DISCUSSION ON TRANSFORMATION FITNESS NUMBER OF BRINE RESERVE CIRCLE OF PLASTIC-FILM-COVERING

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Abstract: Plastic-film-covering with long-term crystallization craft is widely applied, old preserving halogen way to be very difficult to adapt the need of production. This article carried on the theoretical calculation about the fitness number of transforming adjustment pool into plastic-film-covering and found the optimal benefit transformation value, in order to instruct the transformation project of beach field and increase the transformation benefit of beach field.

Key word: plastic-film-covering, brine adjustment pool, the area ratio, transformation.

PREFACE

Along with the economic development of coastal areas, the land resource is getting more and more rare and precious, sea salt is produced in the open-air terrene equipment, which has taken up massive land resources; simultaneously the production capacity of two alkali production enterprises is in expansion, which take the sea salt as raw material, and the demand quantity for raw salt is getting more and more, so it is an important topic for sea salt production to enhance the effective producing area of crude salt. Without the beach field area enlarged, making transformations to the current salt field in a way, improving the system of production, guarantee and Emissions for salt field unceasingly, and enhancing the brine production quantity are the effective measures to enhance the effective producing area.

In recent years, as the price of raw salt products rises again, sea salt enterprises gradually increase the transformation investment to salt-making industry, and salt plants have also made transformation to salt fields to some extent. Because the brine reserve of plastic-film-covering can be implemented easily and also possesses such advantages as short time consumption, good effect and easily adjustable range of brine reserve, the salt-making plants in Shandong, Tianjin carried on some transformation of brine reserve rings. However, there are many different opinions about the area ratio of transformation. This article carried on the discussion about quantity of transforming adjustment pool into plastic-film-covering, in order to obtain the transformation proportion with the best benefits and bring the best benefit value for enterprise's investment.

The present situation

Tang-Gu salt plant transforms partial brine adjustment pools of the third and fourth work areas into plastic-film-covering, and the

transformations of two adjustment pool in each working team, three are about to be completed; beach types of the third and fourth work areas are quite regular, and every beach is comprised by the water reservoir, evaporation tank, adjustment pool, crystallizing pond (certain teams and groups has partial barren beach area). The concrete number and area number are shown in table 1, and presently the adjustment area is being transformed, aiming to transform two 0.25 hm^2 adjustment pools into one 0.50 hm^2 adjustment pool with plastic-film-cover in order to increase the ability of production and guarantee of high-concentration brine.

Table 1 The Area Distribution of Beach Field in Working-Group 1 (hm^2)

Items	reservoir	evaporation area			Adjustment area		crystallizing pond	
		one	two	three	First step	Second step	Big plastic film cover	small plastic film cover
Number	4	4	4	4	8	8	6	12
Single area	1.3	1.08	0.82	0.64	0.25	0.25	0.84	0.14
Subtotal area	5.20	4.32	3.28	2.56	2.00	2.00	5.04	1.68

CALCULATION ABOUT THE BRINE-PRODUCING PROCESS

Now take beach field of the 37th working group (fourth work area) as example, and carry on the calculation in April-June, July-October and November-March of the whole year, then determine the best transformation numbers of adjustment area.

The selection of data in brine-making process

(1) the meteorological data (average meteorological value in that last 40 years, see Table 2)

Table 2 The meteorological data in the last 40 years

Month	Apr-Jun	Jul-Oct	Nov-Mar	Total
Evaporation E m (mm)	811.2	824.2	382.6	2018.0
Rainfall amount R (mm)	121.2	428.7	29.7	579.6

(2)Brine concentration of entering the water-conducting channel of teams and groups Because the effect of reserving brine with plastic-film-covering is better in July - October, 12.0° Be'is selected in the calculation of brine-producing process as the brine concentration in the water-conducting way.

