TOP TENS

TOP TEN 2018

CHINA'S ENERGY EFFICIENCY TECHNOLOGIES FOR THE INDUSTRIAL SECTOR

The National Development and Reform Commission of China (NDRC) guided the China Quality Certification Center (CQC) to develop a China TOP TENs Best Energy Efficient Technologies list to highlight energy savings technologies for the China's industrial sector. The technologies represent good value for money, are innovative, reliable and widely available. The technologies represent top level in China that are innovative, sustainable reliable.

Each technology has been weighted using a structured methodology to determine its energy saving potential, technical and financial characteristics, as well as co-benefit characteristics.

How to use the list

Energy consumers, program administrators, developers, designers, and policy makers can use this list to consider the benefits of these technologies, while producers of these technologies can use this list and underlying research to promote their products in the global marketplace.

China will partner with other countries that also investigated buildings technologies, including France and Japan. Getting exposure to the Chinese audiences, for example, can be beneficial for Chinese producers to implement the technologies in general, as China is one of the largest industrial markets in the world.

Top Tens Task Group

The Top Tens Task Group was established in 2013 and is managed through the International Partnership for Energy Efficiency Cooperation (IPEEC). China, co-leading with Australia, is together with members including Canada, France, Japan, South Korea, and the United States.

The objective of the task group is to improve energy efficiency globally through better exchange of information about technologies and practices. Members of the task group are developing domestic and international Top Tens lists, with related case studies, to provide practical information for technology users. These will have broad international relevance and provide a range of comparative case studies in different national contexts.

TOP TEN 2018

BEST AVAILABLE ENERGY EFFICIENCY TECHNOLOGIES

These are the technologies that have demonstrated leading energy efficiencies across China Industrial sector and are innovative or provide other sustainability benefits. The score given is out of 100 possible points.

1 Score: 93.3

Potential energy recovery technology of energy-saving and efficient excavator
The potential energy generated when the working device of the excavator descend,.... click for more

2 Score: 92.3

Motor energy-saving technology based on three-phase sampling and fast response
The potential energy generated when the working device of the excavator descends is recovered.... click for more

3 Score: 91.3

Energy-saving control chip technology on body voltage sensor
An adjustable threshold four-terminal module is embedded in appliances... click for more

4 Score:89.7

Low-grade waste heat power generation technology of ORC screw expander
Utilizing efficient screw expander that has rotor profiles optimization, the organic working medium R245fa.... click for more

5 Score: 88.7

New-type current-stabilizing, heat-insulation aluminum electrolytic cell energy-saving technology
By optimizing the current distribution, electrode struct

6 Score: 87.0

Energy Saving Technology of Liquid Cooling Heat Conduction for Electronics Equipment
Combined heat pipe radiation technology and water cooling technology, the heat pipe-cold plate module... click for more

7 Score: 86.7

Energy Balance and Optimal scheduling Technology in petrochemical enterprises
By implement energy production and consumption forecasting, energy pipeline network simulation... click for more

8 Score: 86.0

Industrial Waste Water Heat Recovery Technology Based on Low Vacuum Phase
Transformation Principle Based on the principle of low-vacuum phase transformation... click for more

9 Score: 84.0

Energy-saving technology of suspension copper smelting
By adding a nozzle capable of generating a swirling flow on the flash furnace... click for more

10 Score: 79.0

Modularization Cascade Heat Recovery, Clean fuel Coal Gasification Technology
Based on the principle of circulating fluidized bed gasification, the heat exchange process... click for more

TOP TENS

1 SCORE 93.3

Potential energy recovery technology of energy-saving and efficient excavator
The potential energy generated when the working device of the excavator descends is recovered and stored in a hydraulic tank containing inert gas. When the material is lifted, the energy is released, acts as an auxiliary energy source to provide energy to the load together with the main engine, greatly improving the performance of the excavator as well as reducing the excavator fuel consumption.

Sectors and end-use applications

Machinery, Industry. Excavators, loaders and other mechanical equipment

Score and weighting

Indicator	**Score**
1. Energy saving potential	
1.1 Level of energy efficiency	**13/15**
1.2 Technical potential &	
1.3 Maximum adoption potential	**18.7/20**
2. Technical practicality	
2.1 Advanced nature	
2.2 Innovative nature	**10/10**
2.2 Reliability	**9.3/10**
3. Economic characteristics:	
3.1 Internal rate of return	**23.7/25**
3.2 Payback period	**9.3/10**
4. Social characteristics	
4.1 Co-benefits	**9.3/10**
TOTAL	**93.3/100**

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2 SCORE 92.3

Motor energy-saving technology based on three-phase sampling and fast response

By reducing the input voltage of the motor end and improving the power factor of the motor, keeps the motor working in the best efficiency state; By utilizing three phase sampling technology of adjustable resistance network, high frequency pulse column triggered SCR (Silicon Controlled Rectifier) technology and induction voltage detection technology, respectively solve the problems of system feedback sampling, SCR triggering, system response speed efficiently, so as to achieve motor energy saving.

