

Recommendation of Maintenance of Power Generation Facilities

**We propose the optimum maintenance plan
for the customer.**

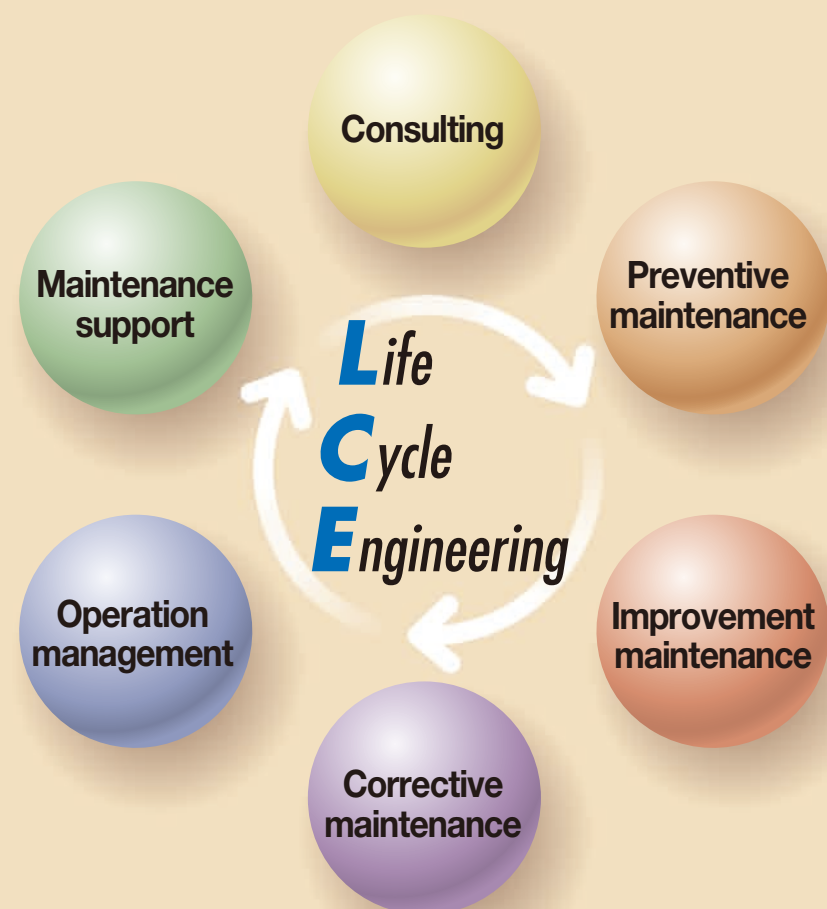


At Meidensha group,
we ensure that the customer's
generation facilities are maintained
in sound condition.

We propose life cycle engineering for existing equipment.

As maintenance professionals, we propose consulting and preventive maintenance based on an investigation of the operating environment and equipment diagnosis.

We provide 24-hour support for reliability by corvective maintenance, operation management, and maintenance support.



