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# Portable Grease Steel Dust Meter

## Model SDM-72

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### Instruction Manual

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- Please keep this instruction manual available for quick reference when needed.
- Before use, carefully read this instruction manual and fully understand the content.



**NEW COSMOS ELECTRIC CO., LTD.**

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# **1. Introduction**

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We thank you for purchasing the Portable Grease Steel Dust Meter Model SDM-72 for the measuring of steel dust in the lubricating grease.

The Portable Grease Steel Dust Meter employs a magnetic balance type electromagnet induction method as the measuring principle, and is a useful simplified diagnosis tool for the inspecting the abrasion status of the bearings and gears.

The steel dust can be measured simply by collecting from the waste (expelled) grease sample in a sampling container when fresh grease is applied to the machinery.

This Manual describes the specifications, functions and operating instructions, carefully read and thoroughly understand this manual before operating the Portable Grease Steel Dust Meter SDM-72.

## 2. Features

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- ◆ The employed magnetic balance type electromagnetic induction method is a highly sensitive for the detection of the abrasion in the initial stage.
- ◆ Suitable for diagnose of irregularity in the ultra slow speed revolution range where diagnosis by vibration method is difficult.
- ◆ Very simple operate.  
Only requiring the sampling container to be filled with the sampled grease and inserted for instant measurement.
- ◆ Compact portable instrument and useful for field measurement.

## 3. Safe Operation

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Read and understand the contents of the manual before operating the instrument. The following safety symbols are used in this manual and must be observed without fail:



### **Warning**

WARNING indicates a situation, which if not avoided, could result in malfunction or abnormal performance of the instrument.



### **Caution**

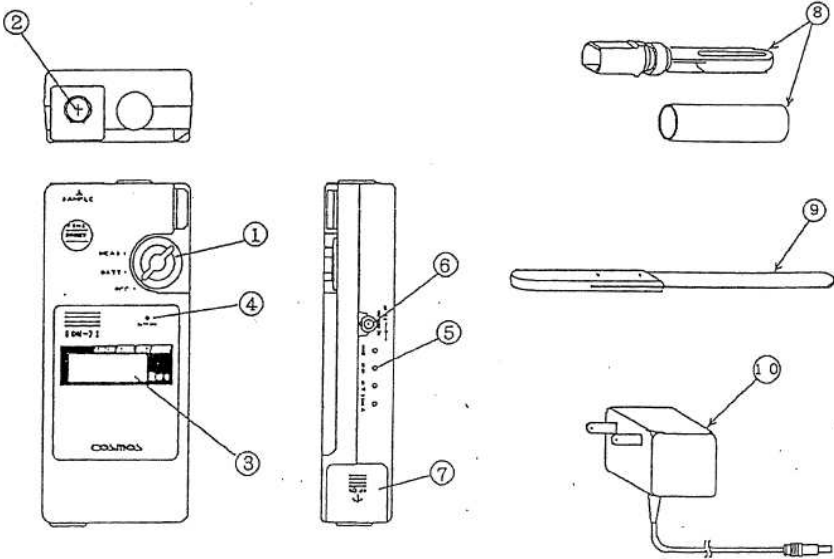
CAUTION indicates a situation, which if not avoided may cause damage to the instrument, or an accurate measurement may not be obtained.

### **MEMO**

MEMO indicates operational advice and or instructions.

# 4. Component Names and Functions

## 4-1. Exterior View



## 4-2. Component Names and Functions

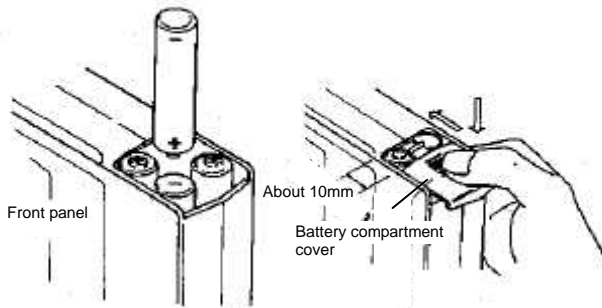
No.	Name	Functions
1	Change-over selector switch	<p>Rotate the switch to "MEAS" position to commence measurement, with the sampling container removed from the instrument.</p> <p>To check the voltage level of the batteries, rotate the switch to "BATT" position.</p>
2	Sample insert port	<p>Insert port for sampled grease.</p> <p>The measurement of the steel dust is conducted when the sampling container is inserted, while the selector switch is set at "MEAS" position.</p>
3	LCD display	<p>The display will indicate a digital reading of the steel dust in the sampled grease.</p> <p>Also, to indicate the reading of battery voltage.</p>
4	BATTERY alarm lamp	<p>To indicate the low battery status, when the battery voltage becomes lower than 3.6V, the alarm lamp will turn ON.</p>
5	Calibration switch	<p>Calibration switch of the indicated value. (The instrument is calibrated at factory prior to shipment. Do not attempt to make any calibrations.)</p>
6	DC jack	<p>The exclusive jack to accept the plug of the AC Adapter.</p>
7	Battery compartment	<p>The battery compartment accommodates 4 AA size dry cells.</p>
8	Sampling container	<p>A quantitative sample container to collect 0.8ml of sampling grease.</p>
9	Spatula	<p>A tool used for the collection of sample grease.</p>
10	AC adapter	<p>Exclusive AC adapter. (Option)</p>

