

ANALYSIS ON THE COMPARISON OF THE ADVANTAGES AND DISADVANTAGES OF THE HOT PRESSURE SALT AND VACUUM SALT AND THE DEVELOPMENT

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Abstract: one way that couple the vacuum salt and hot pressure salt was developed in this paper through the vacuation on the principle of hot pressure salt and the analysis on the advantages and disadvantages of hot pressure salt at home. Which can not only make full use of the excess heat of vacuum salt power station to attain the steam-power balance, but also play the advantages of hot pressure salt to achieve better energy efficiency.

Key words: hot pressure salt, gains and losses, steam power balance

1 INTRODUCTION

In the face of keen competition, the energy consumption, environment protection and product quality gap of vacuum salt industry between home and abroad come to emerge. Especially in the wake of the progress of industrial technology, energy saving has become the focus of attention of various enterprises, in order to improve the technological level of domestic vacuum salt, making use of a more advanced way is the inevitable trend of the salt manufacture technology development.

At present, the common way of vacuum salt manufacture is the multi-effect evaporation, from 3 to 4 effect, up to now, some manufacturers are adopting the 5-effect evaporation, all those way is to make full use of heat and reduce energy consumption. but some Foreign companies utilize the hot pressure salt to reduce power consumption. The purpose of this paper is to find a more energy-efficient, more cost-effective production way through the comparison of hot pressure salt and vacuum evaporation salt, the summary of the gains and losses of the heat pressure salt which had been used by domestic enterprises. Also hope to throw a

sprout to catch a herring, discuss with colleagues in order to better achieve the purpose of saving energy and reducing energy consumption.

