Important check points concerning technical energy conservation measures

Business category / Items		Steel	Petrochemical	Paper/pulp
(1) Operation management		Operation management of major production facilities Advanced combustion control by computers, etc.	Optimization of naphtha-cracking furnace Combustion control of furnaces such as naphtha-cracking furnace Optimization of reflux ratio of distillation towers and optimization of steam pressure Optimum operation control by computers, etc.	Optimization of temperature, pressure, and material density in each process Optimization of electricity consumption by operation control of power generation facility and processing appliances Optimization of steam pressure Reinforcing of water conservation Effective use of waste heat
(2) Additional facilities	Thermal	Conditions of waste energy recovery (sensible heat recovery for cokes and sintered ore) Introduction of high-efficiency heating furnaces Temperature control of furnace wall Moisture control of coal charge Reduction of coking time and coking temperature	Waste heat recovery from naphtha-cracking furnace Insulation of pipes and furnace casing Effective recovery of reaction heat Collection of steam drain Construction of additional high-efficiency heat exchanger	Installation of high dew point sealing hood in paper machine Installation of high-efficiency heat exchanger Installation of automatic combustion control appliances Use of heat pump Installation of waste kiln-heat recovery appliance Use of waste as fuels
	Electrical	Idling prevention and speed control of electric motor for a roller of rolling mill Power generation by exhaust gas pressure from the furnace, exhaust heat recovery power generation Introduction of CDQ steam driven expansion turbine	High-efficiency compressor Control of number of operating units Control of rotation speed Intake air temperature control of gas turbine Rotation speed control of motor	Rotation speed control of motor Use of medium and low pressure surplus steam for power generation using mixed pressure turbine Electricity conservation of dust extracting process
(3)Production facilities		Continuous casting equipment Direct rolling equipment Continuous annealing equipment Optimization control of intervals of regenerative burner	High-efficiency radiation tube of naphtha-cracking furnace Introduction status of low-temperature low-pressure process by changing catalysts (Low density polyethylene production plant Gas phase polypropylene production plant)	Sealing of process, strengthening of pressurization, raising density Heat cascade use control of paper machine
(4) Others		Utilization of waste plastics for blast/coke furnaces	Utilization of pinch technology	Efficient use of black liquor recovered from pulp processing (Multiple-effect condensed and canned black liquor High-temperature high-pressure recovery boiler) Sludge combustion boiler

Source) Survey by the Energy Conservation Center, Japan

Items \ Business category		Cement	Plate glass	Textiles	Automobiles
(1) Operation management		Kiln combustion control	Management of solution tank (conditions of burner)	Operation management of boilers (automatic control of O_2) Operation under the optimal conditions by attaching temperature and moisture sensor Control of dyeing heat pattern	Operation management of major production facilities (high-efficiency operation, etc.)
(2) Additional facilities	Thermal	Strengthening of thermal insulation of kiln and suspension preheater Renovation of preheater Power generation using medium-/low temperature waste heat High-efficiency clinker cooler	Installation of waste heat boiler Operation condition Strengthening of thermal insulation of solution tank	Exhaust heat recovery Drain recovery Heat recovery from waste fluid Insulation for pipes Shortening pipes Operation with constant loading (accumulator)	Heat insulation of/heat recovery from oven in painting process Waste heat recovery and heat insulation of furnace in heat treatment process
	Electrical	Computer control of motive energy (rotation frequency control, etc.) Vertical mill Mill with preliminary milling High-efficiency separator	Rotation frequency control of motor	Rotation frequency control of motor Low-pressure loss type transformer	Load control of motor in machine processing process Switch from electric heating (heater, etc.) to direct heating Control of number and rotation speed of hydraulic/pneumatic motor
(3) Production facilities		NSP kiln SP kiln High-efficiency mill Fluidized bed cement calcination furnace		Short-liquor dyeing device Water-saving washer Heat setter High-efficiency dryer	Reduction of air circulation amount in painting booth in painting process Reduction of standby electricity by conversion of hydraulic/pneumatic driving into electric driving Prevention of generating surplus electricity by rapid high-precision control of welding current Rationalization of painting/drying process
(4) Others			Improvement of defect rate in quality control	Installation of distribution type boiler Introduction of cogeneration system	Heat recovery of solid waste incinerator (power generation steam, etc.) Introduction of cogeneration system

Challenges in typical energy conservation technology development

Business category	Future challenges in energy conservation technology development		
	Points for attention	Typical techniques	Problems
Steel	Rationalization of production process	Integration of high-speed continuous casting process and hot rolling process	Development of zero defect mold casting technology
	Cut-down of reduction energy	Utilization of scrap (electric furnace, cold iron-resource melting furnace)	Production of virgin iron for dilution of electric furnace (DR, IC)
	Exhaust heat recovery	Lateral production of iron and hydrogen	Establishment of optimal process
	Development of new iron producing method	Direct iron ore melting reduction technology	Establishment of optimal process
	Development of new coke production method	Future generation coke making technology	Establishment of optimal process
		Multi-purpose converter	Establishment of optimal process
	Development of materials for enabling high-efficiency	Material technology for extremely high temperature/highly critical turbine	Improvement in extremely high temperature tolerance/durability based on hyperfine structure observation technology
Petro-chemical	Rationalization of production process	Gas phase polypropylene production technology	Development of low-temperature, low-pressure, and high selectivity catalyst
	Development of low energy decomposition technology	Separation by membrane, extraction, and absorption	Development of optimal process for high-performance membrane separation
	Reduction of environmental load	Development of catalytic cracking process of naphtha	Analysis and evaluation technology using bio-technology/extremely critical catalyst
		Green chemistry	
Textile	Minimization of circulating stain solution	Nozzle-type dyeing device	Stabilization of dyeing quality
		Airborne dyeing device	Dyeing measures for fabrics with heavy weigh per unit
	Minimization of washing water	Counter-current washer	Removal of impurities such as lint
	Use of drying heat cascade	Vacuum drying system	Establishment of decompressing process
	Non-aqueous system processing	Processing technology using plasma	Improvement of treatment capacity, etc.
	Non-heating processing	Dyeing processing technology under the condition of critical CO_2 density	Development of treatment appliance
	Change in dyeing processing system	Processing equipment using ozone	Improvement of treatment capacity, etc.
		Ink-jet printing technology	Improvement of productivity, etc.
Paper/pulp	Change in paper making process	Improvement of dehydration/draining efficiency	Development/introduction of new draining technology
	Improving efficiency of paper making method	High-density paper making technology	Maintenance of paper quality
	Improving efficiency of causticizing process, omission of caustic kiln	Direct causticizing technology	Prevention of lowering of strength of pulp
		High-temperature high-pressure causticizing technology	Development of gout removal/filtration technology in high temperature
	Energy conservation of pulping process	Cooking using preliminary treatment of microbes in chips	Searching for lignin-decomposing fungi and enzymes and increasing their reaction speed, and consideration of their application to industrial technology
		Bio-bleaching technology	
	Increase in amount of power generation by high-efficiency use of black liquor	Increase in amount of power generation by gasification technology and re-powering	Development of recovered lignin utilization and improvement or efficiency in recovering chemicals
			Decrease in energy required for gasification

Source) Surveyed by the Energy Conservation Center, Japan