Table 3 Brine concentration of entering the water-conducting channel of teams and groups

Month	Apr-Jun	July-Oct	Nov-March
Concentration (°Be')	12.5	12.0	12.3

(3) big-area evaporation coefficient f_1 is chosen as 0.75 (empirical value);
(4) brine reserve of plastic-film-covering coefficient μ is chosen as 0.95 (empirical value);
(5) the concentration for transforming first-step plastic-film-covering brine reserve is 25°Be'-26°Be', the concentration for transforming second step plastic-film-covering brine reserve is 25°Be'-26°Be' and 24°Be'-25°Be', so is the third step and fourth step.

THE ANALYSIS OF CALCULATION RESULTS

(1) Analysis about the changes of the saturated brine production and salt production before and after transformation: According to the saturated brine production per unit area in attached list 1-12, the total area of brine production is 19.36 hm^2, then the saturated brine production, the conversion salt production and Link relative ratio increment are shown in table 4 (saturated brine empirical value for producing 1ton crude salt is 6.5M^3)

Table 4. The computation results of the saturated brine production quantity, the conversion salt production and Link relative ratio increment after transformation.

Item Effect	None Transformed	One Transformed	Two Transformed	Three Transformed	Four Transformed
April-Jun production quantity (M^3)	39606.1	40217.1	40823.5	41434.3	42057.9
April-Jun production quantity (M^3)	2013.6	5594.1	7389.9	8846.4	10201.0
April-Jun production quantity (M^3)	18908.3	18908.3	18908.3	18908.3	18908.3
Whole year total (M^3)	60528.1	64719.5	67121.7	69189.0	71167.2
conversion salt production (t)	9312.0	9956.8	10326.4	10644.5	10948.8
April-Jun relative ratio increment (%)	-	1.54	1.51	1.50	1.50
Apr-Jun relative ratio increment (%)	-	177.81	32.10	19.71	15.31
April-Jun relative ratio increment (%)	-	0.00	0.00	0.00	0.00
Whole year total increment (%)	-	6.92	3.71	3.08	2.86

It can be seen from Table 4: ①after transformation, saturated brine production of its teams and groups has the obvious difference from before; the saturated brine production q increases along with the increasing of transformation area, and when only one team is transformed, its growth rate is the biggest, especially increasing range reaches 177.81% in July - October; ②transformation of plastic-film-covering has no obvious influence to the saturated brine production in April- June, but it have obvious influence in July-October; ③the growth change of conversion salt production is consistent with that of saturated brine production.

(2) Analysis of evaporation area matching with adjustment area n before and after transformation:

The number of transformed plastic-film-covering ponds is different in adjustment area, so the matched evaporation area is not the same. In the present teams and groups the evaporation area of regulating reservoir is generally 15.36 hm^2 (bigger, if the teams and groups has barren beach), if transformed adjustment area with plastic-film-covering is oversized or too small, it might cause the backstep evaporation area is not matching, the transformation benefit cannot be obtained fully, Calculated according to that the area in each step area occupied the percentage after all kinds of transformations, theoretical value of matched evaporation area is shown in Table 5.

Table 5 Comparison table between matched evaporation pond area and the actual area of different concentration brines after entering the adjustment area

number	transformation number of plastic-film-covering adjustment pool	month	Theoretical evaporation pond area (hm^2)			Actual evaporation tank area (hm^2)
			Brine concentration 23°Be'	brine concentration 22 °Be'	brine concentration 21 °Be'	
1	0	4-6	16.69	15.72	14.70	15.36
2	0	7-10	12.06	11.05	10.12	15.36
3	1	4-6	16.77	15.76	14.70	15.36
4	1	7-10	15.57	14.27	13.07	15.36
5	2	4-6	16.98	15.96	14.89	15.36
6	2	7-10	17.38	15.92	14.59	15.36
7	3	4-6	17.20	16.16	15.08	15.36
8	3	7-10	18.88	17.30	15.85	15.36
9	4	4-6	17.16	16.37	15.28	15.36
10	4	7-10	18.81	18.61	17.05	15.36