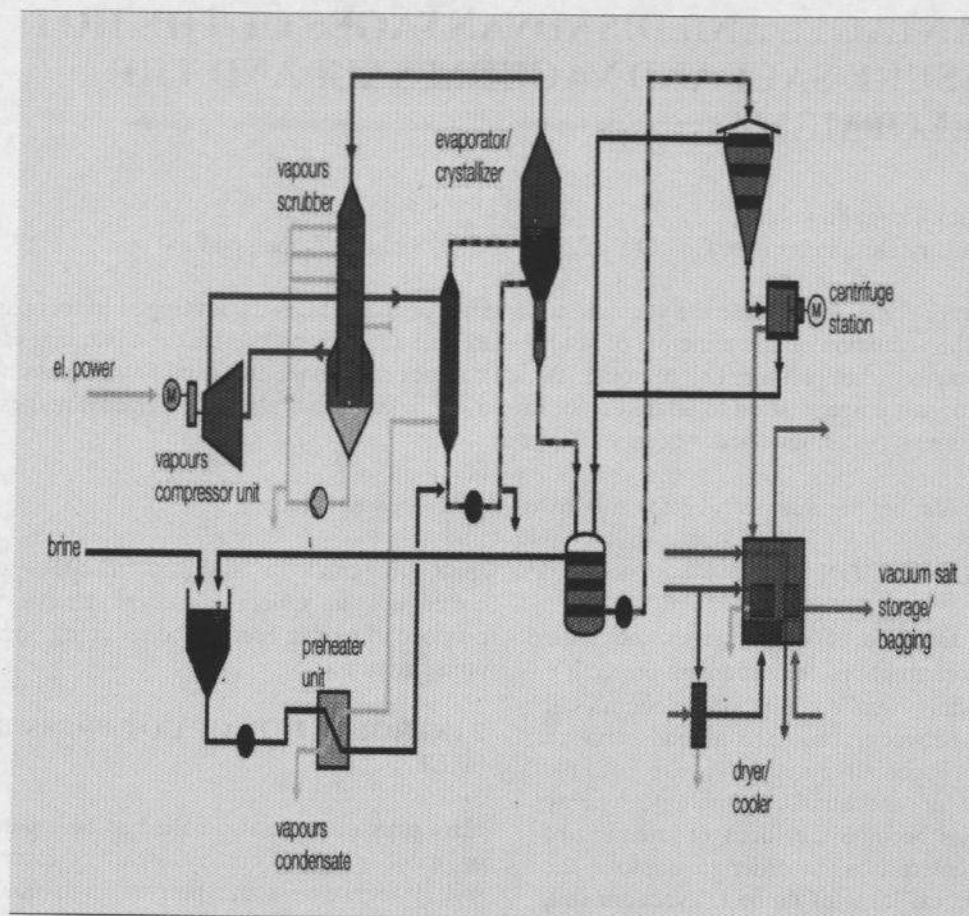
2 INTRODUCTION OF HOT PRESSURE SALT

Hot pressure salt, also called as heat pumps or mechanical secondary steam pressuring salt. It consume some part of high quality energy (heat, mechanical energy, electricity, etc.), shifted from the low-temperature steam to the high-temperature steam through the thermodynamic cycle compression process. The characteristics of the process are only one evaporation tank and positive pressure involved. In order to enable the temperature of brine to reach or approach the boiling point of liquid in chamber, the brine was preheated in the plate type preheater with the condensed water from the heating chamber before flowing into evaporating chamber. The brine was heated by the heating tube after it flowed into the tank, and it reached the boiling point soon when flow into the evaporating chamber again. The generated secondary steam was under a treatment of foam elimination, gas-liquid separation, washing-up and

compressed through centrifugal compressor. The compressed steam returned into the heating chamber as heating media when the degree of superheat had been eliminated. The discharged condensed water from heating chamber was mainly used to preheat brine, and the other part was used to wash the secondary steam to eliminate the degree of superheat. Thus, the whole processes circulate continuously to enable long-term continuous operation. Heating chamber don't require

supply of steam in normal circumstances, and its advancement lie in the consumption of less energy, so that a large number of secondary steam can to re-use. Which is a better way to save energy..

The heat pump itself is not heat source, but is the way to utilize low temperature energy effectively, and it can achieve the purpose of energy conservation and improve the energy efficiency. Its flow chart is as follows:



3 THE SITUATION AT HOME AND ABROAD

Hot pressure salt is receiving increasing attention for its energy-saving effect which can reduce the cost of salt manufacture. The development of hot pressure salt technology is earlier abroad, as early as 1930, Escher Wyss Co. of Switzerland has manufactured a centrifugal turbine compressor which give rise to the wide usage of hot pressure salt. To the 70s 20th century, hot pressure technology has been established. At present, there are many European companies to use hot salt, it become more popular especially in the areas with adequate power and low-price electricity.

such as the hot pressure salt evaporation equipment with production capacity of 1.5 million tons established in Italy by French company, achieve a high degree of automation control.

There are many domestic enterprises are to introduce this technology, improve the competitiveness of the industry.

4 GAINS AND LOSSES OF HOT PRESSURE SALT

4.1 introduction of the overall situation

Sichuang Zhangjiaba Zigong salt chemical plant had imported the hot pressure salt manufacture technology in the late 80's of

20th century, which is the first company adopted this technology. Zhang salt factory has two devices with a total production capacity of 230,000 tons at that time, of which the vacuum salt production capacity is 130,000 tons (the actual production capacity is up to 150,000 tons), and the hot pressure salt production capacity is 100,000 tons. From the material point of view, the entire hot pressure salt equipment including devices and pipes were imported, the evaporation Tank was made from Monel alloy, the others were made from copper-nickel alloy or stainless steel, recycling pumps, centrifuges, vibration dry bed all were advanced equipment, so the quality of the salt production in term of particle size, whiteness and chemical composition reach the domestic advanced level.

Since 1989, the hot salt installation of Zhangjiaba salt chemical plant Zhang have

been running for more than 4 years, the cumulative salt production was close to 200,000 tons. But it suspended production for a variety of reasons. The reason why the device failed to achieve its main purpose is not technical problem, but some other aspects. Several reasons were elaborated as follow:.

4.2 Output match

Zhangjiaba salt production plant had manufactured salt with hot pressure salt for more than 4 years, the cumulative production of salt is only 196,000 tons, only account for 47% of the design capacity (100,000 tons), which significantly lower than the designed capacity. Take the 1992 with the highest and 1993 with the lowest production yield as an example, the percentage of the annual production capacity to design production capacity as follows:

year	Yearly production (10 ⁴ ton/year)	accounting for the proportion of design (%)
1992	6.13	61.3
1993	2.47	24.7

As the production capacity is far from design capability, low production capacity lead to the substantial increase in the fixed unit costs. Which give rise to the illusion that advanced technology produce the of low-efficiency products. It is due to the planned economy at that time, manufacturing salt in accordance with national plans. Since the output of salt was far more than the market demand in those days, the salt production plan issued by government is short, so that the production can not be carried out at full capacity, which

resulting in long-term low- efficiency of the equipment.

