Safety Devices for Gas Turbines Used for Propulsion

Amended Rules and Guidance

Rules for the Survey and Construction of Steel Ships Part D
Rules for High Speed Craft
Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use

Reason for Amendment

IACS UR M60 specifies requirements related to safety devices for gas turbines used for propulsion, and NK has already incorporated the UR's requirements into its Rules.

Since the UR has not been fundamentally reviewed since 1997, IACS recently decided to review it based on input it has received from various manufacturers over the years. As a result, IACS adopted UR M60(Rev.1) to amends requirements for such safety devices to allow for their installation to be based on failure mode and effects analysis (FMEA).

In addition, UR M44 which specifies requirements related to documents for the approval of diesel engines and which was also referred to during the above-mentioned review, was also amended as UR M44(Rev.10 Corr.1) to make minor changes to reference materials for FMEA.

Accordingly, relevant requirements are amended in accordance with URs M60(Rev.1) and M44(Rev.10 Corr.1).

Outline of Amendment

(1) Amends requirements for gas turbine shut-down functionality and alarm devices to make it possible to consider the results of failure mode and effects analysis.
(2) Deletes statements related to the approval of failure mode and effects analysis found in the reference materials for diesel engine approvals.

"Rules for the survey and construction of steel ships" has been partly amended as follows:

Part D MACHINERY INSTALLATIONS

Chapter 4 GAS TURBINES

4.3 Safety Devices

Paragraph 4.3.2 has been amended as follows.

4.3.2 Shut-down Devices

1 Gas turbines are to be provided with hand trip gear for shutting off the fuel in an emergency which is to be provided at the control station.

2 Unless the FMEA proves that the adverse effects due to failures occurring are within acceptable ranges, the shut-down functions for gas turbines are to be provided in accordance with **Table D4.1**.

~~**2**~~**3** Gas turbines are to be provided with a quick closing device (shut-down device) which automatically shuts off the fuel supply to the turbines at least in the cases of the following **(1)** to **(7)**. In addition, means are to be provided so that alarms are operated at the control station by the activation of these shut-down devices.

((1) to (7) are omitted.)

~~**3**~~**4** In addition to the requirements specified in ~~**2**~~**3** above, gas turbines used as main propulsion machinery are to be provided with a quick closing device (shut-down device) which automatically shuts off the fuel supply to the turbines in at least the following **(1)** to **(3)** cases. In addition, means are to be provided so that alarms are operated at the control station by the activation of these shut-down devices.

((1) to (3) are omitted.)

Paragraph 4.3.3 has been amended as follows.

4.3.3 Alarms

Gas turbines are to be provided with alarm devices as required by **Table D4.1**. The addition or omission of alarm devices, however, may be accepted taking into account the results of failure mode and effects analysis (FMEA).

Paragraph 4.3.5 has been amended as follows.

4.3.5 Additional Safety Devices

Gas turbines may be required to be provided with additional safety devices as required in order to safeguard against hazardous conditions arising in the event of malfunctions in the gas turbine installation. Such hazardous conditions are to be verified by the manufacturer in accordance with the failure mode and effects analysis (FMEA).

"Rules for high speed craft" has been partly amended as follows:

Part 9 MACHINERY INSTALLATIONS

Chapter 3 GAS TURBINES

3.3 Safety Devices

Paragraph 3.3.2 has been amended as follows.

3.3.2 Shut-down Devices

1 Gas turbines (excluding those driving emergency generators) are to be provided with at least two independent means of quickly stopping the gas turbine under any operating conditions by shutting off the fuel which are to be provided at the control station. At least one of these means is to be hand trip gear for shutting off the fuel in an emergency. A common actuator may be used for these means.

2 Unless the FMEA proves that the adverse effects due to failures occurring are within acceptable ranges, the shut-down functions for gas turbines are to be provided in accordance with **Table 9.3.1**.

~~**2**~~**3** Gas turbines (excluding those driving emergency generators) are to be provided with a quick closing device (shut-down device) which automatically shuts off the fuel supply to the turbines at least in the cases of the following **(1)** to **(7)**. In addition, means are to be provided so that alarms are operated at the control station by the activation of these shut-down devices.

((1) to (7) are omitted.)

~~**3**~~**4** In addition to the requirements specified in ~~-2~~3 above, gas turbines used as main propulsion machinery are to be provided with a quick closing device (shut-down device) which automatically shuts off the fuel supply to the turbines in at least the following **(1)** to **(3)** cases. In addition, means are to be provided so that alarms are operated at the control station by the activation of these shut-down devices.

((1) to (3) are omitted.)

Paragraph 3.3.3 has been amended as follows.

3.3.3 Alarms

Gas turbines (excluding those driving emergency generators) are to be provided with alarm devices as required by **Table 9.3.1**. The addition or omission of alarm devices, however, may be accepted taking into account the results of failure mode and effects analysis (FMEA).

Paragraph 3.3.5 has been amended as follows.

3.3.5 Additional Safety Devices

Gas turbines may be required to be provided with additional safety devices as required in order to safeguard against hazardous conditions arising in the event of malfunctions in the gas turbine installation. Such hazardous conditions are to be verified by the manufacturer in accordance with the failure mode and effects analysis (FMEA).

“Guidance for the approval and type approval of materials and equipment for marine use” has been partly amended as follows:

Part 6 MACHINERY

Chapter 8 APPROVAL OF USE OF RECIPROCATING INTERNAL COMBUSTION ENGINES

8.2 Application and Approval of Submitted Documents

8.2.2 Drawings and Data

Sub-paragraph -1(2) has been amended as follows.

1 Drawings and data to be submitted are as specified in the following **(1)** and **(2)**, as appropriate for the type of the reciprocating internal combustion engine. Upon review and approval of the submitted drawings and data, they are returned to the licensor.

((1) is omitted.)

(2) Drawings and data to be submitted for information on an overview of the engine’s design, engine characteristics and performance

((a) to (w) are omitted.)

(x) FMEA (for engine control system)

Where engines rely on hydraulic, pneumatic or electronic control of fuel injection and/or valves, a failure mode and effects analysis (FMEA) is to be submitted to demonstrate that failure of the control system will not result in the operation of the engine being degraded beyond acceptable performance criteria for the engine. ~~The FMEA reports required will not be explicitly approved by the Society.~~

((y) to (ae) are omitted.)