

Energy Saving Equipment List (Revision 4.0), Released on : 22nd Nov, 2009

Sl.No	Eligible Equipment / Technology	Advantages	Expected Effects of Energy Conservation (Bench Mark)	Specifications	Reference
1	Electrical Equipment				JCI
	# Variable Frequency Drives (VFD)	Energy Saving; Extended equipment life; reduced maintenance		JEM201,225,226,227	JCI
	# Energy Efficient Motors	Reduction 20~30% Loss by adopting of High level material Efficiency 3-5% up		JISC4212 Over 98% High Voltage	JCI
	# Energy Efficient Transformers	Improvement no load loss		Total Load Loss less than 0.3%	JCI
1.1	Lighting				JCI
	# Energy efficient fluorescent lamps (e.g. T5)		EC25% Cut		BEE
	# Compact Fluorescent Lamps (CFL)		EC25% Cut	Luminous efficiency over 80lm/w	BEE
	# Metal Halides Lamps		EC25% Cut	Luminous efficiency over 60lm/w	BEE
	# High Pressure Sodium Vapor lamps		EC25% Cut	Luminous efficiency over 110lm/w	BEE
	# LED				BEE
	# Microprocessor based intelligent control				BEE
	# Exclusive transformer for lighting				BEE
	# Servo Stabilizer	gives stable output even under severe unbalanced voltage			BEE
	# Electronic Ballast				BEE
1.2	Other electric loads				
	# Energy efficient Air Compressors, Blowers				JCI
	# Energy efficient Fans, Pumps				
	# Capacitors				
	# Automatic Powerfactor Controllers (APFC)	reduces reactive power hence reduces total current from the source			BEE
	# Soft Starters for Motors	Provides smooth and stepless acceleration and deacceleration of AC Induction Motor; less mechanical stress; improved power factor; lower maximum demand			BEE
	# Maximum Demand Controller	Energy Saving achieved by monitoring power use turning of non essential loads during periods of high power use			BEE
2	Thermal Equipment				JCI
	# Water-tube Boiler (by replacing conventional Smoke-tube Boiler)				
	# Condensate Recovery & Recycle System				
	# Energy efficient Boilers	Reduces carbon dioxide emissions by 12%;			JCI
	# Recuperators	Increases the overall efficiency of the Gas Engine			JCI

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	# Cogeneration	Cogeneration is a thermodynamically efficient use of fuel. In separate production of electricity some energy must be rejected as waste heat, but in cogeneration this thermal energy is put to good use.		GEN η 37%up	JCI
	# Heat Pumps	More Energy Saving and Faster operation		COP 1.32up*	JCI
	# Energy efficient Refrigeration System			Turbo ref.COP 2.2up	JCI
	# Automatic combustion control for boilers / furnaces				JCI
	# Regenerative burners for furnace				JCI
	# Condensate recovery & recycle system				JCI
	# Heat Recovery Systems for Boilers (E.g. Economizer, Air Pre-heater)	Reduce Energy Consumption			JCI
	# Sludge combustion Boiler				JCI
	# Outdoor intake Control / VAV (variable air volume) / Heat exchanger	It controls the capacity of HVAC System			JCI
	# High efficiency DG Set for power generation (low fuel consumption with pollution control canopy)	Improvement in quality and efficiency			CLCSS
3	Insulation				JCI
	# Thermal Insulation for hot & cold systems	Reduces Heat Loss,emissions and increase safety			JCI
	# Heat Absorbing Glass; Low Emissivity Glass (Window panel)	Makes walls, ceilings, and floors warmer in the winter and cooler in the summer.			JCI
4	Commercial Buildings				JCI
	# Building Energy Management System (BEMS)	Lighting control, Electrical Plumbing Lift, Security management system, Energy Management, Facility Management			JCI
	# Energy efficient Air Conditioners	20% electric energy saving			JCI
	# Energy Efficient Refrigerators (high efficiency compressors, improved insulation, and precise temperature and defrost mechanisms to improve energy efficiency)				JCI
	# Vapour Absorption Refrigeration (VAR)				JCI
	# Heat Pumps	Reduction of Running cost by 1/3			JCI
	# Fuel Cell Cogeneration System	Reduction of 28% Energy Consumption, 42% reduction of CO ₂ emission			JCI
	# Cogeneration	More than 80% Energy efficiency, Reduction of CO ₂ by 1/3			JCI
	# Energy efficient Elevators	Reduction of Electricity by 12.6%			JCI
	# Equipment, machinery and construction material contributing to increased energy savings				SME EC law
	# Heat reclaim ventilation/air conditioning system				SME EC law
	# High efficiency Escalator				SME EC law
	# High efficiency Automatic Door				SME EC law
	# High efficiency Automatic Revolving Door				SME EC law
5	Heat insulating building material				SME EC law
	# Inorganic textile Insulator				SME EC law
	# Woody textile Insulator				SME EC law
	# Forming plastic Insulator				SME EC law
	# Heat insulating opening material				SME EC law