# 5. Operation Procedures

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## 5-1. Installing Batteries

Open the battery compartment cover located on the lower right side of the instrument, press and slide off the cover, secure a fresh set of 4 AA size (LR6) alkaline dry batteries, and carefully observe the battery polarity illustration inside the battery compartment to make sure that the batteries are installed correctly. It is recommended that a fresh new set of batteries be installed; do not use a set of partial used and new batteries.



To close the battery compartment, place the cover on the batteries leaving an opening of about 10mm, and while pressing the cover downward push it forward to close the compartment.

## 5-2. Battery Check

Rotate the selector which from the “OFF” position to the “BATT” position, the LCD display will indicate - - - - for a period of 2-3 seconds, then the voltage of the battery will be displayed.

Examples of battery voltage display.

b 5. 6 (Battery voltage = 5.6V)

b 3. 6 can be operated if the voltage is higher than 3.6V

b 3. 6 the BATTERY alarm lamp will turn ON if the voltage is lower than 3.6V, and instrument can not be operated. Secure a fresh set of batteries and make replacements.

b 3. 2 when the battery voltage drops below 3.2V, the BATTERY alarm lamp will commence to blinking with an audible buzzer sound.



### Warning

Measurement conducted under low battery condition will not provide an accurate or reliable reading.

### Memo

In case the battery voltage should drop below 3.2V during measurement at “MEAS” mode, the BATTERY alarm lamp will turn ON and the audible alarm buzzer will sound.



### Caution

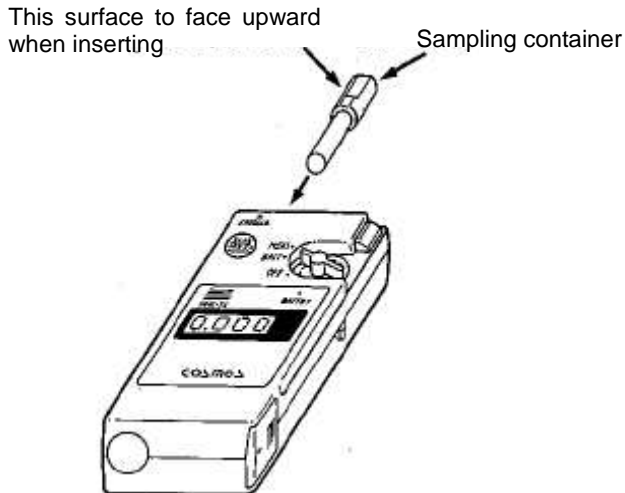
It is recommended to replace the batteries with a fresh set of 4 AA size (LR6) alkaline batteries.



### 5-3. Measurement

- 1) Rotate the selector switch to “MEAS” and shift to the measurement mode.
- 2) Check to see that the display indicates 0.000, then insert the sampling container containing the sample grease into the sample port. (Refer to 5-4. regarding procedures for the collection of sample grease.)

\* The sampling container must be inserted with the collected grease facing upward (same direction as the front surface of the instrument.)



- 3) An audible beep will sound for 2-3 seconds after the sampling container has been inserted indicating the measurement has been completed, and the reading is held, read and record the reading.

- 4) When the sampling container with the holder is removed from the sample port, the display will return to zero  by the auto zeroing adjustment function.
- 5) After the measurement has been completed, make sure to return the selector switch to “OFF” position.



### Caution

- ◆ When the reading exceeds the upper limit of the numeral display reading (approximately 6.5%Wt), the display will indicate .



