Reliability

We create the best value

The Reliability Assessment Center at the Korea Institute of Machinery & Materials (KIMM) is the government designated reliability certification organization for machinery parts in Korea. We are devoted to the quality improvement of machinery and mechatronics parts by establishing a reliability assessment (performance, environment, safety and durability) system that is world class and providing technical support.

For the past 15 years, we have been dedicated to the propagation and expansion of reliability technologies to domestic companies based on accumulated reliability technologies, state of the art assessment equipment and experts. And to solve reliability problems, we provide total solution including test plan, test and certification.
Improvement of the Reliability of Machinery Parts and International Competitiveness

Research Support Areas

Providing Total Solutions of Reliability Technology

Reliability Certification
- Development of reliability assessment standards
- Reliability assessment and certification (R-Mark)
- Support of international mutual certification

Technical Support
- Analysis and interpretation of failure causes
- Development of accelerated test methods
- Development of reliability assessment equipment
- Support of product design

Test & Assessment
- (Accelerated) life tests
- Environmental tests
- Performance / Safety tests
- Precision measurement

R&D Projects
- Reliability assessment infrastructure establishment project
- Reliability-based technology expansion project
- Material and part technology development project
- Corporate consignment project

Future Direction of the Reliability Assessment Center

Infrastructure Establishment Stage
(2000 ~ 2005)
- Establish reliability hardware
  ▶ Establish Infrastructure (personnel, equipment, standards)
- Designate reliability assessment agency for machinery parts
- Establish reliability assessment center for machinery parts

Propagation & Expansion Stage
(2006 ~ 2011)
- Establish support system for mutual cooperation for reliability
  ▶ Linking customers and suppliers
- Cooperate with the customer for reliability improvement
- Designate reliability certification agency for machinery and mechatronics parts

Taking off & Development Stage
(2012 ~ )
- Support reliability technology service
  ▶ Strengthen reliability software
- Strengthen support of test assessment and technology services for companies
- Develop methods, such as accelerated tests and comparative assessments
Definition of Reliability

- Reliability is the probability that an item performs its intended functions without failure in the given normal use conditions for the required period.

In other words, it is a quantitative expression of how long an item can be used while it performs its proper functions.

Concept of Reliability Assessment

- A reliability assessment is a ‘comprehensive quality assurance’ system. It comprehensively assesses the required performance, environment, durability (life) and safety of an item. Based on the test results, it improves design and performance of an item by analyzing failures and life problems or provides reliability certification.
Reliability Certification

- To strengthen the market competitiveness of a product through objective reliability assessment

**Concept of Reliability Certification**

- Reliability certification is to guarantee product lifetime by carrying out test assessment (performance tests, environmental tests, life and safety tests) according to the reliability assessment standards to ensure that the product satisfies customer’s reliability requirements
  - 2000 Designated reliability assessment agency in machinery parts area (Ministry of Trade, Industry & Energy)
  - 2009 Designated reliability assessment agency in machinery and mechatronics parts area (Ministry of Knowledge Economy)

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**Reliability Certification Procedure**

1. **Apply for reliability assessment**
   - Search for related standards
   - Analyze normal use conditions and failure cases
   - Validate assessment standards
     - Working group meeting
     - Expert technical committee

2. **Develop reliability standards**
   - Performance tests
   - Environmental tests
   - Safety tests
   - (Accelerated) life tests

3. **Design and develop assessment equipment**

4. **Reliability assessment**

- Review by technical committee
- Export support
- Obtain prestigious international certification marks

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**RELIABILITY ASSESSMENT CENTER**
- Total solution! Reliability test assessment of large parts and cutting edge technology all at one site

**Life Tests**
- Test plan, test and data analysis
- Certification test to meet the customer requirements
- Accelerated test to shorten test time by using severer conditions than normal use conditions
- 114 types of life test equipment for machinery and mechatronics parts

**Environmental Tests**
- One stop service for environmental test based MIL-STD-810G
- Design of test codes based on normal use conditions
- Environmental tests required by MIL, IEC 60068 series and KS standards
- 35 types of environmental test equipment for vibration, temperature, acceleration, dust and shock, etc.

