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The Development of Dissolution Water Addition Strategy for Quality Control of Crystalline Particles in High Slurry Density Salt Crystallization

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Summary

Introduction In order to obtain salt product crystals at high efficiency, high suspension density conditions are indispensable. Therefore, it is necessary to control the excess number of micro-crystals. In this study, the undersaturation operations by using intermittent feeding and/or addition of dissolution water were developed. New operating strategy for controlling the number of micro-crystals was investigated.

Results and Discussion The evaporation crystallizer with a jacket was used. The operation conditions for controlling the number of micro-crystals were as follows: Run A: Continuous feeding of salt solution. Run B: Intermittent feeding of salt solution. Run C: Intermittent feeding of salt solution and dissolution water addition. From the comparison between Run A and B, when the intermittent feeding was performed, the number of micro-crystals decreased and the mean crystal size LM of final products became large. The micro-crystals could be dissolved in the local undersaturation produced by the difference of the feed and solution concentration in the crystallizer. In the case of Run C, the number of micro-crystals decreased rather than Run B and the mean crystal size of final products became large (Table 1).

Table 1. Summary of experimental results

	Initial (0 min) L_M [μm]	Final (240 min) L_M [μm]	Size Increase Ratio [%]
Run A	400	395	-1.2
Run B	379	422	+11
Run C	373	560	+50

These experimental results mean that addition operation of dissolution water could be used together to intermittent feeding and the operability developed for controlling the number of micro-crystals.

Conclusion When the local undersaturation was created by intermittent feeding, the micro-crystals could be dissolved. It became clear that crystal size distribution was improved by the intermitted feeding and injection of dissolution water, and thus feeding strategy and the injection operation strategy of dissolution water were proposed.