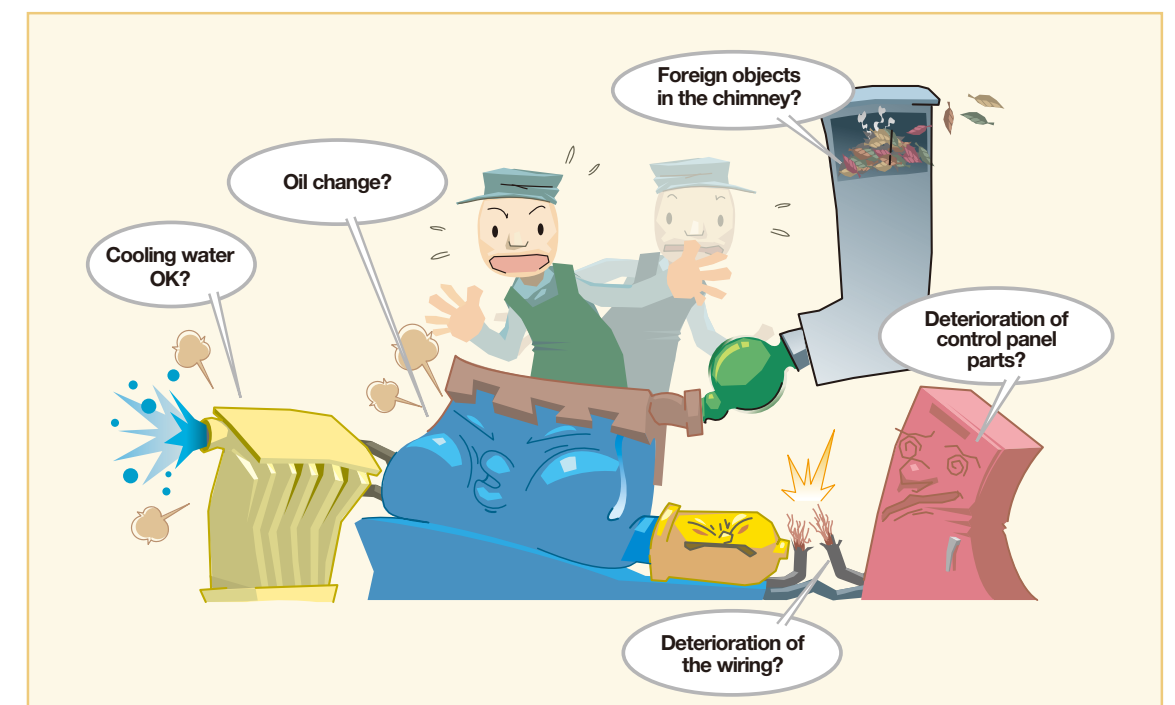
1. Necessity of Maintenance

Are you aware of this?

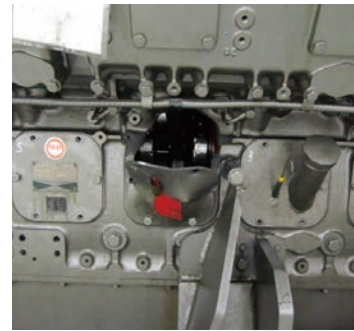
The following periodic inspections are required by law.

Emergency power-generation facilities not only provide electric power when a power failure occurs, but also play a role in protecting human lives when a disaster occurs.

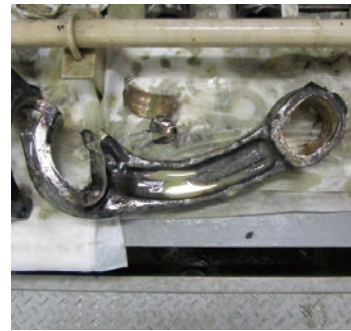
	Object's	Inspection contents	Inspection			
			Inspector	Period	Inspection contents Report	Criteria
Fire Service Act	Specific fire protection objects with a total area of 1000 m ² or more	Equipment inspection General inspection	Qualified inspector for fire fighting equipment Fire protection engineer	6 months (equipment inspection) or 1 year (overall inspection)	Fire-fighting organization Once a year (specific fire protection objects)	Inspection criteria (Announcement) Inspection outline (Notification)
	Fire protection objects with a total area of 1000 m ² or more specified by a fire chief or a fire marshal				Fire-fighting organization Once every 3 years (other than the above specific fire protection objects)	
	Underground tank	Airtightness inspection	Hazardous material officer Hazardous material installation safety officer	Once a year or once every 3 years	Notification to the related organization when not passed	Specified in the Fire Service Act
Electricity Business Act	All electric facilities	Daily patrol Daily inspection Periodic inspections Detailed inspection	Related person	According to the safety regulations	--	Safety regulations
Building Standards Act	Objects specified by specific government agencies	External appearance inspection, Performance inspection.	Qualified inspector for building	Interval specified by specific government agencies (generally once every 6 months to 1 year)	Specific government agencies (generally once every 6 months to 1 year)	Work standard for periodic inspection of building (Supervision by the Building Guidance Division)