### Caution

- It is recommended to insert the sampling container gently. Do not apply an impact when inserting the sampling container. If the insert is too slow, the reading may drift and may not be accurate. In such case pull out the sampling container once and reinsert for the measurement.
- After the sampling container has been inserted for measurement, do not move the instrument until the “BEEP” sound for the completion of the measurement. If the instrument is moved the reading may drift.
- For the measurement, do not hold the portion of the sampling container to be inserted, as the body temperature of the operator may effect the measurement. Hold the ejected portion of the sampling container when handling and for insertion.
- ◆ If the collected sample grease is of high temperature, allow it to cool to normal room temperature before measurement.



### **Caution**

- This instrument employs the electromagnetic induction method as the measuring principle, and should not be operated in the vicinity where a strong electromagnetic wave is generated.  
(Example: inverter controlled motor, welding machine, electric spark machine)  
It is recommended to conduct measurement in a location not effected by such electrical equipment.
- Do not operate the instrument in a location where walkie-talkie or cellular phone may be used.
- During measurement do not use or place a metal tool (object) near the sample port.

### **MEMO**

In case the collected grease sample contains large volume of iron oxide, the reading of the measurement with this instrument may indicate a slight difference from the SOAP method analyzed value.

#### **5-4. Collection of Grease Sample**

For the measurement of steel dust to be conducted with this instrument, the grease sample is to be collected from rotating portion of the machinery. When a fresh supply of grease supplied to bearing, the old discolored waste grease is expelled, collect this waste grease with the spatula and fill sampling container.

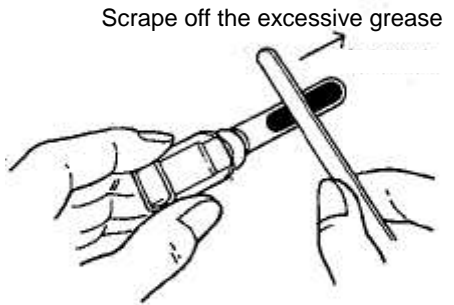
The grease expelled from the bearing is the discolored waste grease expelled from the interior of bearing together with a layer of the freshly supplied grease. Therefore, the collect and use the discolored waste grease for the measuring purpose.

## 5-5. How to Fill the Sampling Container

The sample container has a quantitative groove to accommodate the waste grease sample, use the spatula and fill this groove with a sufficient amount of waste grease.



Use the edge of the spatula and scrape off the excessive waste grease to obtain a quantitative volume of 0.8ml.



Then wipe off any excessive waste grease that may adhere to sampling container with tissue or a soft cloth, and cover the collected waste grease sample with the protective cover.



## 6. Troubleshooting

Problems, which may be experienced during the use of the Grease Steel Dust Meter SDM-72, are listed in the table below, together with indications of probable causes and recommendations for corrective actions. Contact our authorized distributor if your problem is not listed or when the remedy fails to correct the problem.

<b>Problem</b>	<b>Cause</b>	<b>Remedy</b>
No indication appears on the display when the selector switch is set at "BATT" or "MEAS" using fresh set of batteries.	<ul style="list-style-type: none"> <li>• Bad battery contacts.</li> <li>• The polarities of the battery are not correctly installed.</li> </ul>	<ul style="list-style-type: none"> <li>• Take out the batteries and reinstall. (page 5)</li> <li>• Reinstall the batteries with the polarity correctly positioned. (page 5)</li> </ul>
The battery alarm lamp turns ON when selector switch is set at "BATT" or "MEAS" using fresh set of batteries.	<ul style="list-style-type: none"> <li>• The battery may be installed with the polarity in wrong position.</li> </ul>	<ul style="list-style-type: none"> <li>• Reinstall the batteries with the polarity correctly positioned. (page 5)</li> </ul>
The reading of the display does not stabilize or is not held when the sampled grease is inserted. The reading is held at an unstable condition.	<ul style="list-style-type: none"> <li>• The sampled grease is of high temperature and cannot be measured.</li> <li>• Measurement conducted nearby a source of strong electromagnetic wave. (Inverter controlled motor)</li> <li>• Cellular phone or walkie-talkie used while conducting measurement.</li> </ul>	<ul style="list-style-type: none"> <li>• Allow the sampled grease to cool off and conduct measurement. (page 8)</li> <li>• Move away from the source of electromagnetic wave. (page 9)</li> <li>• Turn OFF the cellular phone or walkie-talkie and perform measurement. (page 9)</li> </ul>

