Hydraulic oil control system overview of the ME-C engine

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Abstract

The ME-C Marine diesel engine has become the first choice for new ocean-going ships. The ME series diesel engine has eliminated the original mechanical structure such as CAM and camshaft, and is driven by the servo hydraulic oil to realize fuel injection, cylinder lubrication and other oil supply. Therefore, the control system of the servo hydraulic oil of ME diesel engine series will affect its performance to a great extent. Taking MAN 6G50ME-C as an example, this paper expounds the hydraulic oil control system of the host servo, and then grasps the control principle of the hydraulic oil control system of the ME-C engine.

Keywords

Hydraulic oil control system, ME-C engine, System principle, ECU.

1. Introduction

The ship electronic control diesel engine has become the first choice for new ocean ships because of its low fuel consumption and good emission characteristics. Compared with the traditional MC series diesel engine, the ME series diesel engine eliminates the original mechanical structure such as CAM and camshaft, and the fuel injection, cylinder lubrication and exhaust valve opening and closing are driven by the servo hydraulic oil of 225bar-300bar through the plunger. The pressure of the servo hydraulic oil directly affects the fuel atomization quality, injection timing and exhaust valve timing, and then affects the combustion quality, thermal efficiency and emission characteristics of the diesel engine. Therefore, the pressure of the servo hydraulic oil of ME series diesel engine will affect its performance to a great extent. This paper takes the servo hydraulic oil pressure of MAN 6G50ME-C as an example to illustrate the control system of the servo hydraulic oil.

2. Working principle of hydraulic system

2.1 System principle

The hydraulic system of 6G50ME-C diesel engine is mainly used for fuel injection, exhaust valve opening and cylinder oiler drive. The hydraulic oil pressure is provided by the machine with hydraulic pump or electric hydraulic pump, and the system pressure is controlled by the engine control system (ECS). The composition of the whole system is shown in figure 1.

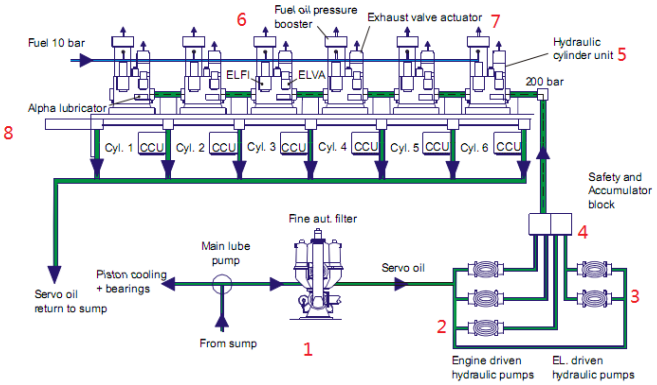

FIG. 1 schematic diagram of hydraulic system principle

The whole hydraulic system is mainly composed of main engine lubricating oil (hydraulic medium), fine filter 1, machine belt hydraulic pump 2, electric hydraulic pump 3, safety valve block 4, hydraulic cylinder unit 5 (including fuel plunger pump 6, exhaust valve actuating pump 7 and cylinder oiler 8) and other valve parts. Main engine lube oil by the host via the main lubricating oil pump oil pan or independent hydraulic oil pump pressurized to about 2 bar, after 1 filter the impurities of the fine filter machine with hydraulic oil pump 2 or electric hydraulic pump suction, the pump 2 or 3 pressure to 225-300 bar, then through the relief valve block 4 to 300 bar in hydraulic cylinder unit 5225 - waits in hydraulic cylinder unit, its flow is determined by the host control system control of proportional solenoid valve, according to the instructions of the control system of host fuel plunger pump 6, exhaust valve actuating pump drive 7 and 8 cylinder lubricator, fuel injection has been completed, the exhaust valve opening and closing and cylinder lubrication.

Fuel injection, exhaust valve opening and closing, and cylinder lubrication were driven by high pressure hydraulic oil. Therefore, it is necessary to ensure that the hydraulic system has sufficient pressure (225bar) during the start-up process of the main engine. The pressure in this process is provided by the electric hydraulic pump. When the main engine has a certain speed, the main engine control system (ECS) gives the instruction to stop the electric hydraulic pump automatically.