Sl.No	Eligible Equipment / Technology	Advantages	Expected Effects of Energy Conservation (Bench Mark)	Specifications	Reference
	# Air sealing support material				SME EC law
	# Other building material contributing to increased heat insulation performance of building & building equipment				SME EC law
6	Incineration & Energy Generation from Solid waste				JCI
	# Waste Heat Recovery Boiler				SME EC law
7	Industrial Furnace				SME EC law
	# Automatic temperature Controller				SME EC law
	# High-frequency induction irradiation				SME EC law
	# High-frequency Melting Furnace	Small volume, light, high efficiency and less electric energy consumption, Less environmental Pollution			SME EC law
	# Highly sensitive and responsive Arc Furnace				SME EC law
	# High-performance Electrolytic Furnace				SME EC law
8	Dryers				SME EC law
	# Electromagnetic irradiation				SME EC law
	# Dehumidification Dryer				SME EC law
	# Infrared irradiation				SME EC law
9	Others				
	# Automatic Board Plant				
	# Case Maker & Printer Slotter				
	# Common Effluent Treatment Plant (CETP)				
	# High speed Automatic Board line & Converting line		Energy Saving 30~35%		
	# Common Incinerator alongwith power generation facilities				
	# Screw Compressor				
	# Computer Desktop Virtual Machine	Energy Saving 90 - 95%			
	# Vehicle using CNG / LPG as fuel				
Industry Subsectors					
10	Glass Industry				CII
	# Waste heat recovery from Regenerative Tank Furnace	Utilisation of waste heat; reduction in fuel consumption			CII
	# Waste heat recovery from Recuperative Tank Furnace	Utilization of waste heat; reduction in fuel consumption			CII
	# Insulation for Furnace	Reduction in heat losses; reduction in fuel consumption; improved work environment; improved safety & health of workers			CII
	# Mechanical Conveyor for Soda Ash (by replacing Pneumatic Conveyor)	Reduction in electrical energy consumption			CII
	# Natural gas fired Pot Furnace with Recuperator	Utilisation of clean fuel; reduction in energy consumption; utilisation of waste heat; reduction in pollution	Energy Saving 25~50%		TERI
	# Natural gas fired Muffle Furnace	Utilisation of clean energy source, Utilisation of waste heat, Reduction in pollution	Energy saving 10~15%		TERI
	# Thermal gasifier (biomass/coal as input fuel)	Utilization of renewable energy; reduction in energy consumption	Energy Saving 35~60%		TERI
	# Oxy-Fuel Fired Glass Melting Technology		Energy Saving 15~20%		

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	# Automatic Controllers & Recorders for Furnace Temperature. On-Line Oxygen Analyzer.	Automatic Control will improve energy/efficiency and productivity by optimizing the Combustion process and minimizing the energy and production losses.			CLCSS
	# LPG fired Bead making Furnace.	Environmental & Energy efficient			CLCSS

Sl.No	Eligible Equipment / Technology	Advantages	Expected Effects of Energy Conservation (Bench Mark)	Specifications	Reference
	# Horizontal flat and bent glass electric furnace for tempering with automatic controller and recorders	Automatic loading and unloading. Automatic control for heating/cooling, Low electric consumption, Increase in production upto four fold, Improvement in quality			CLCSS
11	Ceramics Industry				
	# Insulation for Kiln, Top Chamber & Furnace	Energy saving by insulation strengthening			CII
	# Low thermal-mass Cars	Increasing Energy Efficiency			CII
	# Recuperator for Kiln (hot air generation)	Utilizing Waste Heat			CII
	# Variable Frequency Drives (VFD) for Circulation Air Fans in Vertical Dryer	Energy saving			CII
	# Roller Kiln (by replacing conventional Tunnel Kiln)				CII
11.1	Ceramic Items (Insulator ceramics, electrical ceramics, porcelain, Bone china ware, Stoneware, Earthen ware, Terra-cotta ceramic) including Tiles				
	# Ball mill with high alumina tile lining, high alumina balls of different size (Raw material processing)	Improve grinding; Reduce time of grinding; Lower contamination in the batch			CLCSS
	# Isostatic Press, Fetting machine, Stacking equipment (Fabrication)	Improve strength; reduces breakage & cracking; improve quality; reduce rejection & wastage;			CLCSS
	# Fully automatic vertical Copying Machine for Insulator (Fabrication)	homogeneous pressing; defect-free product; No requirement of Plaster of Paris mould; Higher strength and quality			CLCSS
	# Roller Head machine for cup & saucer (Fabrication)				CLCSS
	# Pressure casting plant (Fabrication)				CLCSS
	# Humidity Driver Chamber (Drying)	Tested Technology, Indigenously developed, quality of tiles much better, less drying time, less warpage and breakage of tiles.			CLCSS
	# Gas/Oil fired Roller Hearth Kiln (Firing Section)	Uniform temperature distribution; fast production; low fuel consumption; low rejection; ease of operation			CLCSS
11.2	Ceramics & Sanitaryware				
	# Gas/Oil fired Tunnel Kiln (Firing Section)	Lower maintenance; Continuous type furnace;			CLCSS
	# Gas/Oil fired Shuttle Kiln (Firing Section)	Low pollution; Energy efficient kiln; Large			CLCSS
	# Automatic Tile Pressing unit	Fast production; Easy making of granules			CLCSS
	# Alumina Brick Insulation for Electric Arc Furnace	Energy saving			CII
	# Improved insulation for Ring Chamber	Energy saving			CII
	# Recuperator	Eliminates fuel consumption for drying raw wares			CII
	# Control instruments for firing system	Better control over furnace performance and saves fuel			CLCSS
11.3	Refractory Ceramic Fiber Paper				
	# Continuous Tunnel Dryer with Indirect Fired Hot Air Generator	More efficient drying of larger quantity with reduction in fuel cost			CLCSS
12	Pulp & Paper Industry				CII
	# VFD (by replacing Dyno Drives)	Reduction in Electrical Energy Consumption			CII
	# Seven-effect Free Flow Falling Film Evaporator	Increasing Steam Economy leading to reduction in thermal energy consumption			CII
	# Chemical Recovery Unit for Spent Liquor	Utilisation of spent liquor as fuel			CII
	# Conversion to Fluidized Bed Combustion (FBC) Boiler from Stoker Boiler	Thermal Efficiency Improvement			CII
	# High efficiency Turbine Pump for water intake				CII

