ICS 21.260
CCS J 21

# NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA



## GB/T 38274-2019

## Lubrication systems - Efficiency assessment method

润滑系统 能效评定方法

**Issued on: December 10, 2019** **Implemented on: July 1, 2020**

**Issued by: State Administration for Market Regulation;**
**Standardization Administration of the PRC**

# Table of Contents

1 Scope
2 Normative references
3 General conditions of test conditions
3.1 Test preparation and general test conditions
3.2 Lubrication pump test conditions
3.3 Cooler test conditions
3.4 Electric heater test conditions
3.5 Measurement accuracy
4 Evaluation method of energy efficiency of lubrication system
4.1 Lubrication system energy efficiency evaluation value
4.2 Motor Energy Efficiency Assessment Method
4.3 Lubrication pump energy efficiency assessment method
4.3.2 Test methods and calculations
4.4 Evaluation method of energy efficiency of cooler
4.4.2 Test methods and calculations
4.5 Evaluation method of energy efficiency of electric heater
4.5.2 Test methods and calculations
Appendix A
Appendix B
Appendix C
Appendix D
Appendix E



## Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009. This standard was proposed and managed by the National Metallurgical Equipment Standardization Technical Committee (SAC/TC409). This standard was drafted. Sichuan Chuanrun Hydraulic Lubrication Equipment Co., Ltd., Taiyuan Tongze Heavy Industry Co., Ltd., Anhui Zhongtian Petrochemical Co., Ltd. Co., Ltd., Qidong Lubrication Equipment Co., Ltd., China Heavy Machinery Research Institute Co., Ltd. The main drafters of this standard. Liu Fulan, Wang Pengfei, Gao Xiaomou, Zhu Qiang, Wang Xinyu, Wu Guobin, Gong Xiangrong, Su Jing, Xia Juan. Evaluation method of energy efficiency of lubrication system

## 1 Scope

China's national method for assessing the efficiency of a lubrication system. It specifies the general test conditions, the preparation and the assessment procedure. A centralised lubrication system delivers measured quantities of oil or grease to dozens or hundreds of points on a machine, and its efficiency is not a question of the power its pump consumes - that is negligible. It is a question of whether the lubricant arrives: whether each point receives the quantity it was designed to receive, whether the distribution blocks divide correctly, whether the lines are clear, and whether the system as a whole delivers what the machine needs at the temperature it runs at. A system that is nominally working while one branch is blocked destroys the bearings on that branch, and nothing indicates it until they fail. Assessing efficiency in this sense is therefore an assessment of delivery, which is why the standard is about test conditions rather than about energy.

This standard specifies the energy efficiency assessment method for lubrication systems (including main components such as lubrication pumps, coolers and electric heaters). This standard is applicable to the energy efficiency evaluation of mass-produced lubrication systems, and other lubrication devices can also be used as a reference.



## 2 Normative references

The following documents are essential for the application of this document. For dated references, only the dated version applies to this article Pieces. For undated references, the latest version (including all amendments) applies to this document.

GB/T 14039-2002 Code for pollution degree of solid particles in hydraulic transmission oil

GB 18613-2012 Small and medium-sized three-phase asynchronous motors

### 3.1 Test preparation and general test conditions

3.1.1 Develop a test outline.

3.1.2 The test equipment should be checked for correctness and functional suitability before the test. Period.

3.1.3 Check the valve and control system of the system under test to eliminate factors that affect normal testing.

3.1.4 Power supply. voltage fluctuation ± 5%, frequency fluctuation ± 1%.

3.1.5 The kinematic viscosity of the test lubricating oil is 288mm2/s ~ 352mm2/s (at the temperature of 40 °C).

3.1.6 The solid particle pollution level of the test oil shall meet the requirements of-/ 20/17

~-// 21/18 in Table 1 of GB/T 14039-2002.

