

AN EFFECTIVE WAY OF IMPLEMENTING ENERGY-SAVING AND EMISSION-REDUCING FOR SALT ENTERPRISES TO ACHIEVE SUSTAINABLE DEVELOPMENT

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Abstract: Analyses of energy-saving and emission-reducing are presented. Developments and discussions regarding the ways of technology and effects of energy-saving and emission-reducing vacuum salt enterprises currently implement are performed.

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INTRODUCTIONS

Energy-saving and emission-reducing is an important social mission during "11th Five-Year Plan" period, also an important factor of building a harmonious society. To achieve the goal---by the 2010 GDP energy consumption per unit decreased by 20%---put forward during "11th Five-Year Plan" period, the implement of rational use of energy source and the vigorous development of energy-saving is quite crucial, meanwhile, reasonable control and decrease pollutant emissions of corporation, effective protection of the environment is rather a basic national policy that benefits the whole country and next generations. Salt enterprises must take practical measures to strengthen corporation management, to vigorously implement energy-saving and emission-reducing, and to establish relative energy-saving and emission-reducing targets evaluation mechanism; to enhance the production process of dynamic assessment; at the same time, to increase the capacity of eliminating outdated production and equipment; to connect with reality, do a good job of reusing sources, and continuously push forward the development of circular economy. In addition,

we must strive positively for economic policies that assist energy-saving and emission-reducing, and facilitate the implementation of the strategy of energy-saving and emission-reducing.

In recent years, China's salt companies focus on the center of production and management, uphold the scientific concept of development to guide the central work of them, continue to strengthen management and reputation, carry out technical innovation and energy-saving vigorously, and achieve gratifying results: increased production quality and quantity, efficient use of resources, reduced pollution emission, protected environment, achievement of the enterprise's comprehensive, harmonious and sustainable development

1 WAYS OF ENERGY-SAVING

On the basis of stability and increase of yield and quality, Chinese salt enterprises have implemented energy-saving and consumption-reducing, low the production cost continuously, and improve the quality of economic operation of the enterprise. The effective way and successful experience of implementing energy-saving and

consumption-reducing largely lies in the following aspects:

1.1 Adopting advanced production technology

During the period of project construction, we take the energy-assuming target as an important factor to consider, choose the better technology project by tremendous observation, analysis, comparison, and demonstration. For instance, the advanced technology of Switzerland MESSO with an annual output of 30-60 million tons of salt and sodium-generation and the advanced technology of Switzerland Aisaiweisi company with an annual output of 100 million tons using a single thermal effectiveness of mechanical compression (MVR referred to as technology) both have good energy-saving effects.

1.2 Adopting advanced energy-saving equipment

First is the boiler selection and transformation. Advanced energy-saving circulating fluidized bed boilers are used in new construction projects, instead of the old boilers which acquire high coal quality and cause high consumption, such as chain furnace, pulverized coal furnace, boiling furnace. We carry out renovation of the boiler with the permission of condition, so as to gradually adopt circulating fluidized bed boiler to replace the chain furnace, pulverized coal furnace, boiling furnace, and so on. There are three main characteristics of CFB boiler: ① Since it has the fly ash cycle combustion technology, its thermal efficiency increases more than 20% than that of the boiling furnace and other forms of boilers, the coal saving effects are significant; ② It has a low requirement of coal quality. As low quality coal, even coal gangue can be burned as well, it realizes the turning from rubbish to wealth. ③ It has the technology of high self-desulphurization. Desulphurization efficiency is up to 90%. The sulfur content of the coal is 0.23 percent, the gas sulfur content is only 225 mg / m³ after the circular combustion, and it will help reduce exhaust emission and reduce pollution.

Second is the selection of turbo-generator group. At present, most of the enterprises adopt back-generator group, which could use

the surplus energy produced in adjusting parameters such as steam pressure, temperature during the cogeneration technology of salt and sodium to generate power, it is one of the effective industrial production equipments that using the surplus energy to generate power at present. This replacement from extraction condensing steam turbine generator group to back-pressure turbo-generator-group can take full advantage of the flexibility of parameters adjustment, and of its energy-saving characteristic to ensure the electricity supply needed by the production of basic technology, and to enhance the utilization ratio of thermal energy.

Third is the selection of salt and sodium centrifuge. The effect of centrifuge is a direct reflection of the effect of salt or sodium product dehydration, it is clear that efficient centrifuges due to the fine effects of dehydration, salt and sodium products that after dehydrating contain less water, thus have a better dry effect into the dry bed, and a less consumption of dry stream. At present, many China's salt companies adopt the German company's Fulaimu-P centrifuge or other countries advanced centrifuge production, these fine centrifuges can run more stably and reliably with excellent productivity, they also have a low residual moisture after dehydration and can save dry steam consumption by about 25% than the national ordinary centrifuges, at the same time reduce the power consumption significantly.

