

ZENIYA



MGO Cooling System

--Low sulphur fuel cooling system

www.zeniya-hvac.com

JIANGSU ZENIYA REFRIGERATION AND AIR CONDITION EQUIPMENT CO., LTD.

Introduction

Air pollution from ships may not have the direct cause and effect, for example, an oil spill incident; it causes a cumulative effect that contributes to the overall air quality problems encountered by populations in many areas, and also affects the natural environment, such as acid rain.

MGO cooler is developed to meet the MARPOL sulfur emission regulations. Currently, the most widely used fuel in the shipping industry is heavy oil (HFO). Due to the high levels of sulfur and heavy metals in heavy oil, using heavy oil at marine vessels can emit large amounts of air pollutants, so this is a major global environmental issue. The International Convention for the Prevention of Pollution from Ships, the sulfur emission regulations, have been implemented through a series of deadlines and have gradually reduced the maximum sulfur content of fuels over the years.

Current Regulation of Air Pollution from Marine Fuel

At present, ships are basically designed to use heavy oil (mainly is RME180 (180cST) or RMG380 (380cST)), and the heavy oil's sulfur content standards do not meet the EU standards for low-sulfur fuel.

When ships implement EU Directive 2005/33 / EC for low sulfur oil conversion, light oil which is MGO or MDO (DMX, DMA, DMB, DMC).

According to ISO8217:2005 Petroleum products-Fuel (class F) – Specifications of marine fuels, the main parameters of the standard as shown below:

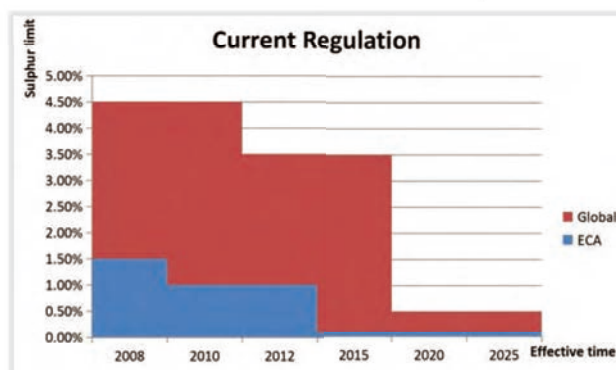
Parameter	Unit	Limit	DMX	DMA	DMB	DMC
Density at 15°C	kg/m ³	Max	-	890	900	920
Viscosity at 40°C	mm ² /S	Max	5.5	6.0	11.0	14.0
		Min	1.4	1.5	-	-
Flash point	°C	Min	43	60	60	60
Sulphur	% (m/m)	Max	1.0	1.5	2.0	2.0
Lubricity	um	Max	520	520	520	520

The main features of low sulfur fuel are high calorific value, low density, low viscosity, poor lubricity, low flash point and low sulfur content. These features can lead to the abrasion of the related diesel engine parts such as high-pressure pump plunger sleeve couplers and fuel nozzles.

Low sulphur fuel with low density and low viscosity causes the plunger sleeve fuel leaks, and leakage will increase with the wear gap increases, in order to ensure the same power as the original, the angle of the output shaft of the diesel governor will increase, and the maximum output limit of the speed governor will be limited. In this way, the maximum alarm set point will be reached until the diesel engine starts to be difficult or unable to work.

Fuel requirement for the ocean going main diesel engine, auxiliary diesel engine and auxiliary boiler are as below:

Outside an ECA established to limit SOx and particulate matter emissions	Inside an ECA established to limit SOx and particulate matter emissions
4.50% m/m prior to 1 January 2012	1.50% m/m prior to 1 July 2010
3.50% m/m on and after 1 January 2012	1.00% m/m on and after 1 July 2010
0.50% m/m on and after 1 January 2020*	0.10% m/m on and after 1 January 2015



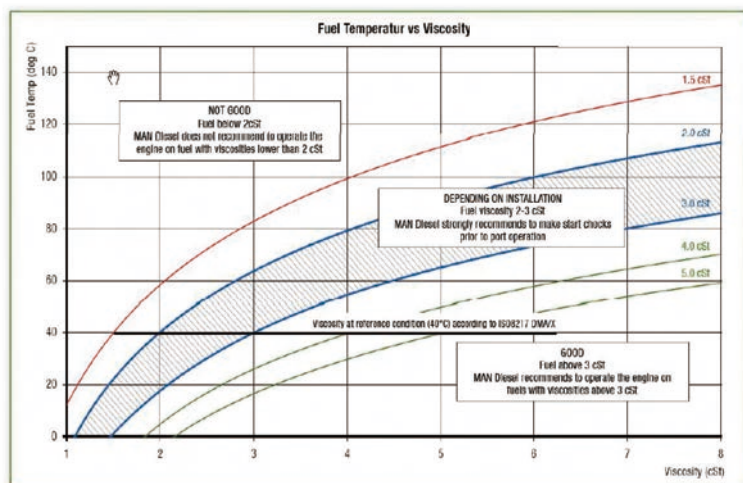
Four Options to Meet the Upcoming Limits