## 7. Specifications

Items	Specifications	Remarks
Model	SDM-72	
Measuring principle	Magnetic balance type electromagnetic induction method.	
To measure	Concentration of iron particles in the waste grease.	
Measurement range	0 – 5.000 %Wt	%Wt = weight ratio%
Display	4 digit liquid crystal display	
Minimum resolution	0.001 %Wt	
Accuracy	$\pm(10 \%rdg + 10 dgts)$ * The analyzed value of standard grease by atomic absorption method	%rdg = measured value%
Zero adjustment	Automatic adjustment	
Sample volume	0.8 ml	
Power requirement	4 AA size dry batteries	
Battery life	30+ hours of continuous operation	using alkaline batteries
Operating temperature	0 to 40 degrees C	
Dimensions	84W x 40D x 190H (mm)	
Weight	Approximately 480g	
Standard accessories	Spatula for collecting grease sample 1 pc Sampling container SMC-01-G 1 box AA size dry batteries 4 pcs Carrying case 1 pc Operation Manual 1pc	(10 pcs/box)
Consumables	Sampling container (10pcs/box) SMC-01-G	
Option	AC Adapter TC-420	
Approval	CE (EMC Directive 2004/108/EC)	

## 8. Handling & Storage

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### CAUTION

- This instrument is not explosion-proof. It must be used in a safe location.
- Remove the batteries and store the instrument if it is not be used for a long time.
- Do not disassemble or modify the instrument or change the structure or electric circuits.
- Do not leave the instrument in high-temperature or highly humid places.
- Keep the instrument away from radical temperature or humidity changes, walkie-talkie, mobile phone, or its performance may be adversely affected.
- Do not drop, hit, or apply a strong mechanical shock to the instrument, or its performance may be adversely affected.
- The instrument is not drip-proof. Keep the instruments away from water.

## **9. Warranty**

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New Cosmos Electric Company Limited (New Cosmos) offers the following as the sole and exclusive limited warranty available to Customer.

This warranty is in lieu of, and customer waives, all other warranties of any kind or nature, expressed or implied, including without limitation, any warranty for merchantability or fitness for a particular purpose. The remedies set forth herein are exclusive.

New Cosmos warrants to the original purchaser and no other person or entity (customer) that gas detection product supplied by New Cosmos shall be free from defects in materials and workmanship for a period of one (1) year from the date of purchase. This warranty does not include consumables, such as fuses, filters, etc. Certain other accessories not specifically listed here may have different warranty periods.

After examination of allegedly defective product return to New Cosmos, with freight prepaid, should the product fail to conform to this warranty, customer's only remedy and New Cosmos's only obligation shall be, at New Cosmos's sole option, replacement or repair of such non-conforming product or refund of the original purchase price of the non-conforming product. In no event will New Cosmos be liable for any other special, incidental or consequential damages or losses of any kind whatsoever, including but not limited to, loss of anticipated profits and any other loss caused by reason of non-operation of the product.

This warranty is valid only if the product is maintained and used in accordance with New Cosmos's instructions and /or recommendations. New Cosmos shall be released from all obligations under this warranty in the event repairs or modifications are made by persons other than its own or authorized service personnel or if the warranty claim results from physical abuse or misuse of the product.