Sl.No	Eligible Equipment / Technology	Advantages	Expected Effects of Energy Conservation (Bench Mark)	Specifications	Reference
	#Boiler with paper sludge & other solid waste as fuel				
	# Heat Recovery Boilers for Waste Combustion				
13	Foundry				CII
	# kWh Indicator for Induction Furnace	Reduction in Electrical Energy Consumption			CII
	# Medium Frequency Induction Furnace (by replacing Arc Furnace or Main Frequency Furnace)	Waste Heat Recovery leadign to reduction of Thermal Energy Consumption	Cost Saving by elimination electrodes		CII
	# Heat Recovery System for Stress Relieving Furnaces	Reduction of Fuel consumption			CII
	# VFDs for Screw Compressors				CII
	# Oil fired Core Drying Oven	Reduction in Electrical Energy Consumption	Reduction of operating condition by 50%		CII
	# Gas fired Aluminium Melting Furnace (replace Oil fired Furnace)	Reduction in Thermal Energy consumption.	Reduction fuel cost by 20%		CII
	# Divided Blast Cupola (DBC)	Replace conventional cupola	Coke saving 25~65%		TERI
	# Gas fired Cupola	Eco friendly, Higher tapping temperature, Better melt quality and Reduction in Thermal Energy consumption.			CLCSS
	# Oil fired Rotary Furnace	Pollution control, Better quality product, cost effective			CLCSS
	# Induction Furnace with cooling tower & water treatment plant	Flexibility to produce ferrous castings of all grades, Flexibility for charge mix selection, Best melt quality, Eco friendly			CLCSS
	# Induction Ladle Refining Furnace	Value added casting, eco friendly and Reduction in Electrical Energy Consumption			CLCSS
	# Natural Gas based Power Generating Set	Reduced air pollution, energy saving			CLCSS
	# Intensive Mixers (Molding/Core)	Reduced defective casting, Better as cast surface finish, Reduction in additive cost, Reduced air pollution			CLCSS
	# Simultaneous Jolt / Squeeze Moulding Machine	Higher productivity, dimensional accuracy, less skill requirement			CLCSS
	# Spun Pipe Casting Machine	Export potential, higher productivity, eco friendly			CLCSS
	# Induction Hardening Equipment (100KW, 500Hz to 3KHz)	Higher Productivity, Consistency in quality, eco friendly			CLCSS
	# Removable Hearth type Chamber F/C upto 1200 C moving with computer compatible Temperature Controller	Cost saving, Consistency in quality, Better productivity			CLCSS
	# CNC Milling Machine	Higher productivity, dimensional accuracy, less skill requirement, Consistency in quality			CLCSS
	# CNC Lathe Machine	Higher productivity, dimensional accuracy, less skill requirement, Consistency in quality			CLCSS
	# CNC Milling (Pattern Shop)	Higher Productivity, Consistency in quality, Narrower as cast dimensions, Excellent finish			CLCSS
	# Exothermic/Insulating Sleeves (Oven for Baking Sleeves, Molding Machines, Vacuum system)	reduces requirement of molten metal for risers thus increasing yield of castings to the level of sometimes more than 20%. Highly energy saving, cost reduction system thus improving productivity			CLCSS

Sl.No	Eligible Equipment / Technology	Advantages	Expected Effects of Energy Conservation (Bench Mark)	Specifications	Reference
	# Online shot Blasting Machine (for Cleaning the Returns)	Minimum slag Formation			CII
	# Waste Heat Recovery System for exhaust gases	Waste Heat utilisation			CII
	# Hot blast Cupola				
	# Induction Melting Furnace for Aluminum				
	# Automatic Pouring System				
	# Energy efficient Thermal Reclamation Plant				
	# Energy efficient Short Blasting Machine				
	# Online shot Blasting Machine (for Cleaning the Returns)				
	# High efficiency Centrifugal Fans				
	# High efficiency Power Generating Set				
	# Automatic Flaskless Molding Machine				
	# Core Setter and Automatic Mold Conveyor				
	# Compact vertical moulding machine				
	# Automatic cold box core shooter				
14	Textile Industry				
	# High Efficiency Atomizers in Humidification Plant				CII
	# Energy Efficient Fans				CII
	# VFDs for Humidification Fans		25~30% saving		CII
	# Synthic Flat belt Drives (Replace V-belts)		4% /machine		CII
	# VFD for Autocore Suction Motor		15~20% saving		CII
	# VFD for Water Circulating Pump				CII
	# Transvector Nozzle for Cleaning Application		Save Energy		CII
	# FBC Boiler (replacing Stoker Boiler)	Efficiency increases 70 to 79 % .			
	# Yarn Conditioning Machine	Energy saving 15 - 20%			
	# Automatic rotor Spinning Machine with MRPS system	Energy saving 20 - 25%			
	# Open-width Continuous Scouring and Bleaching Range with Microprocessor Control				CII
	# Ring Frame machine	Saves energy, Inverter driven main motor			
	# Speed Frame machine	Saves energy, Inverter driven main motor			
	# Extruction Lamination Line with frequency control motors	Saves energy			
14.1	Readymade Garments				
	# Warp / Raschel knitting machine (Manufacturing of knitted fabric)	Improvement in quality and efficiency			CLCSS
	# High speed computerized Warping Machine for knitting	Improvement in quality and efficiency			
	# Modern industrial humidification system (for controlling relative humidity & temperature)	Improvement in quality and efficiency			CLCSS
14.2	Wet Processing				CLCSS
	# Wet fabric spreading and squeezing machine (Dyeing activity)	Improvement in quality and efficiency			CLCSS
	# Roller Steamer/Polymeriser (Dyeing)	Improvement in quality and efficiency			CLCSS
	# Washing range with arrangement of tension free fabric drying and reduced water consumption/water reuse system (Dyeing)	Improvement in quality and efficiency			CLCSS
	# Hydro Extractor (Dyeing activity)	Improvement in quality and efficiency			CLCSS
	# Tumble Dryer (Dyeing)	Improvement in quality and efficiency			CLCSS
14.3	Wet Finising Machines				CLCSS
	# Multi chamber Stenter (min 4 chambers) with arrangement of oil/gas heating (Finishing)	Improvement in quality and efficiency, efficient heating			CLCSS