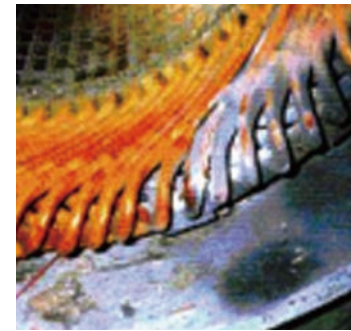
2. Examples of accidents and causes



Cylinder block breakage



Breaking of engine parts



Burnout caused by insulation breakdown of the stator winding



Burnout of the AVR control section caused by contamination



PT burnout caused by insulation deterioration



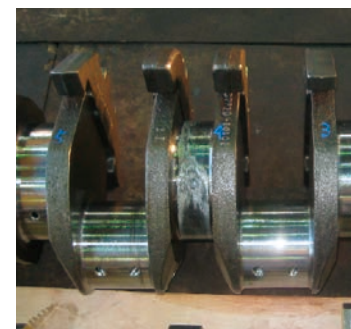
Corrosion in the cooling water tank



Contamination in the fuel tank



Emulsification of the lubricating oil caused by the entry of cooling water

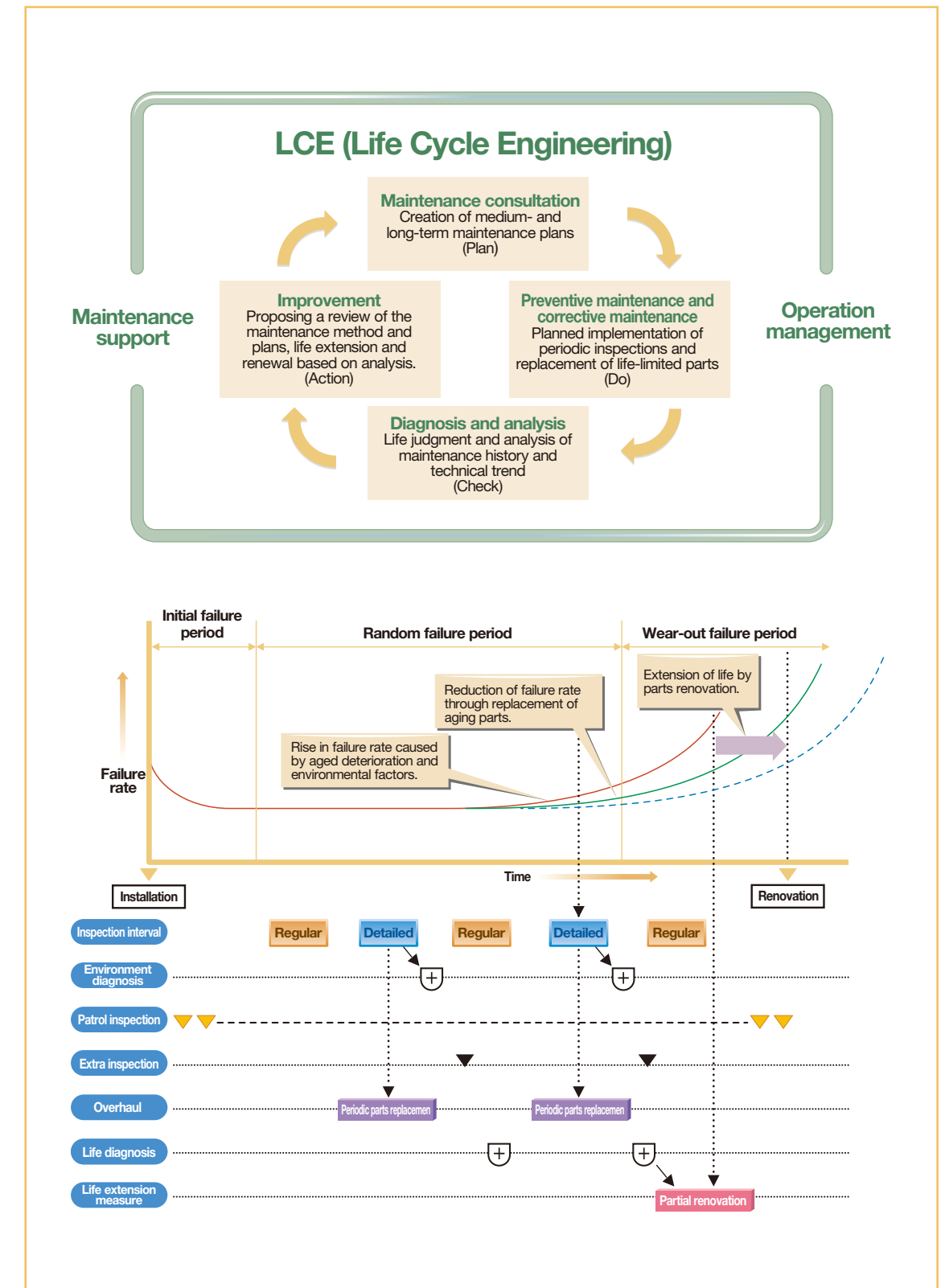


Main bearing burnout caused by engine oil deterioration

3. Maintenance process

The accident rate is increasing caused by aging deterioration and environmental conditions.