4.3 Cost Comparison

From the cost point of view, the long-term intermittent production resulted in the higher cost of hot pressure salt than that of vacuum salt, But it is not the case. Take the vacuum salt and hot pressure salt cost of 1992, 1993 as an example to compare the cost of production, the data is as follows:

year	Unit cost (yuan/ton)	Direct cost (yuan/ton)	Indirect cost (yuan/ton)
1992	36.0	7.5	43.5
1993	37.1	13.9	51.0

As can be observed from the item composing of cost in table, the indirect costs is the main reasons the caused high cost of hot pressure salt. And indirect expenses consisted of the workshop expenses. And hot salt depreciation is the main reason for the issue of increased funding of workshop.

The fixed assets of hot pressure salt is 36.86 million yuan, more than 1,000 million that the fixed assets of vacuum salt, only one-third of hot pressure salt; compared in

term with the production capacity, the capacity of the vacuum salt is 130,000 tons, which is 1.3 times that of the hot salt. As the hot pressure salt has more fixed assets, the extracted depreciation charges according to the ratio was higher; combined with the production of salt in accordance with national plans, the production is small, so the depreciation charges per ton is even more. Depreciation charges as follows:

year	Hot pressure salt Depreciation (yuan/ton)	Vacuum salt Depreciation (yuan/ton)
1992	43.54	7.24
1993	41.31	5.95

As can be seen from the table, due to the short running time, this set of device is mainly reflected in the depreciation charge that the cost of hot salt were much higher

than that of the vacuum salt. However, the direct cost of hot pressure salt is obviously lower than that of the vacuum salt. Direct cost comparison is as follows:

year	Unit cost of hot pressure salt (yuan/ton)	Unit cost of vacuum salt (yuan/ton)
1992	171.30	176.61
1993	154.34	162.59

As can be seen from the above analysis, the main reason that the cost of hot pressure salt is higher than that of vacuum salt in Zhangjiaba salt production plant at that time is mainly due to the fact that the cost burden didn't base on the same level, the former cost more 30 yuan depreciation charge than the latter when produce one ton of salt, as a result that the cost-effective of the former is higher than that of the latter. However, just consider the direct costs alone, the cost of hot pressure salt is lower than that of vacuum salt.

Therefore, it should be sure that the main reason why the hot pressure salt device did not achieve the desired purpose is not technical issues: hot pressure salt is an advanced technique and can be used to produce high quality product; At the same time, the hot

pressure technology is mature, reliable and economically feasible.

As for the multi-effect vacuum salt, the number of the steam use rise with the increase in efficiency number, but regardless of efficiency number, the secondary steam has always been cool when it had come from the end-effect, which resulting in the waste of a large number of steam latent heat (about 540 kcal / kg). And hot pressure salt can overcome such waste of energy, it reuse the steam potential energy directly, which is the reason for the energy-saving. The comparison of energy consumption index in hot pressure and vacuum salt is as follows:

Hot pressing and vacuum salt consumption comparison table:

Salt method	scale(kt/a)	Gas consumption(t)	Electricity consumption (kw.h)	Converted into standard coal (kg)
Vacuum salt	150	1.3	45	160.50
	300	1.23	33	147.96
	600	1.05	29	126.65
	800	1.0	27	120.36
	1000	0.97	23	115.46
Hot pressure salt	100	0.128	171.3	83.72
	500	0.128	140~160	61.10

Hot pressure salt and vacuum salt both have its advantages and disadvantages. If combining the vacuum evaporation salt and hot-pressure salt to co-generate power, will be the solution to the current district steam salt imbalance of power the best way. In this way, not only can have a high fever Reactive evaporation heating efficiency advantages, but also the use of multi-effect vacuum evaporation with a high fever of economic advantages, to overcome the shortcomings of each, salt areas to achieve a basic balance between steam power; it is also energy-efficient the best way to technical and economic good, especially for places where electricity sufficient.

In the operational process, the hot pressure salt should be carried out on a smooth condition to make sure that the compressor produces a steady amount of steam. brine should also be treated in order to decrease equipment corrosion, improve the heat transfer coefficient, extend the operation cycle and achieve long-term economic benefits.

5. CONCLUSION

As can be seen through the analysis and comparison, the combination of the hot pressure salt and vacuum salt not only can

take full advantage of the surplus steam of the vacuum salt power station, to achieve the steam power balance, but also is an effective way to save energy. With the growing concern on the energy, combining multi-effect vacuum evaporation salt and hot-pressure salt will be the new direction for the development of the salt industry.

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