



SMART

Scheduled Maintenance And Reliability Testing
SERVICE

SMART SERVICE

Providing Preventive and Predictive
Maintenance Diagnostics
for SCR Copper and
Aluminum Rod Systems



INFRARED TEMPERATURE MEASURING



VIBRATION MEASUREMENT



END AND PARTING PLAY MEASUREMENT



LUBRICATION OIL ANALYSIS

SCHEDULED MAINTENANCE AND RELIABILITY TESTING



SCR SMART SERVICE PROGRAM

Scheduled Maintenance And Reliability Testing

SCR SMART Service Program provides preventive and predictive maintenance diagnostics for SCR copper and aluminum rod systems to determine system conditions including:

- *Temperature Observations*
- *Vibration Monitoring*
- *Radial and Axial Movement Analysis*
- *Lubrication Oil Quality Assessment*

SCR SMART Service Program compares observed equipment condition to optimal equipment condition for the following benefits:

- *Greater Equipment Reliability by Increasing Plant Readiness*
- *Data Trending to Schedule Maintenance with Planned Shut-Downs*
- *Reduced Labor and Parts Costs from Uncontrolled Catastrophic Failures*
- *Identification of Otherwise Unknown Deficiencies*

SCR SMART Service Program uses data from information recorded by SCR during a visit to the site. The initially recorded information is used to determine existing deficiencies and as a baseline for operational effectiveness at your facility. Future recorded information is compared to the baseline information to determine changes over time that may affect operational effectiveness.

BENEFITS

REDUCE PRODUCTION COSTS
INCREASE RELIABILITY (more uptime)
IMPROVE PRODUCT QUALITY

PREVENTS

UNSCHEDULED DOWNTIME
EQUIPMENT DAMAGE
SAFETY ISSUES



SAVINGS

LABOR, PRODUCTION AND DELIVERIES
PARTS, SERVICES AND TIME
REDUCED SCRAP



SMART

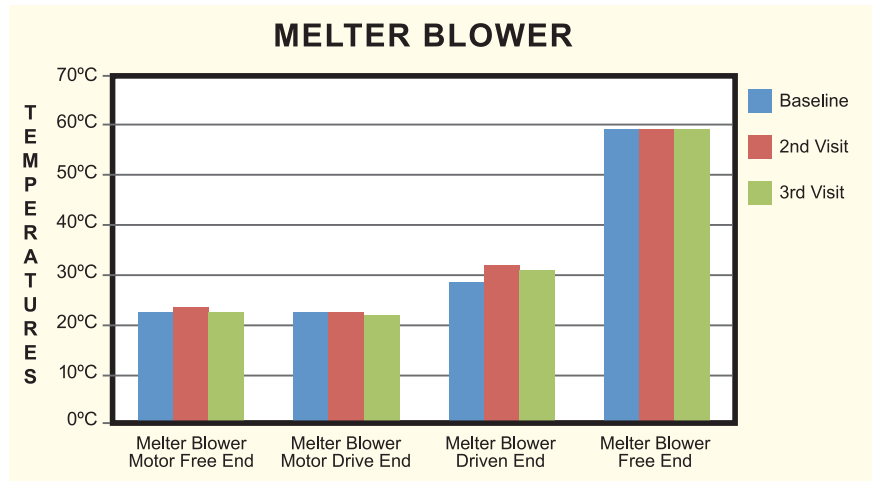
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TEMPERATURE ANALYSIS REPORT

Example: Temperature data was collected on the furnace blower motor.

Purpose: The temperatures of all motor bearings and couplings were collected to establish a baseline. The baseline data was documented so it can be compared to data collected in the future. Problems that develop over time are noted in a report for identification prior to component failure.

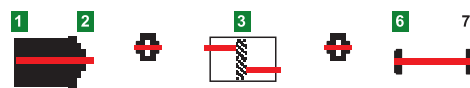


VIBRATION ANALYSIS REPORT

Example: During on-site observations, moderate and extreme bearing wear as well as moderately loose housings were identified.

Recommendation: Disconnect the motor and output couplings, and verify that radial and axial movement is within the required 0.1 mm tolerance. Follow periodic maintenance practices to check the couplings for signs of gear wear.