Fourth is the selection of heat transfer pipes in heating chamber. At present, heat pipe made by titanium and titanium alloy materials are ideal heat transfer materials. Heating pipes made by this kind of material can increase the efficiency of the heat transferring, enhance the salt production per unit area, and reduce gas consumption per salt production by ton. Since these kind of pipes have a significantly reduction of gas consumption per salt production by ton than that of E2 copper or steel pipe, they can effectively save the steam.

1.3 Matched energy-saving measures in production system

First is the use of axial feed evaporation crystallization tank. It has a great variety of advantages, such as: alleviating the

phenomenon of heat short circuit, raising the effective temperature differential of heat transferring, having a more uniform distribution of solid-state, slowing evaporation tank wall scarring, reducing the vortex loss and circular resistance, decreasing the power consumption of the circulating pump, increasing the evaporation intensity per unit area and reducing one-time investment of the equipment.

Second is the use of salt and sodium-generation technology, which reduces the consumption of brine effectively. The use of salt and sodium separation technology retract all of the Na_2SO_4 that after salting which can made of high-quality industrial by-product of anhydrous sodium sulfate and is a good market prospects for chemical raw materials and high economic returns, and the mother liquor. Then, as a result of the recovery of the mother liquor, brine consumption has been effectively reduced.

Third is the use of brine purification technology. According to the characteristics of the brine, the brine purification method of "two alkali" combined with the "lime - flue gas" law method can be used. Through the brine purification technology, we can remove calcium, magnesium, and other impurities in original brine effectively, reduce the extent of scaling in evaporation heat exchange ducts, improve the effect of heat transferring of heat transfer equipment, increase the thermal efficiency of salt, sodium evaporation, improve the product yield and quality, reduce the clearing time of the pre-heater tank and evaporation tank, prolong the effective production time, and lower the consumption of steam and electricity.

Fourth is the promotion and application of the heat pump technology. A heat pump is a kind of energy-saving device that makes the low heat source flow to high heat source using the high potential partly. It reaches the energy-saving purpose by turning the low heat source which can not be directly used to high heat source which can be used like the transmission fluid pump. Although the heat pump consumes a certain quantity of high potential, its energy output is the sum of the consumed high potential and the low potential that be attracted, as a result, the heat pump technology has an obvious energy-saving effect. Salt (sodium) production projects usually adopt steam jet heat pump, it take the steam provided by the power plant as a source

of power to drive the injection of salt (sodium) evaporator which evaporate the brine to produce a secondary steam. The high pressure mixed steam generated through the heat pump is used once again into the salt (sodium) heating chamber, and at the same time, the first steam provided from the steam power plant is added as the complementary steam to maintain the heating chamber thermodynamic cycle in the heating chamber. As the result of the steam jet pump, a large number of brine evaporation generated by the secondary steam system is retracted to make full use of heat and reduce emissions of heat system, it decrease the use of the first steam quantity by 20% under the same conditions of salt production. At present, the tons of salt steam consumption of this heat pump technology drops to 0.8-0.9 ton which demonstrates that the technology has an obvious energy-saving effect.

Fifth is the adoption of natural ventilation cooling tower technology. The second steam produced at the end of the cycle in the thermal system of general multi-effect vacuum salt evaporation process must condense into water before the process complete, in general, the system adopts an air mixed condenser. As the circular water contain a certain degree of chloride ions, in order not to cause water pollution, most of the circular water is cycled by the closed-cycle cooling tower. Cooling tower uses the contact of water and air, hot and humid (high-enthalpy) water is sprinkled from the water-broadcast system into the tower. When the water droplets contact with the air, on the one hand, due to the direct heat transfer between water and air, on one hand, as a result of the pressure difference between air and water, evaporation occurs under the effect of pressure, then latent heat of evaporation is taken away, so as to achieve the purpose of cooling. At present, some of the salt enterprises adopt hyperbolic natural ventilation cooling tower to replace the previous mandatory ventilation cooling tower, such undertakings eliminate the need for strong cold fan which can save the electricity power effectively.

Sixth is the reinforcement of the brine preheating. The effect of pre-heater is the key factor during the use of condensation water preheating method. We can improve energy efficiency and enhance the energy-saving effect of the whole production system

obviously by using advanced preheater with high thermal efficiency, for such preheater can take good use of the condensation water in salt and sodium efficient system to preheat the brine.

Besides, the cooling water from boiler blower, induced draft fan, and the Roots blower in power plant and other equipment can be recycled as the water source of cold residue machines, and used-water also can be sent to the salt-sodium system acting as other kind of industrial water which is a good reuse of industrial water resource.

1.4 The electrical energy-saving measures in production system

At present, the effective power-saving measures that extended by salt production enterprises are as follows:

First is the use of dispersion compensation-based low reactive power compensation. Since this improves the power factor of the production system, and reduces the active and reactive power loss in power lines and electrical equipment effectively, it has an obvious power-saving effect.