**Providing one stop services for environmental tests**

<table>
<thead>
<tr>
<th>High temperature</th>
<th>Low temperature</th>
<th>Humidity</th>
<th>Vibration</th>
<th>Acoustic noise</th>
<th>Rain</th>
<th>Thermal shock</th>
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<tbody>
<tr>
<td>Mechanical shock</td>
<td>Sand and dust</td>
<td>Solar radiation</td>
<td>Low pressure(altitude)</td>
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<td>Explosive atmosphere</td>
<td>Temperature, humidity, vibration and altitude combined environment</td>
<td>Vibro-acoustic temperature combined environment</td>
<td>Icing freezing rain combined environment</td>
<td>Immersion</td>
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<td>Fungus</td>
<td>Acceleration</td>
<td>Salt spray &amp; fog</td>
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**Performance / Safety Tests**
- Tension, compression and fatigue tests using 100 ton class tension and compression tester
- 500 MPa impulse test and pressure test
- Driving device efficiency test using 1700 HP Dynamometer
- Performance tests for various machinery and mechatronics parts

**Precision Measurement**
- 3 dimensional shape measurements
- Straightness and roundness measurements
- Flatness and surface roughness measurements
Providing fast, accurate and customized technology support services for companies

Analysis of Failure Causes and Mechanisms
- Designated a center for the investigation of mechanical and physical accidents (2011, Korea Agency for Technology & Standards)
- Analysis of failure causes and support of design improvement from the reliability test assessment
- Analysis of failure mechanisms through stress and structure analysis
- Support of failure analysis methods such as FTA, FMEA, QFD
- Failure reproduction and improvement tests
- Wear analysis using lubricant oil

Development and Support of Accelerated Tests
- Identification of effective stresses for accelerated life tests
- Design of accelerated test conditions and data analysis
- Support of accelerated test equipment and tests execution
- Development and consulting of accelerated test method

Development of Reliability Assessment Test Equipment
- Design and production of about 75% of proprietary test equipment (150 types)
- Development and application of failure self–diagnosis control algorithm for unmanned test
- Design and production of control systems and programs
- Design of jigs and utilities for life and performance tests

Support of Product Design
- Concept, basic, detailed and optimum designs for product development
- Design modification for improving performance and structure
- Support of 2D and 3D design professionals
Maximizing operational efficiency of the government’s R&D projects by using the test assessment infrastructure of the Reliability Assessment Center

- Reliability assessment infrastructure establishment project
  - Establishing reliability assessment infrastructure (personnel, equipment, technology)
  - Reliability assessment and certification
  - Supporting reliability methods

- Reliability-based technology expansion project
  - Customer linked type project
  - Independent type project

Reliability Assessment Infrastructure Establishment Project

- Project to expand reliability assessment infrastructure and support the development of up-to-date reliability methods to improve reliability and facilitate the market entrance of Korean parts through the objective verification of the reliability of Korean parts
  - Develop reliability assessment standards and provide technology support for reliability assessment, certification, equipment use and reliability technology expansion

Reliability-Based Technology Expansion Project

- Project to support the improvement of the reliability of parts and finished products by using public research institutions that have reliability infrastructure (personnel, equipment and technology)
  - Customer linked type project: Form consortiums of part companies, customers and Reliability Assessment Center(Duration: 2 years, government support: up to 500 million KOREAN WON each year)
  - Independent type project: Form consortiums of part companies and Reliability Assessment Center(Duration: 1 year, government support: up to 150 million KOREAN WON each year)

Material and Part Technology Development Project

- Project to support the development of core parts that are essential for technology innovation and to improve the competitiveness of materials, parts and other areas that have bright prospects for entry into the global market for the continuous development of the Korean part industry
  - Customer linked project: Develop core parts that are necessary for technology innovation and enhanced competitiveness to create bright prospects for entry into the global market(Duration: 5 years, government support: up to 1.8 billion KOREAN WON each year)
  - Investor linked project: Develop core parts to improve the adverse balance of trade with Japan and narrow the technology gap(Duration: 3 years, government support: up to 1.8 billion KOREAN WON each year, private investment and reliability assessment essential)

Corporate Consignment Project

- Project to support test assessments, failure analysis, test methods development, product design and equipment development to solve company reliability problems by using the personnel, equipment and technology of the Reliability Assessment Center
  - Project that is carried out through a contract between a company and Reliability Assessment Center without governmental fund
Life & Performance Test Equipment – 114 types