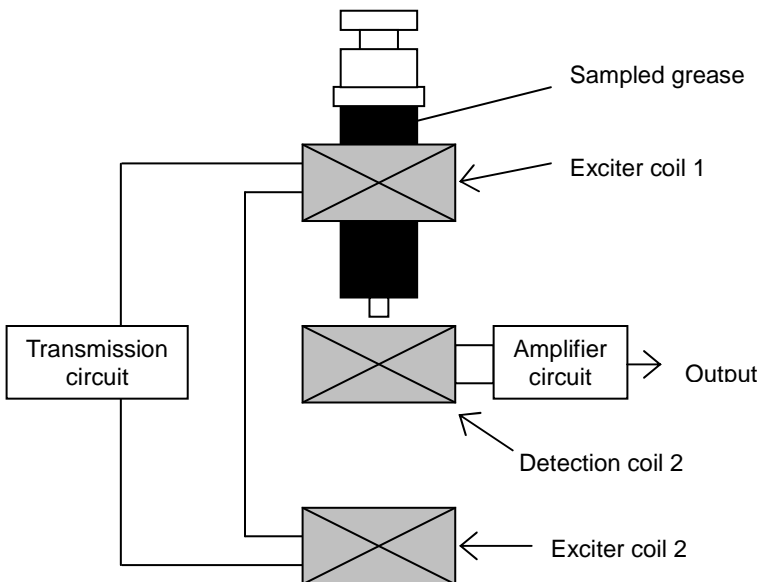
# Appendix

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## Reference Materials

### 1. Measuring Principle

The measuring principle of the magnetic balance electromagnetic induction method is shown in the illustration below, the magnetic circuit sensor is composed of an exciter coil connected to the both sides of the detection coil, the magnetic field generated by both exciter coils are blanketed in the vicinity of the center detection coil. Normally, the center detection coil does not generate an induction voltage, on the other hand when the sampled grease containing iron particles is inserted into the exciter coil, the magnetic field is offset by the magnetic permeability variation, and an induction voltage is generated in the detection coil. The induction voltage can measure the concentration of the iron particles in the sampled grease.



## 2. Metal Materials Measurable

Table 1 of Metal Materials that can be Measured

(○:Measurable, ×:Not measurable)

Metal and Materials	Magnetism	Measurable	Remarks
Iron, nickel, cobalt	Ferromagnetism	○	
Aluminum, chrome, manganese, titan, stainless steel (SUS-304, SUS-316)	Para magnetism	×	
Copper, silver, lead, zinc, tin	Diamagnetic	×	
Iron oxide ( $\alpha$ -Fe <sub>2</sub> O <sub>3</sub> ) Ferruginous (Hydroxide iron)	Para magnetism	×	*1
Iron oxide ( $\gamma$ -Fe <sub>2</sub> O <sub>3</sub> , Fe <sub>3</sub> O <sub>4</sub> )	Ferromagnetism	○	
Sodium, calcium, lithium, molybdenum	Para magnetism	×	*2

\*1: Iron oxide has several isomers, as can be noted from the table above there are substance that can be measured with the Grease Steel Dust Meter and substance that can not be measured. Specially in case the environment allows the oxidation of iron particles easily and where the collected sample contains red rust the measurement conduct may indicate a reading lower than the actual concentration.

\*2: When the grease contains a filler agent, the Grease Steel Dust Meter does not have any sensitivity against such substance, and does not affect the measured reading.

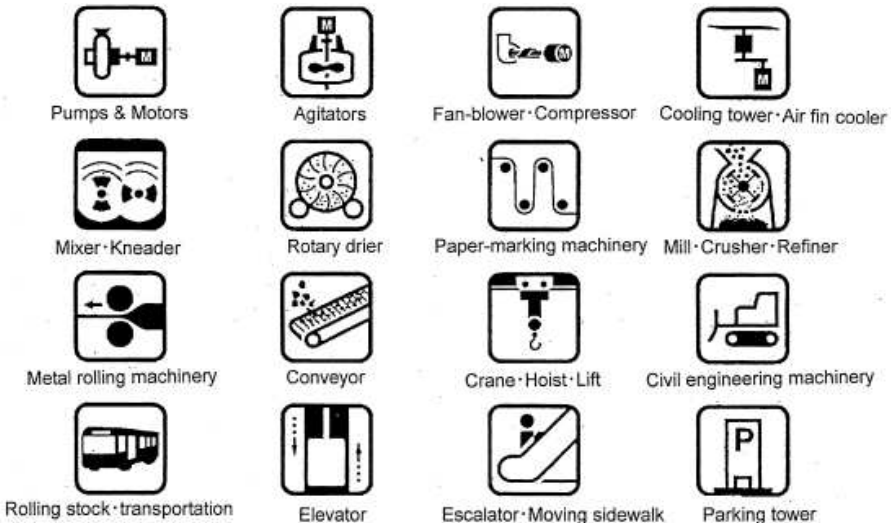
### 3. Practical Use

#### 3-1. Management and Simplified Diagnosis of Grease Lubricated Bearings & Gears

- ◆ To be used to diagnose the steel dust contents in the grease applied for lubrication of low speed rotation to high speed rotation machinery.

Most useful for the diagnosis of the abrasion of the bearing and gears used at low speed rotation and difficult to diagnose with the vibration method, and to improve the accuracy of diagnosis when jointly used with the vibration method for medium and high speed rotation machinery.

- ◆ Preliminary diagnosis for SOAP method, ferrography method, etc. Useful tool for preliminary diagnosis as a cost saving for maintenance.
- ◆ Example of various use



3-2. Correlation between the Abrasion of the Bearing and Steel Dust Concentration in the Grease.

Table 2 shows the inspection results of correlation between the abrasion of the bearing and steel dust concentration by disassembling and inspecting the bearing of various rotating machinery such as motors, pumps and blowers.

