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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 3485-1998

Replacing GB 3485-83

Technical guides for evaluating the rationality of electricity usage in industrial enterprise

评价企业合理用电技术导则

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Foreword

GB/T 3485-1998 was approved by the State Bureau of Technical Supervision on 19 February 1998 and has been in force since 1 September 1998. It replaces GB 3485-83.

The document is a recommended national standard: the /T in the designation marks it as recommended rather than compulsory.

1 Scope

China's national technical guide for evaluating whether an enterprise uses electricity rationally. It is an energy management document rather than a product standard, and its subject is the gap between the electricity a plant buys and the work it gets out of it. That gap opens in three places, and the guide is organised around them: the supply itself, where the transformer count, the voltage level, the load factor and the power factor decide how much is lost before any machine turns; the conversion of electricity into mechanical work, which is mostly a question of motors sized and matched to their load rather than oversized as a precaution; and the conversion into heat, where furnace efficiency and insulation govern. The document sets the basic requirements, the evaluation principles and the methods, with the numerical targets against which a plant is judged, and it applies to all enterprises, with other electricity users able to refer to it.

This standard specifies the basic requirements, the evaluation principles and the methods for the rational use of electricity by an enterprise.

This standard applies to all enterprises; other electricity users may also refer to it.

2 Referenced standards

The provisions contained in the following standards constitute provisions of this standard through reference in it. The editions shown were valid at the time of publication of this standard. All standards are subject to revision, and parties using this standard should explore the possibility of using the most recent editions of the following standards.

GB/T 12326-90 Power quality - Voltage fluctuation and flicker

GB/T 14549-93 Power quality - Harmonics in public supply network

GB 50034-92 Design standard for lighting of industrial enterprises

GB 50033-91 Standard for daylighting design of industrial enterprises

GBJ 133-90 Standard for lighting design of civil buildings

3 Rationalisation of the enterprise power supply

3.1 The enterprise shall select a reasonable supply voltage and mode of supply according to the nature of its electricity use and its capacity.

3.2 The substation of the enterprise shall be located close to the load centre, the number of voltage transformation stages shall be reduced, the supply radius shortened, and the conductor cross-section selected according to the economic current density.

3.3 According to the number of transformation stages from the receiving end to the equipment, the total line loss rate of the enterprise shall not exceed the following: a) one stage 3.5 %; b) two stages 5.5 %; c) three stages 7 %.

3.4 Where the receiving end voltage of the enterprise is within the permitted deviation of the rated voltage, the supply voltage deviation at the electrical equipment of the enterprise shall not exceed plus or minus 5 % of the rated voltage.

3.5 The working state of the electrical equipment shall be adjusted, the distribution and the balancing of load arranged rationally, the use of electricity evened out and the load factor of the enterprise raised. According to the different circumstances, the monthly load factor of the enterprise shall be not lower than: a) continuous production 95 %; b) three-shift production 85 %; c) two-shift production 60 %; d) single-shift production 30 %.

3.6 Single-phase electrical equipment of the enterprise shall be connected evenly to the three-phase network, so as to reduce the three-phase voltage unbalance; the voltage unbalance factor of the supply network shall be less than 2 %.

3.7 On the basis of raising the natural power factor, the enterprise shall install reactive power compensation equipment, centrally or locally, on the load side. Where the maximum load of the enterprise gives a power factor lower than 0.90, the capacity of the compensation equipment shall be adjusted so that no compensation is wasted.

3.8 The enterprise shall, according to the characteristics and the pattern of variation of the

electricity used, select and configure correctly the capacity and number of transformers, and by choosing the mode of operation and arranging the load rationally achieve the economical operation of the transformers.

3.9 The substation of the enterprise shall be equipped with the corresponding measuring and metering instruments for the electrical equipment, monitoring and recording voltage, current, power, power factor, active energy and reactive energy. The accuracy class of the electricity metering instruments shall be 2.0 to 1.0 grade.

3.10 Where the electrical equipment of the enterprise has a non-linear load that produces higher harmonics and causes distortion of the network voltage and current, measures shall be taken to suppress the higher harmonics so as to meet the requirements of GB/T 14549.

3.11 Where the electrical equipment of the enterprise has impact loads or fluctuating loads that cause voltage fluctuation and flicker in the network, measures shall be taken to limit the impact and fluctuating load so as to meet the requirements of GB/T 12326.

3.12 The enterprise's own power plant and the local electricity supply shall both be assessed against the plant's electricity use indices.

4 Rationalisation of the conversion of electrical energy into mechanical energy

4.1 The type of motor shall be selected on the principle of energy saving, provided the requirements of safety, starting, braking and speed regulation of the driven machine are met.

4.1.1 For continuous operation at constant load, a synchronous motor should be used for powers of 250 kW and above.

4.1.2 A high voltage motor should be used for powers of 200 kW and above.

4.1.3 A direct current motor should not be used except where special conditions require it.

4.2 The rating of the motor shall be chosen rationally according to the load characteristics and the operating requirements, so that the motor works within its economical operating range.

4.3 When an asynchronous motor is replaced by one of a smaller rating for energy saving, the comprehensive power factor loss and the reduction in power resulting from the saving shall be calculated and the starting torque checked, and the motor shall work within its economical operating range under the condition that the mechanical load requirement is met.

4.4 When an asynchronous motor is replaced by a smaller one for energy saving, the comprehensive power factor loss, the reduction in power and the overload capacity shall be checked, and the motor shall work within its economical operating range under the

condition that the mechanical load requirement is met.

4.5 For electrical drive systems in which the mechanical load varies, an economical mode of operation shall be adopted, the speed regulation and the mode of operation chosen according to the characteristics and the economics of the system, and a technical and economic comparison made.

4.6 Under safe and economically reasonable conditions, reactive power compensation shall be applied at the terminals of the asynchronous motor to raise the power factor and reduce line losses, so as to operate economically.

4.7 For alternating current electrical drive systems, on the premise of meeting the process requirements and the safety and operation of production, the equipment, piping and load matching of the electrical drive system shall be improved through scientific management and technical modification, so as to achieve economical operation and improve the utilisation of system electrical energy.

4.8 Motors of 50 kW and above shall be provided individually with a voltmeter, an ammeter, an active energy meter and other relevant metering instruments, so that the operating parameters of the motor can be monitored and measured.

5 Rationalisation of the conversion of electrical energy into heat

5.1 According to the needs of production, the appropriate electric heating equipment shall be selected rationally. The efficiency of arc furnaces, induction furnaces and similar electric heating equipment shall be not lower than 50 %; that of box, chamber and continuous operation electric heating equipment not lower than 40 %; and that of salt bath furnaces and similar equipment not lower than 30 %.

5.2 Electric heating equipment of 50 kW and above shall be provided with a voltmeter, an ammeter, an active energy meter and a reactive energy meter, excluding resistance furnaces and electric melting furnaces, and shall be monitored and recorded. The following technical and economic indices shall be analysed statistically: a) electricity consumption per unit of product; b) efficiency of the furnace; c) power factor.

5.3 Advanced heating elements shall be adopted and the performance and shape of the furnace wall improved. Where technical and process conditions permit, refractory and insulating materials of low heat capacity and low thermal conductivity shall be used in the electric furnace.

5.4 The openings of sealed electric heating equipment shall be reduced in size, and a double-layer cover shall be fitted at the opening to reduce heat loss.