Sl.No	Eligible Equipment / Technology	Advantages	Expected Effects of Energy Conservation (Bench Mark)	Specifications	Reference
	# Radio frequency / infrared radiant gas fired/ microwave/ loop /relax dryer (Finishing)	Improvement in quality and efficiency, efficient heating			CLCSS
	# Heat Recovery System for Stenters	Utilisation of waste heat			CII
	# Balloon Padding Machine				
	# Slit Opener with Squeeze Mangle				
	# PLC based Compacting Machine				
	# PLC Based Mercerizing Machine				
	# Fabric Reversing and Slit Opening Machine				
14.4	Dry processing / Finishing Machines				CLCSS
	# Energy efficient boiler with combustion control system (Steam heating system)	Improvement in quality and efficiency			CLCSS
	# Thermo Pac (Heating system)	Improvement in quality and efficiency			CLCSS
	# Biomass Gasifier based hot water generator	cleaner fuel; environment friendly;			CLCSS
14.5	Knitting				
	# High Speed / Ultra High Speed Knitting Machines				
	# 3 Thread Fleece Machines (Ploy Plating)				
	# Interlock Knitting Machines				
	# RIB Pointel Jacquard Machines				
	# RIB Knitting Machines				
	# High Speed Single Jersey Knitting Machines				
	# Single Jersey Machines with Open Width Take up System				
	# Single Jersey Auto Striper Machines				
	# Terry Knitting Machines				
	# Float Plating Denim Machine				
	# Double Knit electronic Jacquard Machine				
	# Woven Like Corduroy Machine				
	# High Speed Circular Knitting Machines	Energy saving 20 - 25%			
14.6	Modern Energy Efficient Dyeing System				
	# Grey Heat Setting				
	# Soft Flow / Jet Flow Dyeing Machine (low MLR of 1:5 or lower)				
	# Squeezer with Slit Opener				
	# Balloon Padding				
	# Relax Dryer				
	# Specialty Fabric Finisher such as Brushing, Sueding, Raising, and Compacting				
	# PLC based Package Dyeing Machine				
	# Automatic Hank / Yarn Dyeing Machine				
14.7	Sewing/Stitching				
	# Direct-drive, High Speed, Lockstitch Machine with Automatic Thread Trimmer				
	# Lockstitch Machine with Automatic Thread Trimmer				
	# Semi-dry-head, High Speed, Overlock Stich Machine				
	# Computer-controlled, High Speed, Lockstitching Buttonholing Machine				
	# Computer-controlled, High-speed, Lockstitch, Button Sewing Machine				
	# High-speed, Flatbed, Top & Bottom Coverstitch Machine				

Sl.No	Eligible Equipment / Technology	Advantages	Expected Effects of Energy Conservation (Bench Mark)	Specifications	Reference
	# High-speed, Cylinder-bed, Top & Bottom Coverstitch Machine				
	# Computer-controlled, High-speed, Bartacking Machine				
	# Servo-motor Stitching Machines				
	# Clutch Motor Stitching Machines with 3-phase Motor				
	# Computerized Embroidery Machine				
	# Automatic Printing Machine				
	# Industrial Washing / Drying Machine / Tumble Dryers				
14.8	Yarn Processing				
	# Draw Winder	Individual inverter driven motor drive system offers stepless parameter setting in running conditions and helps to save energy			
	# Air Draw Texturising Machine	Individual inverter driven motor drive system offers stepless parameter setting in running conditions and helps to save energy			
	# Draw Texturising Machine	Maintain leadership in Energy Conservation, has inverter driven closed loop speed control for individual drives			
	# Filament Twisting Solutions	Electronic NXG Power Saver Control System			
	# Spun Twisting Solutions	Electronic NXG Power Saver Control System			
	# Industrial Twisting Solutions	Electronic NXG Power Saver Control System			
	# Thread manufacturing Solutions	Electronic NXG Power Saver Control System			
	# Crepe Yarn Solutions	Electronic NXG Power Saver Control System			
	# Automatic Cone Winder	Saves energy			
	# Yarn Guided Machine with Precision Crossing with inverter control	Saves energy			
14.9	Weaving				
	# Water Jet Looms	Lowest power per meter of fabric			
	# Air Jet Looms	Lowest power per meter of fabric			
	# Rapier Looms	Lowest Production cost due to high efficiency (90%) then power looms (60%)			
14.9	Utilities				
	# Water-tube boilers (by replacing conventional Smoke-tube Boiler)				
	# Condensate Recovery & Recycle System				
	# Heat Recovery Systems for Boilers (E.g. Economizer, Air Pre-heater)				
	# High efficiency Diesel Generating Sets with high specific energy generation ratio				
	# Energy efficient Fans, Blowers, Pumps				
	# Energy efficient Motors				
	# Variable Frequency Drives for Fans, Blowers, Pumps				
	# Automatic Power Factor Controller (APFC)				
15	Engineering Industry				CII
	# Energy-efficient Air Compressors		SEC reduces by 0.13 KW/cfm		CII
	# VFDs for Screw Compressors				CII
	# Heat of Compression Air Dryers (Replacing Desiccant Air Dryer)		-45 Deg Dew point Achieve		CII

