# Brief Talk On The Adding Control of Salt Addictives In The Process Of Salt Production

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**Abstract:** The paper covers the data control of the adding of salt addictives in each procedures to prevent the unqualified production, thus to decrease the rate of accident of salt production.

## 1. INTRODUCTION

The adding of iodine in the salt production usually was implemented at the wet salt transmission belt automatically or manually, and then the salt production was transmitted in desiccators for drying. The determination of iodine comprises two steps, the first step is the semi-quantitative colorimetric assay on site, the second step is the quantitative analysis of regular sampling in laboratory, and however, both the control of the steps belong to certain information lag and it will easily lead to the occurrence of unqualified product . In order to prevent such accidents, our company adopted rigorous controlling measures on each procedure in the adding of iodine, utilizing the chemical analysis data to control the whole process, which not only successfully prevented the occurrence of accident and also improved the qualified rate of salt addictives.

## 2. FACTORS INFLUENCING THE UNQUALIFIED SALT ADDICTIVES IN THE PRODUCT.

According to the 1999 national standards for edible salt, the content of iodine in edible salt was 20~50mg/kg, Ferrous Cyanide ions≤ 10mg/kg. we have developed standards for our business: ① $I^-$content of 25~45mg/kg ② ferrous cyanide content of 3~7mg/ kg, the pass rate of iodine adding is more than 96% and ferrous cyanide 100%; ③ $I^-$content of 20~50mg/kg, once the salt product showed agglomeration phenomena, it would be regarded as industrial salt, which was aimed to prevent the flow of unqualified iodine slat into the hands of users. For this purpose, we have adopted a "three-stage" approach to the testing:

Level- I inspection. Semi-quantitative colorimetric assay every 10 minutes on-site, this approach follow the principle that different contents of ions of iodine and ferrous cyanide show different color, thus the content of specified ions can be judge manually. The approach indeed avoids some occurrence of accidents and improved the pass rate of salt addictives, but there are some disadvantages. ① when the $IO^{3-}$ in the salt react with the I- in KI , the ion of I- may easily was disturbed by other ions such as $Fe^{3+}$, $Fe^{2+}$, $OH^-$. In the process of visual colorimetric analysis, the result shows a color of iron red or the color did not change in depth, which hindered

manual judgment. ② Among the reagents of determining the ferrous, the $FeSO_4$ can be easily oxidized, even may be oxidized within 24 hours according to the different weather, which made the result inaccurate, and put a serious impediment to the manual judgment. This problem is inevitable in the salt production and application

Level- Ⅱ inspection. The laboratory assistant monitored the I- in the product on the transmission belt every half an hour, and the ferrous cyanide every two hours, and then to instruct the production according to the result of inspection. Once the unqualified product occurred, the general control office would be informed and the related packed product would be isolated as industrial salt, which would cause certain amount of economic loss to company.

Level Ⅲ inspection. In order to prevent the inflow of unqualified iodized salt to the user's hands, the laboratory center inspect the production of each class with a sampling, only the product with qualified sampling can be sold, otherwise the product would be isolated and dealt with as industrial salt .

The above mentioned methods are very strict and effective to some extent, and targeted at the product, rather than prevent the unqualified product from source and from the process control. In order to solve such problems , we considered to overcome it from the preparation of reagents to prevent the factors influencing the unqualified product.

**2.1Weighting process**

When the amount of potassium iodide and potassium ferrocyanide was not seriously taken, it will cause the concentration ratio either higher or lower than standard, thus will bring some difficulty to the laboratory assistant, because they had to adjust the flow rate of the solution according to the data observed from the laboratory assistant, another error source may be introduced by the inaccurate measurement by the apparatus.

**2.2Burden process**

In the process of adding iodine, either the volume of distilled water is higher or lower than 600L, it will cause the concentration ratio higher or lower than standard, even worse some irresponsible operator would make overflow of the ingredient barrel, and the overflow was then flowed to the storage barrel, in this case, the operator of adding iodine usually did not notice this, which would lead the unqualified product.

## 3. CONTROL OVER THE ADDING PROCESS OF THE PRODUCT

Exclude all external factors, such as the thickness of salt layer, the uniformity of particle size, the stability of the centrifuge of salt production, and the tube blockage of iodine. The first consideration is to strictly control the process of weighing and burdening, another consideration is the determination of the concentration of potassium ferrocyanide solution and potassium iodate. Once the operator have formed some habit of when and how to add the addictives. They can control the flow rate easily and correctly, thus to ensure the pass rate of the adding of addictives. According to this method, our company had improved obvious about the pass rate of the adding of addictives (Table 1).

**Table 1 Pass rate of addictive**

| Year | Passrate of iodine | Pass rate of ferrous cyanide |
|---|---|---|
| 2000 | 90. 27% | 98. 04% |
| 2001 | 95. 87% | 99. 87% |
| 2002 | 97. 78% | 99. 90% |

The specifications of the method adopted here are as follows:

Step 1: Accurate preparation of additives solution 5ml with accuracy of 0.01g, and then added to 500ml shake and diluted to scale, drew 2ml of it to iodine bottle, added 5ml (5%) of the KI solution, then to add adding 2ml (1mol / l) of $H_3PO_4$ solution, shaked to uniformity, finally titrated to light yellow by $Na_2S_2O_3$, added 2ml (0.5%) of starch solution and continue to titrate until the solution became colorless.

$$K103(\%) = \frac{TI^- / Na_2S_2O_3 \times V \times 1.686}{(W/500) \times 2 \times 10^6} \times 100 \quad (1)$$

Where: TI/ $Na_2S_2O_3$ : titer value(ug/ml)

V:Volume of $Na_2S_2O_3$ (ml)
W:Mass of solution(g)

Step 2: Extracted 2ml of the solution from step1 into colorimetric tube, and added 4ml of $FeSO_4$ solution, and then to add distilled water to shake scale, airtighted for 10 minutes, then place to colorimetric ware, finally the measurement of value L can be calculated with a spectrophotometer .

$$K_4[Fe(CN)_6](\%) = \frac{L \times 10 \times 1.7358 \times 100}{(W/500) \times 2 \times 10^6} \quad (2)$$

Where: L: the content of $Fe(CN)_6^{4-}$ (ug/g)

Comparing the calculated value and the theoretical value, if the deviation is within 0.2%, the solution can be used, otherwise you have to add some distilled water or solute in order to keep the accuracy.

By make full use of the above mentioned measures, the pass rate of the adding of addictives improved steadily, and at the same time, the accident rate decreased obviously, which brought enormous economic effect to the company(Table 2)

**Table 2 Tons of unqualified product in successive year**

| Year | Times of degrade | State(Date) | Tons total(ton) |
|---|---|---|---|
| 2000 | 5 | Lower(Feb 2) | 18.3 |
| | | Higher(Apr 25) | |
| | | Lowe(May 22) | |
| | | Lowe(Jun 1) | |
| | | Lowe(Oct 21) | |
| 2001 | 3 | Lowe(Jan 6) | 10.5 |
| | | Higher(Feb 12) | |
| | | Lowe(Oct 7) | |
| 2002 | 1 | Higher(Jul 15) | 9 |