- Use of (Low Sulfur) Marine Light Diesel / Marine Diesel. This is a safe and industry-recognized solution that requires little investment and is globally applicable. The downside of this option is that fuel costs will continue to increase.
- Use heavy oil with scrubber. This solution eliminates the need to adjust the fuel tank or divert to more expensive fuels. However, this is still under test and the installation is expensive.
- The LNG retrofit program will reduce emissions of carbon dioxide, nitrogen oxides, sulfur oxides and particulate matter. However, the cost of retrofitting existing ships is excessive and there is a lack of infrastructure for fueling.
- Use of MGO Cooler Unit.

Economical & Feasible Solution: MGO Cooler

Increasing the viscosity of low-sulfur fuel to improve lubrication, abrasion and fuel leakage of moving parts is a major solution. According to a comprehensive analysis of diesel engine manufacturers to provide technical advice related to low-sulfur fuel operation, the lowest viscosity of low-sulfur fuel used can reach 1.8cST or 2 cST, the current shipping companies in the application of the oil generally require the addition of low-sulfur fuel its viscosity value is not Below 2.5 cST at 40°C.

Following chart shows the relationship between fuel viscosity and temperature:



Below conclusions are taken from the chart:

- The fuel needs cooling from 3 cSt at 40°C and lower to prevent the damage of the fuel pumps.
- The fuel needs cooling from 5 cSt at 40°C and lower to prevent the damage of engines' start/stop.

How to choose the optimum MGO cooling system?

Optimum model of the unit can be selected based on the following conditions:

- Flow rate of the fuel supply pumps and circulating pumps.
- MGO temperature in the service tank.
- MGO temperature returned from the engine.
- MGO temperature to be cooled before entering the circulating pumps or the engine.

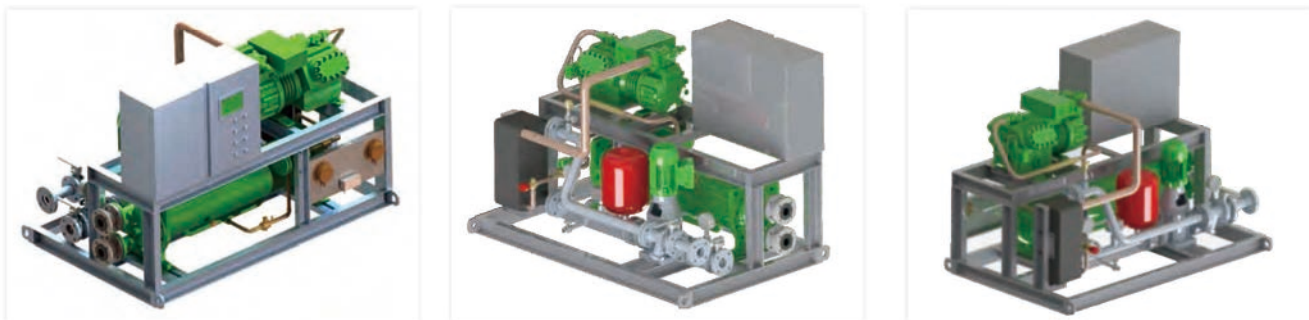
Zeniya's MGO Cooling System Description

The most effective way to increase the viscosity is cooling the temperature of fuel down, and the most cost-saving way to cool the temperature of fuel down is installing MGO cooling system.

Operation Principle:

Zeniya's MGO cooling system is designed by the cooling principal, it can cool the fuel temperature down to 17°C and increase the viscosity to above 2cST, in this case, it can meet the requirements of marine diesel engine and fuel supply system.