Drive Train



Diagnosis

| Fault Description | Fault Severity | Severity Score | Severity Scale |
|-----------------------------------|----------------|----------------|----------------|
| Non-standard Fault Detected | Extreme | 100/100 | ██████████ |
| Non-standard Fault Detected | Serious | 53/100 | ███░░░░░ |
| Gearbox Ball Bearing Wear | Moderate | 41/100 | ███░░░░ |
| Motor Drive End Bearing Looseness | Moderate | 34/100 | ███░░░ |
| Motor Free End Bearing Looseness | Moderate | 27/100 | ███░░ |
| Motor Drive End Bearing Wear | Slight | 12/100 | ███░ |

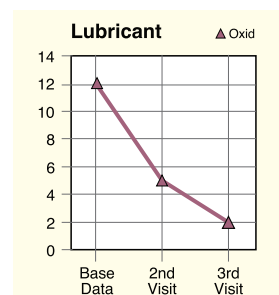
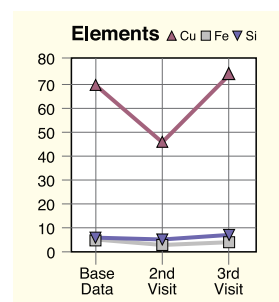
Recommendations

| Recommendations | Priority | Priority Description |
|--|----------|----------------------|
| Contact Vibration Specialist | 4 | Mandatory |
| Replace Coupling And Align Unit | 3 | Important |
| Monitor All Motor Bearings For Increased Vibration | 2 | Desirable |

LUBRICATION OIL ANALYSIS

Example: Several test results exceeded the acceptable contamination limits. The questionable locations were resampled. The test results were confirmed and excessive amounts of water were identified. Possible sources of water intrusion include leaking seals, condensation due to low operating temperature or prolonged shut-down, outside contamination, or integrity of the oil cooler.

Recommendation: Correction of the water contamination source is recommended along with removal of the water or replacement of the oil.



Sample Data

| | | | |
|--------------|------------|------------|------------|
| Sample ID | 4043633070 | 4003242001 | 3310265034 |
| Date Sampled | Base Data | 2nd Visit | 3rd Visit |

Wear Elements - ppm (mg/kg)

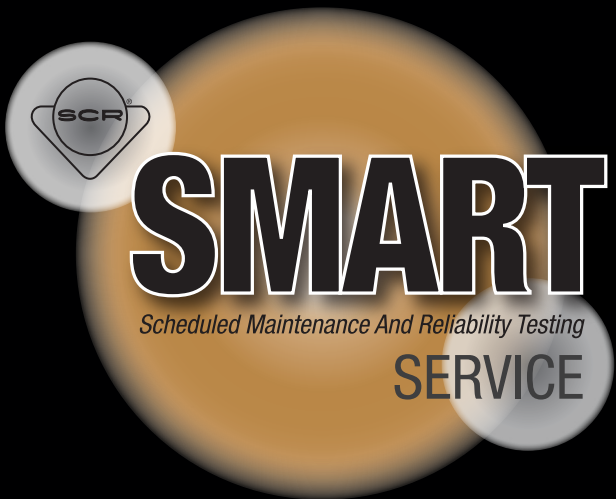
| | | | |
|-----------------|----|----|----|
| Al (Aluminum) | 0 | 0 | 0 |
| Cr (Chromium) | 0 | 0 | 0 |
| Cu (Copper) | 60 | 74 | 48 |
| Fe (Iron) | 2 | 3 | 2 |
| Mo (Molybdenum) | 6 | 9 | 2 |
| Ni (Nickel) | 0 | 0 | 0 |
| Pb (Lead) | 0 | 0 | 0 |
| Sn (Tin) | 0 | 0 | 0 |

Lubricant Data

| | | | |
|-------------------|-------------|-----------|-----------|
| Contamination | *Alert | *Alert | *Alert |
| Equipment Rating | Normal | Normal | Normal |
| Oil Rating | Normal | Normal | +Caution |
| Visc@40C (cst) | 140.4 | 141.9 | 152.2 |
| Oxidation (Ab/cm) | 0 | 2 | +5 |
| Water (Hot Plate) | NotDetected | *Detected | *Detected |

Contaminant Elements - ppm (mg/kg)

| | | | |
|---------------|------|------|---|
| B (Boron) | 1 | 2 | 1 |
| K (Potassium) | 7 | 8 | 7 |
| Na (Sodium) | *263 | *366 | |
| Si (Silicon) | 4 | 6 | 4 |



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