Sl.No	Eligible Equipment / Technology	Advantages	Expected Effects of Energy Conservation (Bench Mark)	Specifications	Reference
	# VFDs for Oil Pimp in Hydraulic Power Pacs				CII
	# Energy efficient Exhaust Fans				CII
	# VFD for Hot Air Circulation Fans in Preheating Furnaces		30% speed reduction		CII
	# Ceramic Fiber Insulation for Batch Furnaces		Outer temp. 50~60 deg C.		CII
	# Air Preheater (for furnace flue gas waste heat recovery)	Reduction Oil Consumption			CII
	# CNC Cutting Machine with End Former		45%~50% energy saving		
	# Full Automatic CNC Return Bender		45%~50% energy saving		
	# Automatic Ring Sizing and Loading Machine		45%~50% energy saving		
	# CNC Vertical Machining Centre				
	# Vacuum Holding for Non-Ferrous Components for High Speed Milling		25%~30% energy saving		
	# CNC Co-ordinate measuring machine		25%~30% energy saving		
	# CNC SP (Sharpening and Profile Grinding), Automatic Broach Shapping Machine				
	# Turning Machine with VFD with Regenerative Braking System				
	# Servo Electric Turret Punch Machine				
	# Abrasive assisted High pressure Water Jet cutting	Energy Saving 20 - 30%			
	# Inverter based Welding Machine	Better design, faster response time, extremely low ripple, smaller in size & lighter in weight hence portable, more efficient during welding, better weld quality and energy efficient operation			CLCSS
16	Food Processing Industry				NEDO
	# Improved Oven with Heat Recovery Equipment (Puffed rice)	reduction in pollution emission	35%~60% energy saving		TERI
	# Oil fired oven; Biomass fueled multipurpose drier; energy efficient wood fired low cost bakery oven (Bakery products manufacturing)	Improves quality, and shelf life of the product, reduces smoke nuisance			CLCSS
	# Energy-efficient boiler with heat recovery (Cashew processing)				
	# Energy-efficient boiler with heat recovery (Parboiled Rice Mill)				
	# Biomass Gasifier based Furnace (Namkeen making)	1.Replacement of 10-15 L/H diesel with local biomass, 2.Eco-friendly, 3.Cost effective			CLCSS
	# Pickles,Sauces and Chutney manufacturing. (Automatic fruits and bottles washing machine with conveyor, blower, pump and agitator, fruits and vegetable cutting machine, stainless steel double walled steam jacketed kettles(tilting type), boiler, pulper/cru	Improvement in sanitary and hygienic conditions, micro contamination, quality and productivity.			CLCSS
	# Spice grinding (Cryogenic grinding, automatic FFS packaging)	Improves sensory qualities, productivity as well as shelf life of the product			CLCSS

Sl.No	Eligible Equipment / Technology	Advantages	Expected Effects of Energy Conservation (Bench Mark)	Specifications	Reference
	# Bakery products manufacturing. (Shifting from semi-mechanisation to mechanisation, replacement of coal/wood fired oven to oil fired/electric oven ,Bio mass fired multipurpose drier, energy efficient low cost bakery oven(wood fired) installation of qualit	Improves quality, and shelf life of the product, reduces smoke nuisance			CLCSS
	# Cashew Processing (Boiler, heat exchanger with complete accessories, packaging machine, electronic weighing machine etc.)	Recovery of cashew nut shell liquid, enhancement of shelf life of cashew nuts, less pollution			CLCSS
	# Rice Milling with rubber roller sum sheller (without parboiling) and modern rice milling with parboiling (Paddy cleaner, destoner,rubber roller cum Sheller, paddy separator, boiler, par boiling system, dryer, colour sorter, cone polisher, quality control	Better polished, less breakage and high yield of rice, bran suitable for oil recovery, good export opportunity for scented/Basmati rice.			CLCSS
	# Fryer Machine with Conveyor Belt & Bucket elevator (Namkeen)	Energy Saving 20 - 25%			
	# Palates - Kukure Line Machine with Packing units	Energy Saving 20 - 25%			
	# Packing Machine - Bag Maker & Weigher	Energy Saving 20 - 25%			
	# Namkeen Mixing Machine	Energy Saving 40 - 50%			
	# Oil Fired Rotary Rack Oven	Saves energy			
	# Prover	Saves energy			
	# Spiral Mixer	Saves energy			
	# Automatic Rinsing, Filling & Capping machine for PET bottles	Saves energy			
	# Automatic Rinsing, Filling & Capping Machine for Glass bottles	Saves energy			
	# Shrink Sleeve inserting machine	Saves energy			
16.1	Sweet meat				CLCSS
	# Biomass Gasifier based Furnace	1.Replacement of 5-6 L/H diesel with local biomass, 2.Eco-friendly, 3.Cost effective			CLCSS
	# Carbon Molecular Sieve for Nitrogen generation	Eliminates the use of LPG			CII
	# Heat Recovery System for A/C Condensers	Hot air can be used in Confectionery section; reduces live steam consumption			CII
	# Improved Oil Burners (Biscuit Plant)				CII
	# High Efficiency Fan at wheat Godown				CII
17	Brick Industry				TERI
	# Vertical shaft brick kiln (VSBK)		Energy Saving 20~40%		TERI
18	Auto components Industry				
	# Falling film Evaporator (Re-refining of lubricating oil)	Eco-friendly technology			CLCSS
	# Wiped film evaporator (Re-refining of lubricating oil)				
	# Fine Grinding (CBN Surface Grinding Machine)				
	# Gas fired/oil crucible melting furnace	Saves energy			CLCSS
	# CNC Wire cut	Improves energy efficiency			CLCSS
	# CNC Milling	Improves energy efficiency			CLCSS
	# CNC Lathe	Improves energy efficiency			CLCSS
	# Gas based Generator set	Saves energy			CLCSS
	# Computerized Automatic Electroplating / Zinc Plants	Saves energy			
	# Heavy Duty Horizontal Machining Center	Saves energy			
	# CNC hydraulic press brake	Saves energy			