Second is the use of advanced frequency conversion speed control energy-saving devices. According to the characteristics of salt production technology, we can appropriately and selectively install the advanced frequency conversion speed control energy-saving devices in many production process, such as water supply pump, the induced draft fan, desalination water pump in the heat electrical system; variety of water pumps in salt production system; the induced draft fan and blower in salt-sodium drying system; waste water pump in sewage treatment devices and other process, and transform the traditional valve (damper) method of cutting-conditioning into the speed of adjustment methods to save the energy consumed in the valve gate (door) efficiently. The use of such frequency conversion methods have an excellent energy-saving effect, and can effectively improve the working conditions of equipment, eliminate the "pressure hold" phenomenon in water (wind) loop system, extend the service life of equipments effectively. According to the theoretical analysis, the wider the adjusting extent of the valve (damper) in production process, the better the effects of its energy-saving. General salt business can

partly and selectively carry out (with the energy-saving space) frequency conversion energy-saving devices in accordance with its own characteristics. The practice has been proved that their benefits are substantial, and the frequency conversion power reduction ratio is more than 30% in most enterprises.

Third is the reconstruction of DCS system. In salt enterprises, the discrete component types are used in thermal control system of salt and sodium and heat-electrical production process in the past, their degree of automation and efficiency is very low, and have less stability. At present, the use of advanced computer Distributed Control Systems (DCS) can control the production process of power plant and Salt plant automatically, so that their production process parameters can be effectively and accurately control. In addition, they can also link the inverter power equipment and DCS system together, channel the control of the flow of liquid (or wind) into DCS system, realize the PID automatic control both of the heat-electrical system and salt production system which can not only ensure the accuracy of the process parameters, but can reduce fuel consumption, brine consumption, power consumption, improve heat transfer effect of the whole system of evaporating and drying effectively, finally enable the energy-saving and consumption-reducing reach a new level.

2 MEASURES OF EMISSION-REDUCING

At present, we are promoting energy-saving and emission-reducing. Salt enterprises should also control and reduce the emission of "three wastes", produce less pollution, protect the environment while practicing energy-saving.

2.1 Effective treatment of waste water

It is extremely essential to do a good job of comprehensive management and efficient use of waste water. The waste water from salt factories is mainly produced by of heat-electrical system and salt and sodium system which contains acid, alkali, salt, sulfur, and other harmful substances. The paramount consideration of sewage treatment is recycling. We can construct industrial waste water pond and pump station to recovery the sewage discharged in all production process

and send the industrial waste water to mine for brine recycling and reusing through the pressure water-returning pipeline, which will not only save the clean water for brine abstracting, but reduce the amount of sewage significantly, meanwhile such refinements can reduce the cost of production effectively and promote the orderly development of circular economy. Second consideration is that when the recycling can not balance, we should do chemical treatment to wastewater to meet the discharge standard.

2.2 The treatment of exhaust emission

The use of current advanced electrostatic dust removal devices or dust bag removal devices for dust removal of flue gas in boiler has the dust removal efficiency of more than 99%. The use of cyclone dust collector and water membrane dust collector in treating salt, dust and other sulfured emissions produced in salt factories can reduce the concentration of salt-sodium dust in the air, cut down the emissions of such harmful substances, and protect the atmospheric environment effectively.

2.3 The effective treatment of waste residual

The waste residue from salt factories is mainly the fly ash, cinder in power plant, and calcium and magnesium-based solid pollutants produced by brine purification in salt enterprises. In dealing with the boiler slag and ash, the use of water blow ash (slag) treatment device is much better than that of dry-type blow, for such doing minimizes the extent of air pollution caused by ash and dust. The preferred scheme for dealing with the boiler slag is to seeking partners actively, who can use the slag to make into useful additives for the production of brick and cement. Selling the boiler slag to appropriate enterprises not only deal with the ash, but create a certain degree of economic efficiency for both sides. However, if the slag can not be sold on time, it is necessary to build a repository with enough capacity to store the slag effectively and in a timely manner so that it can not run out arbitrarily and pollute the surrounding environment.

3 CONCLUSION

With the national policies of energy-saving and emission-reducing, pollution-reducing, and environment-protecting were introduced, salt enterprises has vigorously implemented tremendous successful discussion and practice of effective technologies to achieve sustainable development which won a great deal of success and represented a solid pace for the construction of the material civilization, political civilization, spiritual civilization, and ecological civilization.

On the road of energy-saving and emission-reducing, salt enterprises a long way to go, we must always adhere to the plan of maintaining stability and improving the yield and quality, implementing energy-saving and consumption-reducing, controlling and decreasing pollution effectively, protecting the environment, improving the enterprises overall efficiency as the total handle of production and management, take a series of corresponding measures to practice energy-saving and emission-reducing, strict the implementation of examination, rely on technological innovation, reform the processes and equipment continuously, promote the use of advanced energy-saving technology and equipment, eliminate high energy consumption technology and equipment gradually; At the same time, adopt domestic and foreign current advanced pollution emission equipment, reuse and recycle the industrial "waste water", "exhaust" and "slag" produced in production process in time, achieve the "double harvest" of corporate economic benefits and social benefits.

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