It can be seen from Table 5: ①before transformation, in the premise that the concentration of entering adjustment brine in April - June is 22°Be', the theoretical value of evaporation area matches with the actual value well; while other conditions seem to be out of balance; especially the theoretical value is smaller than the actual value in July - October, which means that the brine-making ability in evaporation area is bigger than the matching ability in adjustment area, so the waste takes place. Therefore, adjustment ponds need to be transformed with plastic-film –covering to improve the brine-making ability and achieve the matching better;

② If the number of steps for transformation is different, the degree how the theoretical value of area matches the actual value is different. Considering labor's brine-producing ability, teams and management of groups, etc in the real operation, the theoretical value of evaporation area should be smaller slightly than the actual value; therefore, when the concentration of entering adjustment brine is 22°Be',

two adjustment ponds should be transformed; and when the concentration of entering adjustment brine is 21°Be', three adjustment ponds should be transformed;

③ From other transformation situations, the matching in April - June and in July - October cannot be simultaneously guaranteed; especially, transforming four ponds, the theoretical values of evaporation areas are all bigger than the actual value, matching is impossible. Thereby, these situations should be forbidden in the process of transformation to maximum the transformation benefit.

(3) Analysis of the matching situation of back adjustment area before and after transformation (Table 6):

Table 6 Comparison table between theoretical area of adjustment area and actual area of the different concentration brines after entering the adjustment area

number	transformation number of adjustment pool with plastic film covering	month	Theoretical adjustment area (hm^2)			Actual evaporation pool area (hm^2)
			Brine concentration 23°Be'	brine concentration 22 °Be'	Brine concentration 21 °Be'	
1	0	4-6	2.67	3.64	4.66	4.00
2	0	7-10	7.30	8.31	9.24	4.00
3	1	4-6	2.60	3.60	4.66	4.00
4	1	7-10	3.79	5.09	6.29	4.00
5	2	4-6	2.38	3.40	4.47	4.00
6	2	7-10	1.98	3.44	4.77	4.00
7	3	4-6	2.16	3.20	4.28	4.00
8	3	7-10	0.48	2.06	3.51	4.00
9	4	4-6	2.20	2.99	4.08	4.00
10	4	7-10	0.55	0.75	2.31	4.00

①before transformation, in the premise that the concentration of entering adjustment brine in April - June is 22°Be', the theoretical value of evaporation area matches with the actual value well; while other conditions seem to be out of balance; especially, the theoretical value is bigger than the actual value in July - October, which means that the brine-making ability in evaporation area is smaller than the matching ability in adjustment area, that is the brine-making ability is insufficient. Therefore, adjustment ponds need to be transformed with plastic-film –covering to improve the brine-making ability and achieve the matching better;

② If the number of steps for transformation is different, the degree how the theoretical value of area matches the actual value is different. Considering labor's brine-producing ability, teams and management of groups, etc in the real operation, the theoretical value of evaporation area should be smaller slightly than the actual value; therefore, the concentration of entering adjustment brine should be 22°Be';

③ From other transformation situations, the matching in April - June and in July - October cannot be simultaneously guaranteed; especially, transforming four ponds, the theoretical values of evaporation areas are all bigger than the actual value in July - October, which causes the waste of adjustment area. Thereby, these situations should not happen in the process of transformation to achieve the maximum of transformation benefit.

In sum, the suitable number of the adjustment pool transformation with plastic-film -covering, in third and fourth working area should be two. In this way the optimization of transformation benefit can be achieved.

CONCLUSIONS

Improving the system of production, protection and emissions of salt fields and enhance the unit yield of effective production area are always an eternal topic for the salt-making project personnel. In this article, the suitable number of transformed adjustment pools with plastic film covering is calculated according to the situation of brine entering beach at present. In the future, if the transformation is made for the evaporation area inside or outside the beach, this suitable number of transformed adjustment area will also have corresponding change, which will not be discussed further in this paper.

Reference

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