Pressure relief valves in relief valve block 4 have valves 310 and 311, as shown in figure 2. Valve 310 belongs to electromagnetic pressure relief valve, which is Shared by three machine belt pumps. The opening and closing of this valve is controlled by the host control system. The pressure relief is set at 310bar, which is used to prevent the outlet pressure of the machine belt hydraulic pump from being too high, so as to protect the machine belt hydraulic pump. Valve 311 is a mechanical pressure relief valve. Set the pressure relief valve at 315bar to prevent excessive system pressure and protect system safety. Valve 312 is a mechanical pressure relief valve. Each electric hydraulic pump is equipped with a set pressure relief of 225bar, which is used to prevent excessive outlet pressure of the electric hydraulic pump.

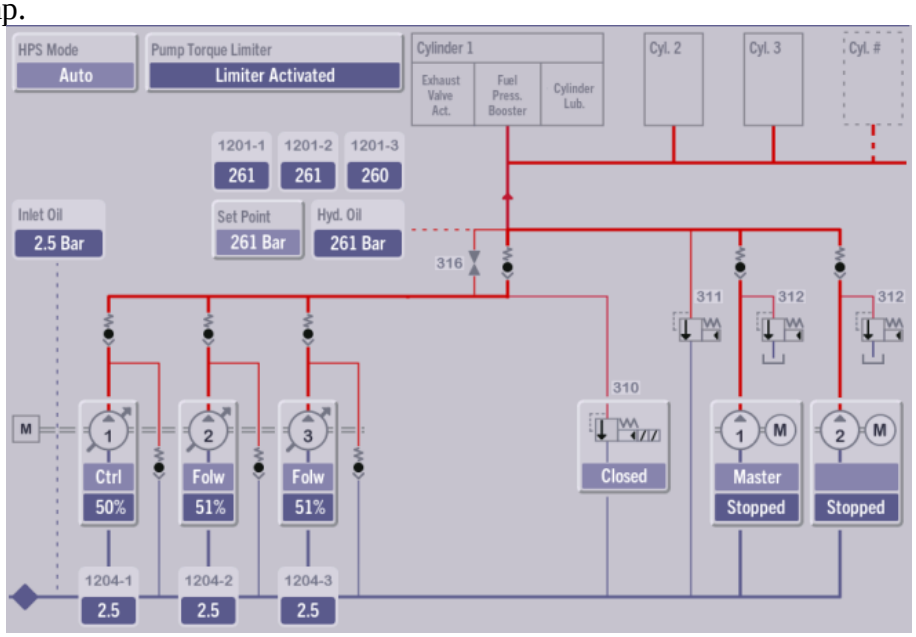

FIG. 2 schematic diagram of the control system

2.2 Pressure control process

The pressure change of hydraulic oil in G50ME-C series electric control engine is realized by changing the displacement of hydraulic oil pump. Its control system mainly consists of ECU, ACU, electromagnetic proportional valve and pressure, position sensor. ECU under different load of the hydraulic oil pressure setting signal to ACU, ACU instructions for processing the pressure signal output control signals for electromagnetism proportion valve, electromagnetic proportional valve plunger pump action change machine belt swashplate Angle of inclined plate, change machine with

pump displacement, so as to change the oil pressure, its control process are negative feedback control system.

In the hydraulic oil control system of the main engine in the paper, the setting value is output by ECU, and its setting value varies with the load of the main engine, as shown in figure 3.

