

METHODOLOGY

Activities followed for preparation of EC Guidelines

A review of the EC Guidelines pertaining to industries in Japan was carried out to draw a blueprint of the EC Guidelines applicable for Indian industries. Relevant secondary data from different industries were collated through a questionnaire survey and field visits. Other sources of secondary data include (i) performance audits and sectoral study reports, (ii) original equipment manufacturers, (iii) industries, (iv) sectoral experts, (v) stakeholder consultations with industries and industry associations, and (vi) secondary sources such as relevant websites. Interactions with industry personnel and industry associations were carried out to understand key operating parameters in different utilities. Further discussions were held with OEMs and sectoral experts in India and Japan to ascertain the relevance of data collated for the different utilities. A detailed data analysis of the relevant parameters of the various utilities in industries were carried out using statistical tools to benchmark key operating parameters as 'standard value' and 'target value'. These parameters include air ratio, flue gas temperature, surface temperature, level of WHR, efficiency of motors, efficiency of fans, corrected target power factor of electrical equipment, lighting power density, etc. The average values and standard deviations of the data samples of similar groupings were arrived at through data analysis. The collated data were sanitized to exclude extremely high or low values for the purpose of analysis. In preparing the EC Guidelines, the existing technology standards and practices of various industry sub-sectors in India were considered. The draft EC Guidelines were presented in a stakeholder workshop in which representatives from industries, industry associations, original equipment suppliers, sectoral experts, etc., participated and provided their inputs.

The revised EC Guidelines were again presented in a second stakeholder workshop to ensure synergy with the industry. With these inputs, the EC Guidelines were finalized for Category-A industries. The 'standard values' of an energy-consuming utility include optimum performance values, which are achieved by the industry under daily routine operations; the 'target values' of the utility represent better performance values than the standard values. These values focus essentially on those benchmarks which shall guide the industry to improve the performance of the existing facilities, new installations, and retrofits in the existing facilities. An empirical equation was considered to arrive at standard values and target values using the average and standard deviation of the data samples, which are discussed below.

Evaluation of Standard and Target Values

Standard values

The standard values are arrived at by using the following equation: Standard value = Average value of the data samples A nominal tolerance of +2.5% to -2.5% of the standard value is considered to accommodate variations in performance of the equipment within the range of standard values. Upper limit = Standard value + 2.5% of the standard value Lower limit = Standard value - 2.5% of the standard value.

Target values

The target values are arrived at by using the following equation: Target value = Average value of the data samples - the standard deviation of the data series A nominal tolerance of +2.5% to -2.5% of the target value is considered to accommodate variations in performance of the utilities within the range of the target values. Upper limit = Target value + 2.5% of the target value and Lower limit = Target value - 2.5% of the target value.

Revision of Energy Conservation Guidelines

The EC Guidelines applicable for Category-A industries will be revised from time to time on a periodical basis based on inputs from various stakeholders and as per recommendations of the technical committee constituted by the BEE.

GUIDELINES

The EC guidelines is a comprehensive, hand-holding document related to major energy-consuming utilities in Category-A industries to guide top management as well as operators in industries to manage energy efficiently. The guidelines shall provide guidance to prepare its own 'Energy Management Manual' (EM Manual) for the efficient operation of various energy-consuming utilities in individual industries under Category-A.

4.1 Standards and Targets

The guidelines consist of two distinct components, namely, (1) the standard component and (2) target component for various common energy-consuming utilities employed across industries covered under Category A. For an industry to operate efficiently, it is essential to run various energy-consuming utilities efficiently and ensure a proper monitoring and recording of all key operating parameters pertaining to each utility. An industry shall maintain optimum operating parameters of the different utilities based on feedback received from the relevant process sections, thereby achieving optimum operation of the utility, which shall be termed as 'standard values' of operation. Thus the standard values of a utility shall be defined as:

STANDARDS ARE OPTIMUM PERFORMANCE VALUES ACHIEVED BY AN ENERGY CONSUMING UTILITY IN DAILY OPERATION.

The industry shall further improve the performance of the equipment by operating them at the best possible operating parameters, which shall be terms as "target values" of operation. The target values as mentioned in guidelines are better than the standard values, which the industry shall strive to achieve best possible performance of the equipment. Thus, the target values of a utility shall be defined as:

TARGETS ARE EQUAL TO THE BEST ACHIEVABLE VALUES OF AN ENERGY CONSUMING UTILITY IN DAILY OPERATION.

Components of Standards

The standard component comprises four distinct sections that focus on the relevant instructions concerning routine operations of the respective utilities. These include: (1) management and control, (2) measurement and recording, (3) maintenance and inspection, and (4) installation of new facility. The primary focus of the standard components is provided in Table 4.1. The instructions are intended to guide the industries to achieve optimum performance of the utilities. The concrete activities in the standard components (1), (2), (3), and (4) shall be described in the EM Manual.

(1) Management and control This section provides guidelines for managing and controlling key operating parameters in different energy consuming equipment in an industry e.g. air ratio, flue gas temperature, surface temperature, WHR, efficiency of motors, efficiency of fans, corrected power factor of electrical equipment, lighting power density etc. It further covers load sharing during part load conditions in a multiequipment e.g. part load operations of equipment such as boiler, pump, fan, blower, air compressor, air-conditioning system etc.

(2) Measurement and recording This section provides frequency of measurements and recording of operating parameters e.g. fuel consumption, temperature of steam, temperature of flue gases, analysis of flue gases, inlet and outlet temperatures of heating and cooling media, supply and return temperature of cooling water, etc.

(3) Maintenance and inspection This section highlights preventive maintenance and the overhauling schedule for various equipment. It further provides schedule for regular calibration of instruments to maintain accuracy in data measurements.

(4) Installation of new facility This section suggests directions for the installation of energy efficient equipment for retrofitting in the existing utility and system upgradation.

Components of Targets

The target components provide a set of instructions for the efficient use of energy consuming equipment or equipment and energy management practices that shall be followed to achieve the best performance of the equipment. The instructions under target components shall relate to the existing practices as well as include guidance for selecting new equipment with advanced features.

Scope of Energy Conservation Guidelines

The DC generally follows energy management (EM) policies to reduce energy consumption in different energy-consuming processes and utilities. The general guidelines for EM policy are provided in section 5. The primary equipment/utilities considered under DCs shall be grouped below.

Details of equipment under Category-A industries

- Combustion of fuel Boiler, industrial furnace, thermic fluid heater
- Heating, cooling, and heat transfer
- Heating equipment
- Air-conditioning and hot water
- supply equipment
- Boiler, steam system, condensate recovery system,
- industrial furnace, thermic fluid heater.
- Heat transport equipment, air-conditioning equipment,
- hot water equipment, thermic fluid heater
- Waste heat recovery and usage Boiler, condensate recovery system, industrial furnace, gas
- turbine, gas engine, diesel engine, thermic fluid heater
- Conversion of heat to electricity
- Power generation facilities
- Cogeneration facilities
- Boiler, steam turbine, gas turbine, gas engine, diesel engine
- Prevention of energy loss due to heat
- radiation and electric resistance
- Prevention of heat loss due to
- radiation and conduction
- Prevention of electricity loss due to
- electric resistance
- Boiler, steam
- Conversion of electricity to motive power, heat, and light
- Facilities using motors and heaters
- Industrial pump and pumping system
- Industrial air compressor and compressed air network system
- Industrial fans and blowers
- Industrial lighting system
- Cooling tower
- Transformer Motor, industrial heater, pumping system, air compressor and compressed air
- system, fan and blower, industrial lighting, cooling tower, transformer
- Industry Energy Management System Overall plant energy management