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	# Automatic Electrostatic powder coating machine	Saves energy			
	# Conveyorised Powder Coating Curing Oven	Saves energy			
	# CNC Milling machine – vertical machining centre	Saves energy			
	# PVD (Multi-arc ion) coating machine	Saves energy			
	# CNC 3 axes Hobbing Machine	Saves energy			
	# Sealed Quench Furnace (use of Thyristor power controller and PLC)	Saves energy			
	# Paint shop with waste heat recovery system	Saves energy			
19	Castings & Forging Industry				
	# Mechanical pneumatic clutch operated Crank type Billet shearing press (Stock Cutting)	High Productivity, Low cutting loss			CLCSS
	# Pneumatic double acting hammer (Forge shop)	High production rate, reduced maintenance cost			CLCSS
	# Microprocessor based energy controlled, pneumatic clutch operated, Screw friction Presses (Forge shop)	High production rate; controlled blow pattern; low investment; Improved press stiffness; less space requirement; good off loading capabilities			CLCSS
	# Hydraulic double acting Hammer (Forge shop)	Precision forging with high production rate & reduced maintenanse			CLCSS
	# Multi station horizontal Formers (Forge shop)	Precision forging with post forging operations minimized; less raw material wastage; high production rate; automation feasible			CLCSS
	# Hot Shearing Automatic Forging Presses (Forge shop)	Microprocessor control, high productivity.			CLCSS
	# Reduce Rolling Machine (Forge shop)	Higher production rate, less skill requirement. Capable of making performs of various cross sectional areas and lengths, high productivity.			CLCSS
	# Gas fired high temperature Furnace with automatic temperature controller & recorder (Heat Treatment)	Eco-friendly, reduced scale losses, facilitate automation, quality improvement			CLCSS
	# Fluidized bed heat treatment line with controlled atmosphere & Recuperators (Heating Treatment)	Eco-friendly; highly energy efficient; minimum time /energy to come on line; Flexible operations with adaptability to handle small batches; controlled atmosphere minimizing decarburisation as well provides flexibility			CLCSS
	# Medium Frequency Induction Heaters (Heating Treatment)	For controlled depth surface hardening of tools such as pipe wrenches jaws, hammers, pliers teeth etc. Improved quality.			CLCSS
	# Natural Gas fired power generating set (Utility)	Eco-friendly, low power cost			CLCSS
	# CNC Turning Center (Tool Room)	Improved quality,high productivity, precision machining, eco-friendly.			CLCSS
	# CNC Milling Machine (Tool Room)	Improved quality,high productivity, precision machining, eco-friendly.			CLCSS
	# Electro Discharge Machine (Tool Room)	Improved quality,high productivity, precision machining, eco-friendly.			CLCSS
	# CNC Wire Cut Machine (Tool Room)	Improved quality,high productivity, precision machining, eco-friendly.			CLCSS

Sl.No	Eligible Equipment / Technology	Advantages	Expected Effects of Energy Conservation (Bench Mark)	Specifications	Reference
	# Fully Automatic CNC Injection Moulding machine (Tool Room)	Modern version, for making handle of screw drivers and sleeves of pliers.			CLCSS
	# Bell Annealing Furnace	Saves energy			
	# Cold forging bolt former	Saves energy			
	# Thread rolling machine	Saves energy			
	# Friction Drop Hammer	Saves energy			
	# Friction Drop Hammer	Saves energy			
	# Metal Gathering Machine	Energy saving 40~50%			
20	Tanning & Leather Processing Industry				
20.1	Leather and Leather Products				
	# Hydraulic/pneumatic Automatic Counter moulding Machine	Faster production and less messy.			
	# Automatic Seat Lasting Machine (Heal Seat lasting)	Accurate, faster and less spacey. Requires less people and also environment friendly.			
	# Automatic Pounding Machine	Improves quality of the final products.			
	# Automatic Buffing & Roughing machine with Microprocessor control mechanism	Precision buffing and faster production			
	# Automatic Combined Rougher and Cementer (Buffing and adhesive application)	Both the operations are done by one machine, results in less messy and faster production. Also reduce the adhesive wastage.			
	# Cement Dryer & Flash Activator Machine (Drying and Reactivation)	Reduce the space required of the workshop. Increases the production by several fold.			
	# Thermo Cementing Machine for Upper & Sole	Reduce the wastage of adhesive, accurate application.			
	# Mackey Sole Stitcher	Faster production.			
	# Fine Turning machine (for last)	Increase the production of last.			
	# Roughing Machine for plastic blocks	Increase the production of last.			
	# Computerized Lasting Turning CAD/CAM CNC controlled Machine including designing and interface software	Essential for last development, accurately copy of any last sampling. A major boon to new product development.			
	# CNC Milling Machine with 3/5 Axis & EDM (CNC sole mould development)	Essential for right quality sole mould			
	# Hydraulic Automatic Press Moulding Press	Saves energy			
20.2	Pre-Tanning Section				
	# Single/Double width Fleshing Machine	Accuracy and higher productivity will offset the cost.			
	# Single/Double width Uhairing Machine	Accuracy and higher productivity will offset the cost.			
20.3	Tanning Section				
	# Through Feed Double width Machine (Shaving)	Split the leather uniformly.			
	# Through Feed Double width Machine (Setting)	Speed of production and final quality of leather improves.			
	# Double width through feed splitting Machine (Splitting)	Speed of production and final quality of leather improves.			
20.4	Finishing Section				CLCSS
	# Vacuum Dryer	Uniform and quick drying. Improves the quality of leather.			CLCSS
	# Hydraulic Press with Automatic time and temperature controller				CLCSS

Sl.No	Eligible Equipment / Technology	Advantages	Expected Effects of Energy Conservation (Bench Mark)	Specifications	Reference
	# Auto Spray with Dryer	Uniform spraying & drying.			CLCSS
	# VFDs for Pumps for Hot & Cold Water Supply (Pre-tanning Section)	Energy Saving			CII
	# Steam Heating (Replacing Electrical Heating)	Saving Energy			CII
	# VFD for Screw compressors (Dyeing section)	Reduce of overall operating pressure.			CII
	# VFD for Hydraulic oil system in Vacuum Drier	Reduction of Energy cost.			CII
	# Combined Through Feed Single/Double width Buffing Machine with Dusting operation	Accurate buffing action.			
	# Roto Press and Roto Print	Uniform pressing.			
20.5	Others				
	# Energy Efficient Chiller	Energy Saving			
21	Pharmaceutical & Bulk Drug Industry				
21.1	Tablet and Capsule section				
	# Flash Dryers or Rotary Vacuum Dryers (Product Drying)	Low cost drying with minimum or no handling; Instant drying with no pulverizing; low initial investment as compared to Spray Dryer			CLCSS
	# Use of Biomass Gasifier with Slurry Economizer (Incinerator)	Use of alternative fuels like rice husk, saw mill waste; heat recovery; less cost;			CLCSS
	# Nauta Mixers (Blenders)	Energy Efficient; no breaking of Grains; less dusting and no manual charging & discharging			CLCSS
21.2	Industry based on medicinal and Aromatic Plants				CLCSS
	# VFD for fluidized bed boiler blower				CII
	# Condensate recovery & recycle system for boiler feedwater				CII
22	Dyes & Intermediates				CLCSS
	# Flaker with Silo and Screw Conveyer (Ice Flaker)	Automatic operation; no spillage and loss of energy; no water losses and latent heat loss			CLCSS
23	Cement Industry				CII
	# High efficiency Dynamic Separator for Raw Mill	Increased output			CII
	# Air lift to Bucket Elevator				CII
	# Low Pressure drop Cyclone	Increase of output			CII
	# Use alternative fuel storage, conveying & firings system as supplement to coal in Calcliner Firing				CII
	# VFDs for Cooler Fans	Avoid damper loss			CII
	# Low pressure Air Burner				CII
	# High efficiency Crusher	Increase in capacity			CII
	# Cogeneration from Kiln Preheater and Cooler Exhaust				CII
	# Pre-Grinder				
	# Waste Heat Recovery Power Generation from Kiln Exhaust gases	Utilisation of waste heat			
	# Power Generation from Kiln Exhaust gases				
	# Slip Power Recovery System				
	# Soft Starters for Motors				
	# Energy efficient Fans				
	# Vertical Roller Mill				
	# Pre-Grinder / Roller Press				