- **General Machinery Parts**: 35 types
  - Hydraulic breaker test equipment
  - Ball screw test equipment
  - Industrial radiator test equipment
  - (5 Ton, 20 Ton and 100 Ton class) Compression & tension test equipment
  - Multi axis fatigue test equipment
  - 40 kN·m class torsion fatigue test equipment

- **Power Train Parts**: 29 types
  - Transmission test equipment
  - Clutch dynamometer
  - Diesel engine test equipment
  - High speed dynamometer system
  - 3-axis hybrid dynamometer

- **Hydraulic Parts**: 25 types
  - Hydraulic cylinder test equipment
  - Hydraulic valve test equipment
  - Oil pump test equipment
  - Hydraulic hose test equipment
  - Oil cooler test equipment

- **Machine Element Parts**: 20 types
  - Bearing test equipment
  - Spring test equipment
  - Coupling test equipment
  - Seal & Packing ALT test equipment
  - Bolt & Nut test equipment

- **Pneumatic Parts**: 5 types
  - Pneumatic cylinder test equipment
  - Pneumatic solenoid valve test equipment
  - Regulator test equipment
  - Rotary actuator test equipment
  - Pneumatic chuck test equipment
Environmental Test Equipment – 35 types

- Hydraulic vibration test equipment
- HALT test equipment
- (Salt spray / humidity / temperature) combined environmental test equipment
- Thermal shock test equipment
- High frequency electric vibration test equipment
- Acceleration(Centrifuge) test equipment
- Freezing rain test equipment
- Rapid refrigeration chamber
- Horizontal vibration test equipment
- Rain test equipment
- Salt spray & fog test equipment
- Mechanical shock test equipment
- Environmental Walk-In chamber
- Blowing dust test equipment
- Blowing sand test equipment
- Settling dust test equipment
- Solar radiation test equipment
- Small temperature & humidity chamber
- Medium temperature & humidity chamber
- Immersion test equipment
- Mud test equipment
- (6DOF) Vertical excitation system
- Drop test equipment
- Ultra high temperature & vibration combined environmental test equipment
- Fungus test equipment
- Explosive atmosphere test equipment
- (Temperature / humidity / vibration / altitude) combined environmental test equipment
- Fluid contamination test equipment
- Fire proof test equipment
- Ozone test chamber
- (Hybrid) Large HALT test equipment
- Extreme environment(−165°C ~400°C) chamber
- (Vibration / noise / temperature) combined environmental test equipment
- Rapid refrigerating and heating system
- Under water combined environmental test equipment
Equipment List

Analysis / Instrumentation Equipment – 40 types

Analysis Equipment : 12 types
- Optical profile projector
- 3D scanning measurement system
- Telemetry data acquisition & control system
- High speed motion analyzer
- FEMFAT software
- Wear( Particle counter) analyzer
- Real time data acquisition & control system
- 3D modeling simulation system
- Pro engineer system
- Laser interferometer calibration system
- Real time logic analyzer
- Vibration & noise analysis system

Instrumentation Equipment : 28 types
- Cylindrical roundness measurement system
- 200CH strain measurement system
- Digital borescope measurement system
- Real time hydraulic viscosity measurement system
- Surface roughness measurement system
- 3 dimension measurement system
- Ultrasonic flow measurement system
- Micro rubber hardness degree tester
- Multi-channel noise & vibration measurement system
- Torque measurement system
- Infrared thermal imager
- Laser optical alignment
- Flowrate measurement system
- Hydraulic brake valve performance measurement equipment
- Hydraulic PWM valve performance measurement equipment
- Hydraulic control regulator performance measurement equipment
- Pneumatic valve performance measurement equipment
- Dynamic characteristics tester
- Voltage type noise and vibration sensor
- Torque calibration system
- Flow rate calibration system
- Modular mounting noise measurement system
- 100 kN·m large torque calibration system
- Compressed gas flow calibration system
- Temperature sensor calibration system
- Unbalance measurement & calibration system
- Bearingless torque measurement system
- HILS(Hardware In Loop Simulation) system
Reliability Assessment Center at KIMM

For reliability assessment application and more information

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