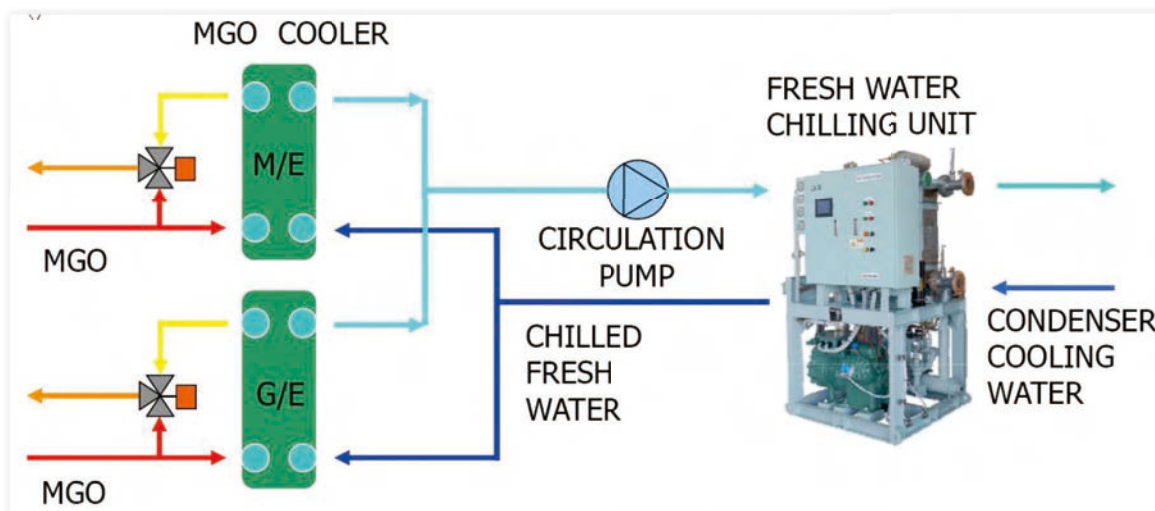
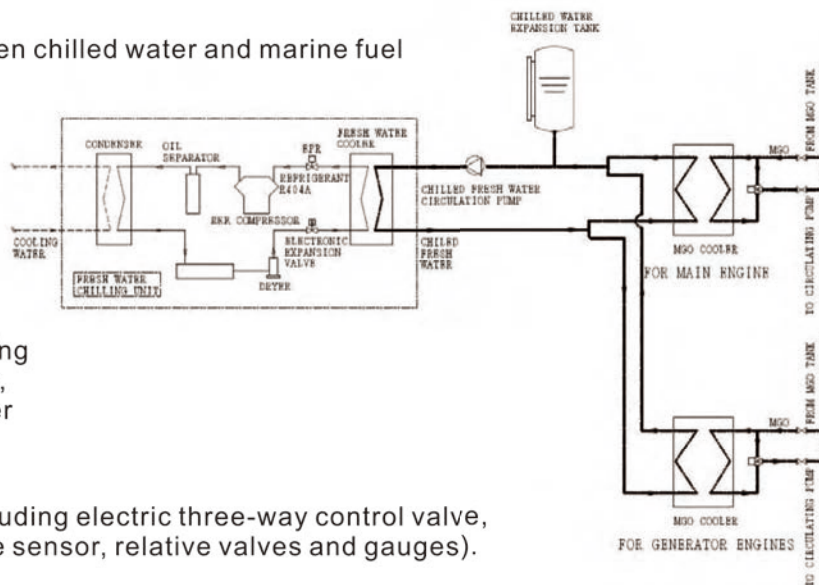
Zeniya's MGO cooling system is installed before the water circulating pump, the advantage of this solution is that the viscosity regulation may be optimized for both engine and circulating pump.



Structure:

Zeniya's indirect type cooling system between chilled water and marine fuel
The MGO cooling system consists:

- Chiller unit (including compressor, condenser, evaporator, expansion valve and relative control elements).
- Chilled water circulation pump (including cooling medium pump, expansion tank, auto watering valve, safety valve, water filter and valves).
- Expansion tank and MGO coolers (including electric three-way control valve, water-oil plate exchanger, temperature sensor, relative valves and gauges).



