarm is accomplished by the pressure alarm switch (AI.2), installed downstream the pumps. The alarm situation is indicated by its related light on the control panel. Outlet pressure of the pumps is monitored with the help of a pressure gauge.

A switch with **M**(anual) and **A**(utomatic) positions facilitates the operation of the pump in manual or automatic mode.

Aj. Heater

The heater serves to heat up the heavy fuel oil whenever its viscosity is higher than desired. The amount of energy, which can be saturated steam, thermal oil or electricity is regulated by **VISCOTROL** (trade name of Mar-In Controls viscosity control system). To facilitate the generation of a high temperature alarm, a temperature alarm switch (Am.) is installed downstream the heater.

Ak. VISCOTROL

For the most efficient burning of fuel oil, it must have the right injection viscosity. VISCOTROL is designed to maintain the desired fuel viscosity by regulating the steam or thermal oil or electricity flow through the heater. The application of "Teflon" coated capillary (**patented**) makes VISCOTROL extremely reliable. The actual viscosity is indicated by the viscosity indicating controller. The application of a pressure to current (P/I) converter facilitates the read-out or recording of the actual viscosity on the bridge. Mar-In Controls viscosity control systems (**Viscotrol**) are applied and respected throughout the world.

Viscotrol which is available in pneumatic as well as electronic version consists of the following main components:

- Viscosity sensor with differential pressure transmitter and thermometer (Ak.1)
- Viscosity indicating controller (VIC) (Ak.2)
- Control valve for saturated steam or thermal oil (Ak.4)
- An alarm switch (VA) for the generation of low and high viscosity alarm (Ak.5)
- Air-filter/regulator (Ak.3)
- Pressure to current (P/I) converter (Ak.7) for a read-out of the viscosity on ship's computer in case the pneumatic viscosity control system has been selected.

Ap. **Automatic filter for H.F.O.**

Two options are available

- the back-flushing type
- the cleaning of filter segment by air

The automatic filter, depending on customer's choice, can be installed in the cold or hot section. If the back-flushing type filter is selected, an accumulator (Aq.) will be installed to prevent pressure drop in the fuel line.

Filter element assemblies are cleaned automatically by compressed air assisted back-flushing without causing interruption to the filtration process.

Ar. **Electric Control Box**

Accommodates the following:

- Two main switches for supply voltage, one for SUPPLY 1 and other for SUPPLY 2, each having positions ON and OFF.
- Overload protections for the electric motors
- Indication lamps for all the alarms
- Switches for the electric motors for the pumps and the viscosity sensor.
- PLC circuitry for the automatic operation of different components and for the generation of alarms.
- Alarm output contacts to facilitate connection to the ship's alarm system.

Optional Features

Mar-In Controls Fuel Supply Modules can be supplied with the following features:

M.D.O. circuits

A pre-filter, an M.D.O.-pump and a double end-filter are the main components of this circuit.

The M.D.O.-pump is automatically started in case of:

- a critical alarm of the Fuel Supply Unit, when it is impossible to operate on H.F.O.
- starting up

Switch-over valves for auxiliary engines

In case more than one (auxiliary) engines are connected to the Fuel Supply Unit, each engine can be provided with two switch-over valves. By doing so, each engine can run on M.D.O. or H.F.O., independent from the other engines. The valves are controlled through the electric control box.

In case of critical alarm occurrence, the valves are automatically switched over to the M.D.O. position (and the M.D.O.- pump is started).

Advantages

Mar-In Controls Fuel Supply Modules offer the following advantages:

- Fully works tested for immediate mounting and connection on site.
- Fulfil all Classification Society rules, where applicable.
- Pre-fabricated, built on a skid, these units are easy to install, eliminating the risks of site installation problems and minimising the high cost of site installation and commissioning.
- The services of commissioning engineers are available if required.
- Precision of the required fuel viscosity is guaranteed.
- The units can be tailor-made in accordance with the customer's request.
- Adjustment of the output parameters such as temperature, pressure and viscosity, is easy to accomplish.
- Automatic switch-over of pumps, self-cleaning of the filters and automatic switching-over to M.D.O. by a critical alarm guarantee a continuous operation of the unit.
- In case of voltage supply failure automatic switch-over to the other supply voltage.
- Output (critical) alarm contacts for remote indication or connection to the ship's computer.

Other Products

In addition to the fuel supply modules, Mar-In Controls designs and produces the following products:

- Lubricating Oil Units
- Pre-heating units
- Viscosity Control Systems (VISCOTROL)
- Pressure Control Systems
- Temperature Control Systems

NOTE: The components installed on the above mentioned products can also be supplied as loose items.