Sectors and end-use applications

Machinery Industry. Low voltage three-phase AC asynchronous motor applications in metallurgy, coal and other industries

Score and weighting

Indicator	**Score**
1. Energy saving potential	
1.1 Level of energy efficiency	**13.3/15**
1.2 Technical potential &	
1.3 Maximum adoption potential	**18.3/20**
2. Technical practicality	
2.1 Advanced nature &	
2.2 Innovative nature	**9.7/5**
2.2 Reliability	**9/10**
3. Economic characteristics:	
3.1 Internal rate of return	**23.7/25**
3.2 Payback period	**9.3/10**
4. Social characteristics	
4.1 Co-benefits	**9/10**
TOTAL	**92.3/100**

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3 SCORE 91.3

Energy-saving control chip technology on body voltage sensor

An adjustable threshold four-terminal module is embedded in appliances with original standby power consumption, by this way, the original standby power consumption (1w to >10w) of the appliance is reduced to zero, and the appliance can be instantly powered on by touching through human body induction voltage. Since the electric appliance and the module will not consume any power after the electric appliance is turned off, will save energy accordingly.

Sectors and end-use applications

Light industry, Electronics Industry, Appliances

Score and weighting

Indicator	Score
1. Energy saving potential	
1.1 Level of energy efficiency	**13/15**
1.2 Technical potential &	
1.3 Maximum adoption potential	**18.7/20**
2. Technical practicality	
2.1 Advanced nature &	
2.2 Innovative nature	**9.3/10**
2.2 Reliability	**8.3/10**
3. Economic characteristics:	
3.1 Internal rate of return	**23.7/25**
3.2 Payback period	**9.3/10**
4. Social characteristics	
4.1 Co-benefits	**9/10**
TOTAL	**91.3/100**

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4 SCORE 89.7

Low-grade waste heat power generation technology of ORC screw expander

Utilizing efficient screw expander that has rotor profiles optimization, the organic working medium R245fa is used as the working medium for ORC power generation to recover low-grade waste heat to generate power.

Sectors and end-use applications

Industry furnance and other low-grade waste heat power generation in building materials, chemical industry, metallurgy and other industries

Score and weighting

Indicator	Score
1. Energy saving potential	
1.1 Level of energy efficiency	**12.7/15**
1.2 Technical potential &	
1.3 Maximum adoption potential	**18.3/20**
2. Technical practicality	
2.1 Advanced nature &	
2.2 Innovative nature	**9.3/10**
2.2 Reliability	**9/10**
3. Economic characteristics:	
3.1 Internal rate of return	**22.3/25**
3.2 Payback period	**8.7/10**
4. Social characteristics	
4.1 Co-benefits	**9.3/10**
TOTAL	**89.7/100**

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5 SCORE 88.7

New-type current-stabilizing, heat-insulation aluminum electrolytic cell energy-saving technology

By optimizing the current distribution, electrode structure and material selection in molten aluminum, optimizing the design of cell lining, the distribution of isotherm, and reasonably matching the technical parameters of the electrolytic cell, purpose is to achieve stabilizing the fluctuation of aluminum liquid, lowering the horizontal current, the voltage of the electrolytic cell, reducing heat dissipation in the lower part of the side and ensuring stable operation of the electrolytic cell in low-voltage and high efficiency state so as to reduce the DC power consumption of aluminum electrolysis.

Sectors and common applications

Non-ferrous metals industry, aluminum electrolytic enterprise

Score and weighting

Indicator	Score
1. Energy saving potential	
1.1 Level of energy efficiency	**14.3/15**
1.2 Technical potential &	
1.3 Maximum adoption potential	**16.7/20**
2. Technical practicality	
2.1 Advanced nature &	
2.2 Innovative nature	**9.3/10**
2.2 Reliability	**8.7/10**
3. Economic characteristics:	
3.1 Internal rate of return	**22/25**
3.2 Payback period	**9/10**
4. Social characteristics	
4.1 Co-benefits	**8.7/10**
TOTAL	**88.7/100**

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6 SCORE 87

Energy Saving Technology of Liquid Cooling Heat Conduction for Electronics Equipment

Combined heat pipe radiation technology and water cooling technology, the heat pipe-cold plate module and the server are coupled to form a chip-level cooling. The heat generated by the server's high heat flux density is exported to the outside of the server chassis, and then the heat is transferred to the cooling tower through the internal and external circulation system of liquid cooling. This technology doesn't need air conditioning compressors' support, significantly reduce the PUE value, effectively achieving energy savings of data centers.