Features of Zeniya's MGO Cooler

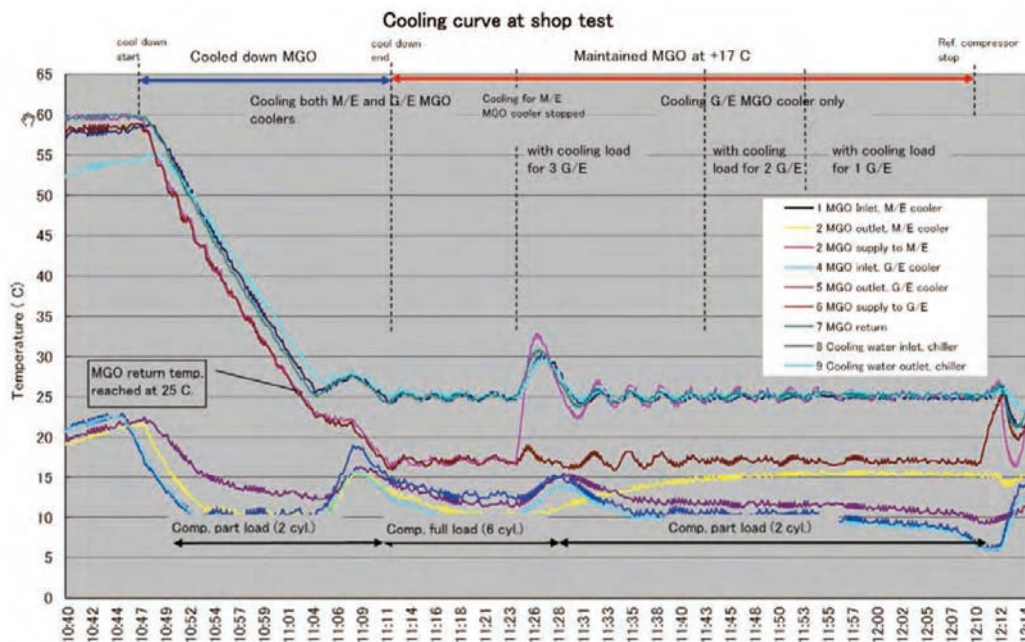
Zeniya's MGO cooling system has the advantages of novel design and convenient maintenance. It is widely used in various types of passenger ships, cargo ships and petroleum platforms. Equipment design, production and delivery are in accordance with the norms of classification societies (such as CCS, ABS, DNV, etc.) and we also provide customized service.

- Energy efficient design
- Fuel temperature precisely controlled by PLC
- MGO cooling system can be operated under the low-capacity condition, 0-100% modulating control
- Leakage proof MGO cooling system
- Retrofit design with small foot print for existing vessel
- Option to choose fresh water cool or sea water cool type condenser

Advantages of Zeniya's MGO Cooler

1. Very easy and reliable operation

- Utilizing electronic expansion valve system for the chiller unit, the outlet water temperature is very precisely controlled, and at the same time, superheating is controlled fully automatically, thus a very secured and reliable operation to be accomplished.
- The compressor's capacity control to be carried out step-wise according to the suction pressure and full automatic controlled EPR is installed on the suction line to maintain the system running at very low heat load. And with a combination of automatic controlled three way control valve installed on the outlet of MGO cooler, the MGO temperature to be finally controlled fully automatically and very accurately.
- To avoid heat contraction to main engine, generator engines and MGO piping, the cooling speed of MGO can be freely adjusted and controlled fully automatically.



2. Zeniya's service

- Worldwide service network
- On-call service
- Spare Parts Logistics
- Preventive Maintenance
- Technical Support
- Training

Company

Zeniya started its business as a joint-stock company in 2004. We focus on designing, developing, manufacturing and selling a large range of refrigeration products, such as water chiller, vacuum cooler, ice machine, grain cooler, etc. Products cover modern agriculture, commerce, food, shipping, transportation, refrigeration, infrastructure, coal, chemical industry, paper making and other fields. With its excellent foundry technique, high quality product performance, intelligent control system, continuous innovation, energy-saving environmental protection technology, Zeniya is well known at home and abroad, it can meet the growing demand for global market diversification.

Zeniya has developed, supplied and supported the Marine industry with cutting edge HVAC technology and customer support for many years. Our strong technical research and design team have various experiences, knowledge and competence in the marine and offshore field that can meet various customer needs expectation.

"Searching excellence, science innovating" is the faith of every staff in Zeniya, all of our staff are devoting ourselves to pursuing the best and the highest quality, aspiring scientific components in each details. We are willing to cooperate with customers at domestic and abroad to provide the most suitable solution of air condition and refrigeration systems for you.

CHINA

Address

Shanghai Hongqiao CBD core zone
Production Base

No.180 Jiangping Road,Zhangqiao Industry Park, Taixing City, Jiangsu Province, China

Tel:0523-87657356 Fax:0523-87657326

E-mail:sale@zeniya-hvac.com

INDIA

Address

NO.28,Aklvya CHS Ltd,Plot
No.69D,J&k,Sector 21,Kharghar,
Navi Mumbai,India - 410210

Tel:+91-7710932939

E-mail:Blue.ajay@blue-mast.com

HONG KONG

Address

Room No.702,7/F,Fu Fai
Commercial Centre,27 Hillier
Street,Sheung Wan,Hong Kong

Tel:+852-64383420

E-mail:Blue.info@blue-mast.com