Accepted Manuscript

Experimental investigation and cost assessment of the salt production by solar assisted evaporation of saturated brine

Jing Zhao, Huaigang Cheng, Xiao Wang, Wenting Cheng, Fangqin Cheng

PII: S1004-9541(17)30396-8
DOI: doi:10.1016/j.cjche.2017.08.016
Reference: CJCHE 916

To appear in:

Received date: 1 April 2017
Revised date: 22 August 2017
Accepted date: 22 August 2017

Please cite this article as: Jing Zhao, Huaigang Cheng, Xiao Wang, Wenting Cheng, Fangqin Cheng , Experimental investigation and cost assessment of the salt production by solar assisted evaporation of saturated brine. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Cjche(2017), doi:10.1016/j.cjche.2017.08.016

Experimental investigation and cost assessment of the salt production by solar assisted evaporation of saturated brine*

ZHAO Jing(赵静)[1,2], **CHENG Huaigang**(成怀刚)[1,#], **Wang Xiao**(王晓)[2], **CHENG Wenting**(程文婷)[1], **and CHENG Fangqin**(程芳琴)[1,**]

[1] Institute of Resources and Environmental Engineering, State Environment Protection Key Laboratory of Efficient Utilization of Coal Waste Resources, Shanxi University, Taiyuan 030006, China

[2] College of Chemical Engineering, Qinghai University, Xining 817000, China

Abstract The technical feasibility and economy of solar heat collection-forced evaporation process are the keys to its practicality, especially its application in strong brine treatment. The operation cost of applying solar collection in salt manufacturing through depth evaporation of brine has been studied. For Na^+,K^+,Mg^{2+}//Cl^-,SO_4^{2-}-H_2O salt–water system, most of the NaCl and all of the Carnallite were separated. The operation cost reached the optimum when the heat collection and evaporation were controlled at 75 and 55 °C, respectively. When the solar radiation amount was 19557 $kJ \cdot m^{-2} \cdot d^{-1}$, the solar collector area for producing Carnallite was about 34.27 $m^2 \cdot t^{-1}_{salts}$, and the operation cost was \$13 t^{-1}_{salts}. The energy consumption of salt manufacturing is at least 25% higher than that of natural evaporation. Regarding the economy, the solar assisted salt manufacturing process is recommended to be performed at a production scale of more than 20 tons per day.

Keywords solar collection, evaporation, brine, salt manufacturing, economy

* Supported by National Natural Science Foundation of China (51674162), the Tri-Jin Scholars and Natural Science Foundation of Shanxi Province (201601D102058) and the Provincial Research Projects (2016JD06, 2016-HZ-803).
** Corresponding author. Tel.: +86-351-7018553; Fax: +86-351-7018553. E-mail: cfangqin@sxu.edu.cn (F.Cheng).
# ZHAO Jing and CHENG Huaigang (chenghg@sxu.edu.cn) contribute equally to this work.