Sectors and common applications

Telecommunications industry, Data centers of Government, Telecommunications operators, IDC enterprises, Internet, Finance, Public security, Power etc. industries

Score and weighting

Indicator	Score
1. Energy saving potential	
1.1 Level of energy efficiency	**13/15**
1.2 Technical potential &	
1.3 Maximum adoption potential	**16.3/20**
2. Technical practicality	
2.1 Advanced nature &	
2.2 Innovative nature	**9/10**
2.2 Reliability	**8.7/10**
3. Economic characteristics:	
3.1 Internal rate of return	**22.7/25**
3.2 Payback period	**8.7/10**
4. Social characteristics	
4.1 Co-benefits	**8.7/10**
TOTAL	**67/100**

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7 SCORE 86.7

Energy Balance and Optimal scheduling Technology in petrochemical enterprises

By implement energy production and consumption forecasting, energy pipeline network simulation, and energy dynamics optimization and dispatching technologies, to achieve optimal scheduling and operation of multi-energy systems (fuel gas, hydrogen, steam, electricity and water power, etc. systems) in petrochemical enterprises, to improve energy efficiency.

Sectors and common applications

Petrochemical industry

Score and weighting

Indicator	Score
1. Energy saving potential	
1.1 Level of energy efficiency	**13/15**
1.2 Technical potential &	
1.3 Maximum adoption potential	**18.3/10**
2. Technical practicality	
2.1 Advanced nature &	
2.2 Innovative nature	**7.7/10**
2.2 Reliability	**8.3/10**
3. Economic characteristics:	
3.1 Internal rate of return	**22.7/25**
3.2 Payback period	**8.3/10**
4. Social characteristics	
4.1 Co-benefits	**8.3/10**
TOTAL	**86.7/100**

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8 SCORE 86

Industrial Waste Water Heat Recovery Technology Based on Low Vacuum Phase Transformation Principle

Based on the principle of low-vacuum phase transformation, transport the industrial wastewater above 50°C to evaporator, utilize the vacuum pump to deaerate, form and maintain an appropriate negative pressure environment, and a multi-stage flash of industrial wastewater occurs. Then, the negative pressure steam carries the latent heat of vaporization is transported to condenser, release heat to low-temperature medium to recover the waste heat of industrial waste water.

Sectors and common applications

Machinery Industry, Low-grade Waste Heat Recovery of Industrial Waste Water

Score and weighting

Indicator	Score
1. Energy saving potential	
1.1 Level of energy efficiency	**14/15**
1.2 Technical potential &	
1.3 Maximum adoption potential	**18/20**
2. Technical practicality	
2.1 Advanced nature &	
2.2 Innovative nature	**8.3/10**
2.2 Reliability	**8.7/10**
3. Economic characteristics:	
3.1 Internal rate of return	**21.3/25**
3.2 Payback period	**7.7/10**
4. Social characteristics	
4.1 Co-benefits	**8/10**
TOTAL	**86/100**

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9 SCORE 84

Energy-saving technology of suspension copper smelting

By adding a nozzle capable of generating a swirling flow on the flash furnace, the air-particle mixing in the smelting process is intensified; the pulsation collision of the material particles is strengthened by the central pulsing gas; and the mass transfer and heat transfer are enhanced by annular material allocation named "Center Air, Material Surround" to improve energy efficiency of the entire smelting process ultimately.

Demand sectors and common applications

Non-ferrous metals industry, Smelting

Score and weighting

Indicator	Score
1. Energy saving potential	
1.1 Level of energy efficiency	**13.7/15**
1.2 Technical potential &	
1.3 Maximum adoption potential	**16.7/20**
2. Technical practicality	
2.1 Advanced nature &	
2.2 Innovative nature	**8/10**
2.2 Reliability	**8.3/10**
3. Economic characteristics:	
3.1 Internal rate of return	**21.3/25**
3.2 Payback period	**8.3/10**
4. Social characteristics	
4.1 Co-benefits	**7.7/10**
TOTAL	**84/100**

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10 SCORE 79

Modularization Cascade Heat Recovery, Clean fuel Coal Gasification Technology

Based on the principle of circulating fluidized bed gasification, the heat exchange process is optimized by preheating high-temperature gasification agent through first-grade high-temperature waste heat recovery, generating water vapor for vaporization through second-stage intermediate temperature waste heat recovery and generating heat water through third-grade low-temperature waste heat recovery, to achieve coal gasification cascade heat recovery and utilization and dry cooling, and achieve energy conservation.

Sectors and common applications

Chemical industry, Coal Gasification Field

Score and weighting

Indicator	Score
1. Energy saving potential	
1.1 Level of energy efficiency	**12.7/15**
1.2 Technical potential	
1.3 Maximum adoption potential	**15.7/20**
2. Technical practicality	
2.1 Advanced nature &	
2.2 Innovative nature	**7.7/10**
2.2 Reliability	**7.7/10**
3. Economic characteristics:	
3.1 Internal rate of return	**19.7/25**
3.2 Payback period	**7.7/10**
4. Social characteristics	
4.1 Co-benefits	**8/10**
TOTAL	**79/100**

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