Sl.No	Eligible Equipment / Technology	Advantages	Expected Effects of Energy Conservation (Bench Mark)	Specifications	Reference
	# Multi-channel Burner				
	# Bucket Elevator (in place of pneumatic conveying)				
	# Fuzzy Logic/Expert Kiln Control System				
	# Improved Ball Mill Internals				
	# High Efficiency Grate Cooler				
24	Chloro Alkali Industry				CII
	# Vacuum Pump (replacing Steam Jet Ejector)				CII
	# VFD for Chlorine Compressor				CII
	# Centrifugal Screw Compressor for HVAC system (replacing Reciprocating system)				CII
	# Cogeneration System				CII
	# Membrane technology (replacing Mercury Cell)				CII
25	Fertilizer Industry				CII
	# VFD for Sulfur Pump	Saves Energy			CII
	# Pipe Reactor in Complex Plant				CII
	# Vapor Absorption Refrigeration	Reduction of Power			CII
	# Replace Old PRDS Valves with Superior Valves	Reduction of Steam			CII
	# Waste Heat Boiler for Diesel Generating Set Exhaust				CII
	# Mechanical Conveying instead of Pneumatic conveying (Phosphoric Acid Plant)				CII
26	Sugar Mills				CII
	# Diffusers in lieu of Milling Tandem	Energy Consumption gets reduced by 6.4 kWh per ton cane			CII
	# Conical Jet Nozzles for mist Cooling System	Reduction of Cooling Energy			CII
	# Jet Condenser with External Extraction of Air	Drops of Water Consumption gets reduced			CII
	# Electric DC Motor Drives in place of Steam Driven Mill Drives	850kW/mill saving			CII
	# Extensive Vapor Bleeding system at Evaporators				CII
	# VFD for weighed Juice Pump	30~40% reduction in power			CII
	# Hydraulic Drives for Mill Prime Movers	Stable operation, Reduced Maintenance			CII
	# Fully Automated Continuous Vacuum Pans				CII
27	Mini Steel Plants				
	# Blast Furnace Hot Stove Heat Recovery				NEDO
	# Coal Moisture Control System				NEDO
	# Power Generation from Blast Furnace Exhaust gases				NEDO
	# Sinter Cooler Waste Heat Recovery				NEDO
	# Coke Dry Quenching				NEDO
	# Waste Gas Recovery from Oxygen Converter				NEDO
	# High efficiency Combustion Control System in Pre-Heating Furnace				NEDO
	# Heat Recovery from Blast Furnace Hot Stove Waste Gases				NEDO
28	Metal Industry				NEDO
	# High efficiency Industrial Furnace in Aluminum Factory				NEDO
29	Chemicals				
	# Regenerative furnace & refractory recuperator	Energy saving 25-30%			
	# Co2 Flue gas Recovery Plant based on Flue gas system	Energy saving 30%			
30	Plastics & Polymers				

Sl.No	Eligible Equipment / Technology	Advantages	Expected Effects of Energy Conservation (Bench Mark)	Specifications	Reference
	# Multi Layer film extruder	Energy saving 25-30%			
	# Solvent less lamination Machine				
	# Servo Motor Plastic Injection Machine	Energy saving 30-70%			
	# PET Moulding machine	Energy saving 40-45%			
	# Fully automatic Micro processor controlled Plastic Injection Moulding machines	Very high rate of production, cost effective, no wastage, better and consistent quality.			CLCSS
	# CNC Milling Machine	For production of quality dies and moulds.			CLCSS
	# PLC controlled Hydraulic Press	PLC controlled-for constant and fast cycle time. Unit can get 8 batches instead of 6 batches per day.			CLCSS
	# Pultrosen machine	Latest technology machine with reverse of extrusion- Pultrosen moulding for continuous moulding of section for structural application provided with 3 production stations. 3 times			CLCSS
	# Infra red heaters / oven	Infra red heaters to save electrical energy .	save electrical energy 30%-40%.		CLCSS
	# Microprocessor controlled fully automatic extrusion/injection blow moulding machine	Fully automatic process, High productivity, Consistent in quality of the product, Hygienic working conditions, Cost effectiveness, Reduction in labour cost, Reduction in air pollution, Reduction in power consumption			CLCSS
	# Plastic Injection Molding Machine with variable pump	Energy saving 20-30%			
31	RETs				
	# Wind energy (Windmills)				
	# Solar energy (Photovoltaic)				
	# Micro hydro				
	# Biomass / Bagasse (Gasifier or Cogeneration)				
	# Municipal solid waste				
	# Biomass Gasifier based hot water Generator				
	# Solar Water Heater				
32	Steel Rerolling Mills				
	# Pusher type reheating furnace with suspended roof, multi fuel capacity and automated temperature controls	Highly efficient over conventional arch roof furnace with single fuel firing limitation, energy saving 20 - 30 %			
	# Provision of IR sensors for material movement	Minimum heat loss, automation with feedback control			
	# AC and DC drives for control of fuel and air	energy saving 10 - 30 %			
	# Liquid and gaseous fuel ratio controllers, ratiotrols	energy saving 10 - 15 %			
	# Heating and pumping units	energy saving 5- 10 %			
	# High efficiency burners with multifuel capacity	energy saving 5 - 10 %			
	# Semi automatic high speed rolling stands with DC drives	automation, high speed production, energy saving 20 - 30 %			
	# Energy efficient motors with VFD	energy saving 10 - 30 %			
	# Dry type starter for slip ring motor	energy saving 4 - 5 %			
33	Corrugated Boxes				
	# Automatic corrugated making plant	3-5 ply can be made without any manual pasting on automatic drying facilities, improve productivity and quality of board			CLCSS