### 3.2 Lubrication pump test conditions

3.2.1 During the test, the oil temperature shall be 40 ° C ± 3 ° C.

3.2.2 Use the torque and speed sensor to detect the torque and speed of the input end of the tested lubrication pump. Torque and speed sensors are installed horizontally, using When the rigid coupling is used, the coaxiality of the pump device must be less than 0.05mm; when the flexible coupling is installed, the coaxiality of the pump device must be less than 0.05mm. 0.2mm. The installation diagram of the torque speed sensor is shown in Figure 1. Figure



### 3.3 Cooler test conditions

3.3.1 The inlet temperature of the cooling medium (cooling water) of the cooler is 28 °C ± 2 °C.

3.3.2 The flow rate of the cooling medium (cooling water) of the cooler is

1.5 times the flow rate of the cooling medium (lubricating oil).

3.3.3 The relative error of heat balance should be less than 5%. The calculation of the relative error of the heat balance is shown in equation (8).

### 3.4 Electric heater test conditions

3.4.1 The volume of the test fuel tank is 1.2m3, and the lubricating oil inside the tank is 1m3.

3.4.2 The lubricating oil is heated from an initial temperature of 10 ° C ± 2 ° C to 25 ° C ± 2 ° C.

3.4.3 The ratio of the electric energy loss of the electric heater to the total electric energy should be less than 5%. The calculation is shown in equation (15).

3.5 Measurement accuracy The allowable error of measuring instruments and meters should be within the range specified in Table 1. Table

1 Allowable errors of measuring instruments and meters Measurement category unit instrument, meter reading accuracy Temperature °C ± 1.0% Pressure MPa ± 1.6% Flow L/min ± 1.5% Torque N · m ± 1.0% Speed r/min ± 1.0%

## 4 Evaluation method of energy efficiency of lubrication system

4.1 Evaluation of energy efficiency of lubrication system The energy efficiency evaluation value of the lubrication system is supplied to the host by the energy efficiency evaluation value of the motor, lubrication pump, cooler, and electric heater. The degree of compliance of the required lubricant is determined, and the calculation formula is shown in formula (1). Et = etaemetaepetaecetaehetastd (1) Where. Et

--- energy efficiency evaluation value of lubrication system,%; etaem

--- motor energy efficiency evaluation value,%; etaep

--- the total efficiency of the lubrication pump,%; etaec

--- heat exchanger efficiency,%; etaeh

--- Heating efficiency of electric heater,%; etastd

--- the deviation of the lubricating oil supplied by the lubrication system in accordance with the required degree,%.



4.2 Motor energy efficiency assessment method The motor energy efficiency assessment test method shall be implemented in accordance with the requirements of Chapter 5 of GB 18613-2012, and the motor energy efficiency assessment value shall meet The provisions of

4.3 in GB 18613-2012.

### 4.3 Lubrication pump energy efficiency assessment method

4.3.1 Instructions for energy efficiency assessment of lubrication pumps The energy efficiency evaluation of the lubrication pump is described as follows:

a) Test the volumetric efficiency and mechanical efficiency of the lubrication pump under the set conditions, and calculate the total efficiency of the lubrication pump. The total efficiency of the lubrication pump The value is used as the energy efficiency evaluation value of the lubrication pump.

b) Refer to Appendix A for the schematic diagram of the lubrication pump energy efficiency test, and refer to Appendix B for the schematic diagram of the lubrication pump energy efficiency test.

### 4.3.2 Test methods and calculations

4.3.2.1 Treat the flow of the lubrication pump at zero pressure difference as the theoretical flow. Start the tested lubrication pump and adjust the outlet pressure of the lubrication pump. When the outlet pressure is approximately zero (<=0.05MPa), record the flow rate of the pump at this time, and record the flow rate of the lubrication pump at zero pressure difference as Q0.

4.3.2.2 Calibrate and adjust the outlet pressure of the lubrication pump to the maximum working pressure of the lubrication system. Q, the speed of the pump is recorded as n, and the torque of the pump is recorded as T.