Long-term safe operation becomes possible by repeating the following main processes during the whole life cycle.



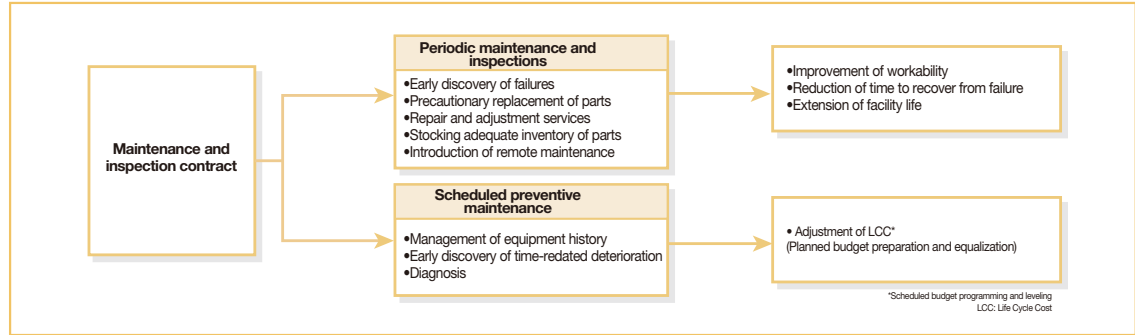
4. Recommendation of a Maintenance Contract

For Long-Term Stable Operation of your Facilities

In order to assure long term, safe operation of your facilities without problems, we are able to undertake maintenance and inspection services on your behalf. In order to optimize maintenance service to your facility operation plan, we strongly recommend that you complete a maintenance and inspection contract so that inspection and repair services can be accomplished promptly and most efficiently.

Advantages of a maintenance and inspection contract signed with our company.

- ① Assured inspection and adequate replacement of parts can be carried out in consideration of time-related deterioration.
- ② Deterioration symptoms can be discovered at early stage. Predictive measures are taken to avoid failures.
- ③ Supplementary parts (authentic) can be furnished promptly.
- ④ Professional engineers offer proposals for repairs and improvements, and provide timely technical support.
- ⑤ Life cycle cost can be reduced.



Contents of the maintenance inspections

Classification		Contents		Purpose	Cycle
Inspection	Fire Service Act inspection *1	Equipment inspection	Inspection of operation, outer appearance, and functions.	Legal inspections according to the Fire Service Act	Once/6 months
		General inspection	Overall inspection of operation, outer appearance, and functions.	Legal inspections according to the Fire Service Act	Once/year
	Regular inspection	Function confirmation, external appearance, visual, and cleaning.		Inspection/examination to determine whether measured values have been met and startup is possible without abnormalities	Once/6 months to 3 years
	Engine	Gas turbine	Endoscope inspection	Confirmation of the inside which is not normally visible	Once every 1 to 3 years
	Detailed inspection	In addition to external appearance, visual, and cleaning, the characteristics of the unit itself are measured, and overall detailed function confirmation is performed.		Inspection/examination to determine whether the measured values are satisfied for circuit breakers, control units, timers, and other single products.	Once every 3 to 6 years
	Extra inspection	Repair/restoration is performed when abnormalities have been detected by various inspections or when an accident has occurred.		Emergency repair, parts replacement	Any time
	Underground tank inspection	Legal inspection (minute pressurization, minute depressurization test)*3		Leakage inspection	Once per year or every 3 years
Maintenance	Control panels	Parts replacement		Replacement of parts that have exceeded their life	Refer to the next page.
	Generators	Insulation diagnosis *2		Generator body insulation resistance diagnosis	Over 10 years
		Maintenance in a factory		Disassembly servicing and winding rewinding in a factory	Over 20 years
	Engines	Diesel engines	Top overhaul	Opening of the cylinder head and confirmation of the inside	Once every 4 to 6 years
			Full overhaul	Internal confirmation for all parts that can be disassembled	Once /8 to 10 years
		Gas turbines	3-year servicing	Replacement of parts with a life of 3 years	Once/3 to 4 years
			6-year servicing	Replacement of parts with a life of 3 or 6 years	Once/6 to 7 years
			12-year servicing	Replacement of parts with a life of 3, 6, or 12 years	Once /12 to 13 years
		Overhaul		Disassembly servicing in a factory	Once/15 to 18 years
	Subsidiary facilities	Fuel tank	Cleaning, surface preparation, painting	Removal of rust and impurities	Once/6 to 10 years
		Cooling water tank	Cleaning, surface preparation, painting	Removal of rust and impurities	Once/6 to 10 years
		Underground tank	Cleaning, surface preparation, painting	Removal of rust and impurities	Once/10 to 15 years