Sl.No	Eligible Equipment / Technology	Advantages	Expected Effects of Energy Conservation (Bench Mark)	Specifications	Reference
	# Thermic fluid boiler or steam boiler using agri residue	Heats up entire length of the roll uniformly, more thermal efficient			CLCSS
	# Web based coating machine for water based coating	Large size of printing and faster drying of the printed material			CLCSS
	# Multi colour flexo printer slotter for flexographic printing	Processed products. Web based coating is eco-friendly, food grade, recyclable and being water based, free from fire hazard.			CLCSS
	# Automatic Corrugated Board Plant with printing die cutter using thermic fluid for heating	Saves Energy			
34	Thermocol packaging.				
	# Fully automatic PLC hydraulically operated Moulding machine	Increased productivity and efficiency.			CLCSS
35	Rubber Processing				
	# Roto-cure machine	Continuous production of high quality rubber mats. Wastage is minimum with higher output.			CLCSS
	# Cold feed extruder	Operation warming of rubber compound prior to extrusion is avoided.			CLCSS
	# Multi channel extruder	Rubber bands manufactured from dry rubber. High output, no pollution & minimum cost of production			CLCSS
	# Thermic fluid heaters	Uniform heating and more thermal efficiency.			CLCSS
	# Bio-mass Gasifier based drying furnace	Saving of conventional fuel (diesel/electricity), Environment friendly technology, Easy to operate and maintain	Reduction of wood consumption up to 50%		CLCSS
36	Dimensional Stone Industry (excluding quarrying and mining)				
	# Laser Technology Duplicating Machines, Pantographs, etc. for sculpting and duplicating artwork and monuments	Capability to mass-produce intricate product patterns, maintain high precision and introduce new product lines.			CLCSS
37	Reinforced Cement Concrete(RCC) Pipes				CLCSS
	# Vertical vibrating machine	Less energy consumption. 15-20% material saving. Accurate quality of spigot and socket. More productivity			CLCSS
	# Mixing Plant with pan mixture alongwith attachment, computerized weighing setup	Less energy consumption. 15-20% material saving. Accurate quality of spigot and socket. More productivity			CLCSS
38	Refractory brick, Insulation brick & Casting products				
	# Oil fired tunnel kiln with recycling of waste heat through recuperators	Uniform temperature distribution, Low fuel consumption, Continuous process, Fast production, Low pollution, Energy efficient, Easy operation, Time saving, Low wastage			CLCSS
39	Fans & Motors.				
	# Automatic coil winding machine.	Material saving, Improved insulation, Improved performance and increased energy efficiency			CLCSS
	# Vacuum Impregnation plant.	Improves energy efficiency			CLCSS
	# Semi Automatic Press	Saves Energy			

Sl.No	Eligible Equipment / Technology	Advantages	Expected Effects of Energy Conservation (Bench Mark)	Specifications	Reference
	# Automatic CNC core cutting machine	Saves Energy			
	# Hi speed precision power press with computerized control	inverters control motor speed, saves energy			
40	Transformer / Electrical Stampings / Laminations / Coils / Chokes including Solenoid Coils, Assemblies.				
	# Vacuum impregnated plant	Improvement in quality and reliability. Improvement in productivity. Product as per National/International Standards. Reduced rejection			CLCSS
	# Automatic/CNC coil winding machine	Improves energy efficiency			CLCSS
	# Temperature control drying oven	Improves energy efficiency			CLCSS
	# Amorphous Metal Core Transformers	Reduction in transmission loss of electrical energy, Reduction in electricity expenses, man-power reduction and accurate			CLCSS
	# CNC Core Cutting Machine	Improves energy efficiency			CLCSS
	# Natural Gas based oven	Reduction in no load losses, Increased efficiency of the end product material saving in rejection			CLCSS
	# Microprocessor based Electric Furnace	Improves energy efficiency			CLCSS
	# Plasma Cutting Inverter				
41	Wires and Cable.				
	# Catalytic Enamelling Machine	Saves Energy			
	# Extruder with temperature control, pre-heating, speed control	Improved coating resulting in better insulation properties and meeting other quality parameters			CLCSS
42	Printing Industry				CLCSS
	# Multi color offset machine	More productivity being four color printing in single operation			CLCSS
	# Programme Cutting Machine Computerized control	Better efficiency			CLCSS
	# Fully automatic folding machine with computer control	For increased production and better quality			CLCSS
	# Auto control punching machine with computerized control	Better cost and efficiency			CLCSS
	# Lamination machine with computerized control	Better Quality and Efficiency			CLCSS
	# Thermal Lamination machine computerized control	Better Quality and Efficiency			CLCSS
	# Multi colour Rotogravure printing machine	Use converter motors, saves energy			
	# Flexographic Printing Press with Inverter speed control	Motor speed control by inverter, saves energy			
	# Adhesive label (logo) die-cutting	Saves Energy			
	# Digital Colour Press	Saves Energy			
	# Fully automatic flat bed screen printing machine with 12 colors	Saves Energy			
	# 8 colour paper printing machine with auto registration system	Saves Energy			