**Table 2 Correlation between the Abrasion of the Bearing and Steel Dust concentration in the Grease**

Fe concentration %Wt	Number of bearing and status of abrasion
0.3 – 1.0	◆◆◆
0.1 – 0.3	●●▲▲▲▲
0.05 – 0.1	●●●●●
0.03 – 0.05	○○
0.01 – 0.03	○○○○○○○○○○
0 – 0.01	○○○○○○○○○○○○
Table number of bearings 36 pieces ◆ = Large damage (continuous flaking of inner and outer rings) ▲ = Medium damage (partial flaking of inner and outer rings) ● = Slight damage (slight flaking, discolored abrasion of inner and outer rings) ○ = No abnormality	

3-3. Criterion

The following table is an example of the criterion.

This criterion is relatively strict in order to carry out appropriate corrective lubrication improvements, to detect the abnormal trend at an early stage.

**Table 3 Criterion of the Steel Dust Concentration in the Grease**

	Criterion	Countermeasure
Normal value	Smaller than 0.05%	Management of steel dust contents in the grease at normal cycle
Precaution value	0.05 – 0.1%	Repeat grease lubrication and remeasure the steel dust concentration 1 month later.
Irregular value	Greater than 0.1%	Countermeasure for improvement of lubrication, precision diagnosis at short cycle management.

### 3-4. Cycle of Measurement

The cycle of measurement of the grease steel dust concentration is related to collection of extracted grease at the cycle of lubrication of fresh grease to the rotating machinery.

The cycle of grease application would differ with the kind and the specifications of the rotating machinery used, and must be determined with the condition of operation, the table below show an example of the cycle of measurement.

**Table 4 Cycle of Measurement of the Steel Dust Concentration in the Grease**

<b>Kind of Rotary Machinery</b>	<b>Cycle of Measurement</b>
Low speed rotary machinery at normal temperature	3 – 6 months
Medium and high speed rotary machinery at normal temperature	3 – 6 months
Low speed rotary machinery at high temperature	1 – 4 months

When an abnormal trend of the measured steel dust concentration in the grease is detected, the cycle of measurement shorten depending on the degree of abnormality. Also, improving the cycle of grease lubrication may reduce progress of abrasion; as a result the countermeasure would lead to the extension of the machinery life span.

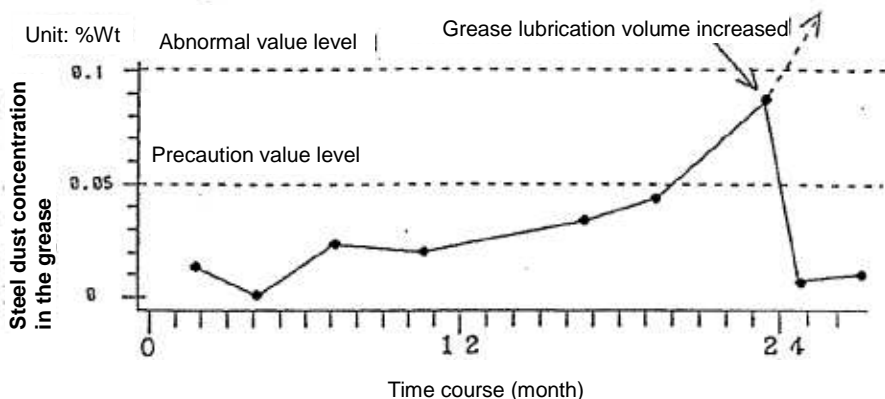
### 3-5. Simplified Diagnose of the Management Trend and Abrasion of the Bearing.

The simplified diagnose of the steel dust concentration in the grease would provide abrasion status of the bearing, the criterion can be made with a single measurement data, also important for the management trend by conducting periodical measurement.

Generally, the steel dust concentration in the grease of the bearing is a low development, but with the progress of abrasion the steel dust concentration shows a conspicuous increase.

The management trend is possible by obtaining the increase trend of steel dust concentration in the early stage of abrasion, by conducting an appropriate lubrication countermeasure at the early stage of abrasion, for the life extension of the bearing.

The graph below shows the management trend of the steel dust concentration at the stage of insufficient lubrication of the bearing used in an agitator.



## Manual Revision History

<b>Edition No.</b>	<b>Date</b>	<b>Change</b>
SDM-72 CEET	June, 2008	

Additional copies of this operation manual are available.  
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