*1:Fire Service Act Inspections are performed in accordance with Section 3-3 of Article 17 of the Fire Service Act.

*2:The object of insulation diagnosis is high-voltage equipment and higher.

*3:The inspection interval differs according to the construction of the underground tank and the number of years that have elapsed.

Table of electric parts replacement cycle for emergency power-generating facilities

Classification	Part name	Replacement years
Parts related to panels	Fuses	3 to 6 years
	Timers	10 years
	Auxiliary relays	10 years
	Voltage sensors	7 years
	Magnet switches	12 years
	Various switches	10 years
	Indicating instruments (transducers)	10 years
	VTT-CTT	10 years
	MCCB	15 years
	Instrument transformers	15 years
Main equipment	Automatic voltage regulators (AVR)*1	10 years
	Touch panels	7 years
	Printed circuit boards	10 years
	Programmable Logic Controller (PLC)	10 years
	Batteries for PLC's	2 years
	Power supply modules for PLC's	7 years
	Protective relays	12 years
	Chargers	10 years
	DC/DC, AC/DC converters	7 years
	Electric governor	7 years
	Synchronizing equipment	10 years
	Circuit breaker replacement parts (at the time of detailed inspection)	12 years
	Circuit breakers	15 to 18 years
	Catalyst plugs	5 years
	Lead storage batteries (HS type)	7 years
Batteries	Lead storage batteries (CS type)	10 years
	Lead storage batteries (MSE normal type)	7 years
	Lead storage batteries (MSE long-life type)	14 years
	Alkali storage batteries *2	12 years

*1: The number of years for replacement of AVR may vary according to the type and the environment.

*2: In an environment where the ambient temperature is 30°C or higher, the number of years for batteries may be reduced.

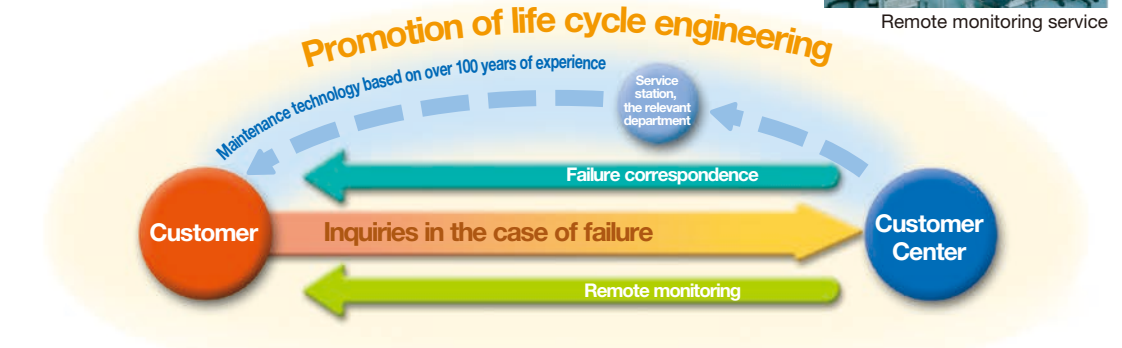
Customer Center

We implement more efficient maintenance based on over 100 years of experience as a heavy electric machinery maker.

- We respond to failure information from our customers 24/7 every day of the year.
- We plan for quick resolution of problems in direct connection with our service stations all over the country.



Remote monitoring service



Every day of the year

- We respond to inquiries concerning our delivery of products and failure information to the customer 24/7. (Japan domestic only)

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