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**The norm of energy consumption
per unit product of ethylene plant**

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Foreword

The Article 4.1.4.2 of this Standard is compulsory, while the remaining articles are recommendatory.

This Standard was drafted according to the regulations specified in GB/T 1.1-2009.

This Standard was proposed by the Department of Resource Conservation and Environmental Protection of National Development and Reform Commission, and the Department of Energy Conservation and Comprehensive Utilization of the Ministry of Industry and Information Technology.

This Standard shall be under the jurisdiction of the National Technical Committee of Energy Infrastructure and Management Standardization (SAC/TC 20), and China Petroleum and Chemical Industry Federation.

Drafting organizations of this Standard: National Energy Conservation Centre, SINOPEC Economics & Technology Research Institute, CNPC Energy-saving Technology Research Centre, CNOOC Planning Department, and North Huajin Chemical Industries Group Corporation.

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The norm of energy consumption per unit product of ethylene plant

1 Scope

This Standard specifies the technical requirements, statistical range, calculation method, energy-saving management and measures of the norm of energy consumption per unit of product of ethylene plant.

This Standard applies to the calculation and evaluation of the energy consumption for the ethylene plant that uses petroleum hydrocarbons as the materials for producing ethylene, propylene, mixed C4, pyrolysis gasoline, hydrogen, and other products after being processed by steam pyrolysis, quenching, compression and separation, and the energy consumption control of new projects.

2 Normative references

The following documents are essential for the application of this document. For dated references, only the versions with the dates indicated are applicable to this document. For undated references, only the latest versions (including all the amendments) are applicable to this document.

GB 17167 General principle for equipping and managing of the measuring instrument of energy in organization of energy using

GB/T 12723 General principles for establishing allowance of energy consumption per unit throughput

GB/T 23331 Energy management systems - Requirements

3 Terms and definitions

The following terms and definitions defined according to the GB/T 12723 are applicable to this document.

3.1 Energy consumption for ethylene plant

It refers to the sum of the physical quantity of various fuels, steam, electricity and energy-consuming working medium actually consumed in the manufacturing process of ethylene plant, within the statistical reporting period,

4.3 Advanced value of energy consumption per unit product of ethylene plant

The advanced value of energy consumption per unit product of ethylene plant shall meet the requirements for the advanced value of energy consumption for unit output of ethylene or energy consumption for unit output of ethylene and propylene, specified in Table 3.

Table 3 Advanced value of energy consumption per unit product of ethylene plant

Type	Advanced Value of Energy Consumption for Unit Output of Ethylene	Advanced Value of Energy Consumption for Unit Output of Ethylene and Propylene
Ethylene plant	≤ 610kgoe/t	≤ 400kgoe/t

5 Statistical range and calculation method

5.1 Statistical range

The statistical boundary of energy consumption for ethylene plant includes various units, such as the zones for material desulfurization and dearsenication, cracking furnaces, quenching, compression and separation, the flare gas recovery compressor, the storage tanks of ethylene products, etc.; it does not include the gasoline hydrogenation unit, auxiliary boilers, main torch, spent caustic processing unit, storage tanks of other products, circulating water field, air compression station, etc. See Appendix A for the sketch map for the statistical boundary of energy consumption for ethylene plant.

5.2 Statistical requirements

5.2.1 The energy consumption statistics for ethylene plant includes fuels, electricity, steam and energy-consuming working medium. The energy-consuming working medium includes fresh water, circulating water, demineralized water, deoxygenated water, condensation water, nitrogen, and compressed air.

5.2.2 The fuels consumed by ethylene plant refer to the sum of various fuels consumed in the statistical boundary.

5.2.3 The energy consumption includes the energies consumed in the process of manufacturing, plant operation and shutdown, overhaul and maintenance; it does not include the energies consumed for basic infrastructure.

5.2.4 The magnitudes of output energies shall be consistent with those of output and input energies obtained from the statistical calculation. The output energies that have not been consumed yet shall not be used for energy output statistics.

Appendix B

(Normative)

Conversion values of the energy for ethylene plant and the energy-consuming working medium

See Table B.1 for the conversion values of the energy for ethylene plant and the energy-consuming working medium.

Table B.1 Conversion values of the energy for ethylene plant and the energy-consuming working medium

Serial No.	Item	Unit	Conversion Value Kilogram(s) of oil equivalent (kgoe)	Conversion Value Megajoule (MJ)
1	Standard Oil	t	1,000	41,868
2	Fuel Oil	t	1,000	41,868
3	Liquefied Petroleum Gas	t	1,100	46,060
4	Hydrogen-methane	t	1,200	50,242
5	Natural Gas in Oil Field	m ³	0.93	38.94
6	Natural Gas in Gas Field	m ³	0.85	35.59
7	Refinery Fuel Gas	t	950	39,775
8	Recovered Flare Gas	t	700	29,308
9	Electricity	kW · h	0.233	9.76
10	10.0 MPa Steam ^a	t	92	3,852
11	5.0 MPa Steam ^b	t	90	3,768
12	3.5 MPa Steam ^c	t	88	3,684
13	2.5 MPa Steam ^d	t	85	3,559
14	1.5 MPa Steam ^e	t	80	3,349
15	1.0 MPa Steam ^f	t	76	3,182
16	0.7 MPa Steam ^g	t	72	3,014
17	0.3 MPa Steam ^h	t	66	2,763
18	Steam below 0.3 MPa ⁱ	t	55	2,303
19	Fresh Water	t	0.17	7.12
20	Circulating Water	t	0.10	4.19
21	Demineralized Water	t	0.25	10.47
22	Desalinated Water	t	2.30	96.30
23	Low-pressure Deoxygenated Water ^j	t	9.20	385.19
24	High-pressure Deoxygenated Water ^k	t	13.20	552.66
25	Condensation Water of	t	3.65	152.81

Appendix C

(Informative)

Lower calorific values of the commonly used pure components

See Table C.1 for the lower calorific values of the commonly used pure components.

Table C.1 Lower calorific values of the commonly used pure components

Serial No.	Component Name	Unit	Lower Calorific Value Kilogram(s) of oil equivalent (kgoe)	Lower Calorific Value Megajoule (MJ)
1	Hydrogen	t	2,867	120,022
2	Carbon Monoxide	t	241	10,106
3	Hydrogen Sulfide	t	364	15,235
4	Methane	t	1,194	50,009
5	Ethane	t	1,134	47,497
6	Propane	t	1,107	46,357
7	Butane	t	1,093	45,752
8	Pentane	t	1,083	45,357
9	Acetylene	t	1,162	48,651
10	Ethylene	t	1,127	47,195
11	Propylene	t	1,094	45,799
12	Butylene	t	1,079	45,171
13	Pentene	t	1,073	44,909

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