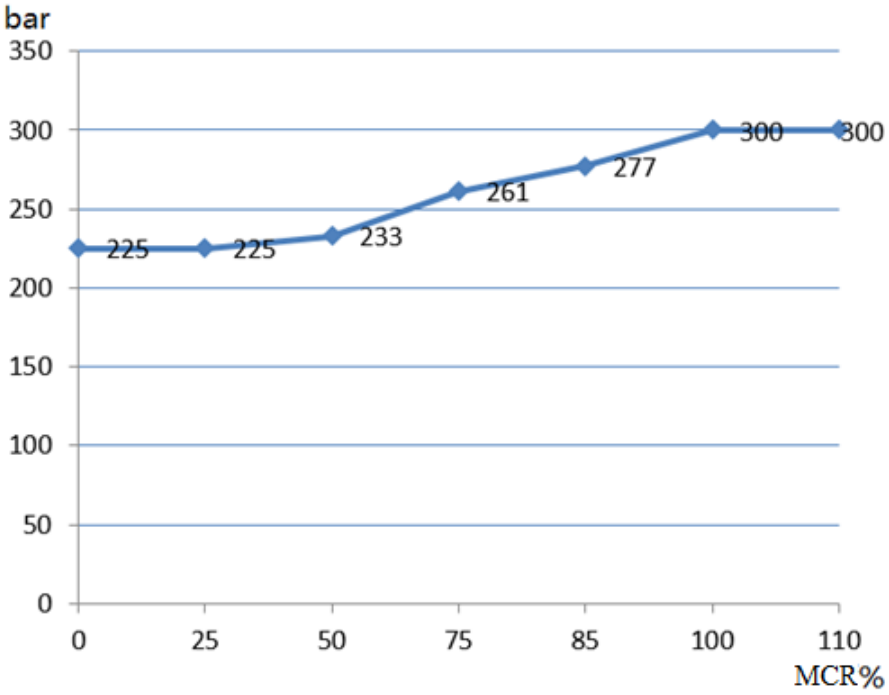

FIG. 3 hydraulic oil pressure setting curve

The control unit ACU receives the pressure setting value instruction issued by ECU, and at the same time receives the measured pressure of the system and the position feedback signal (measured value) of the inclined disk of the motor belt pump. After the comprehensive analysis, the control quantity is given to control the electromagnetic proportional valve (actuator). After the electromagnetic proportional valve is operated, the Angle (actuator) of the inclined disk of the belt pump is changed, so as to change the displacement of the pump and achieve the purpose of pressure control (control object). The input and output channels of ACU control module are shown in figure 4. In the figure, J31 is the measured pressure input of the system. J32 is the inlet pressure input of machine belt pump; J34 is the feedback input of inclined disk position; J70 is the proportional solenoid valve control output.

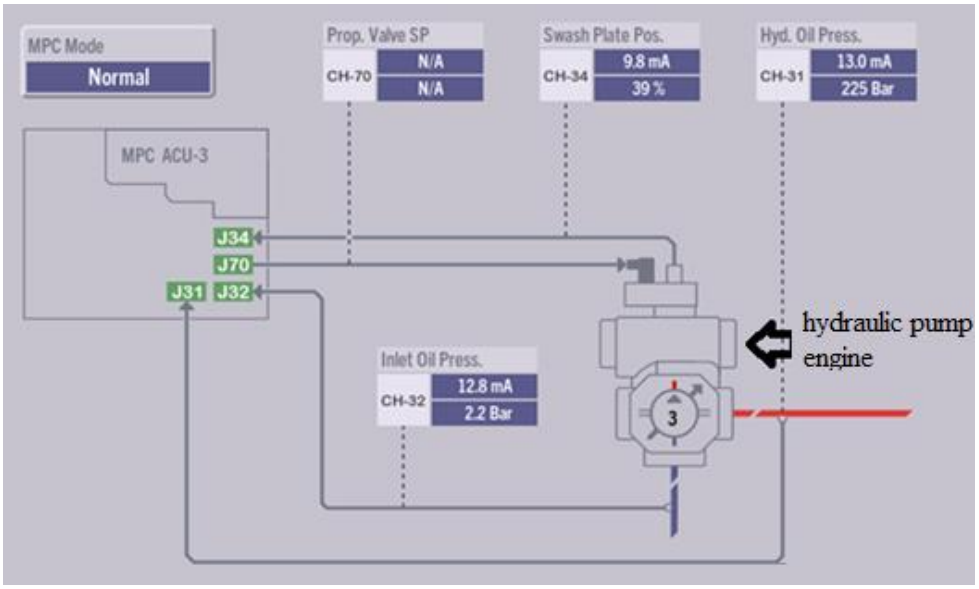

FIG. 4 the input/output channel of ACU control module

3. Summary

This paper introduces the hydraulic oil control system of MAN 6G50ME-C electronic control host of a 72000-ton oil tanker, further analyzes the control principle of the hydraulic oil control system of ME-C electric control diesel, and provides reference for the system debugging, management and control parameter optimization of this type of electric control diesel.

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