



YUANPING CHEMICAL COMPANY LIMITED

Weld “Impingement Plates” for Each Steam Inlet Point at the Jacketed Heater to Avoid Heat Loss

SUMMARY OF THE OPTION

Yuanping city Chemical Co. Ltd is a middle-sized chemical plant with 1679 staff, located in Shanxi Province in China and is Asia’s largest producers of oxalic acid, and also produced products like sodium format and formic acid.

During the walkthrough of the plant, the Team observed that the inner core tube of the jacketed heater is impinged by high-speed inflow steam. Due to the abrasion of the steam, pinholes appear in the core, which results in increased downtime and maintenance cost because the entire heater has to be taken offline during repair. The Team suggested welding “Impingement Plates” on the steam inlet point in the jacketed heater to shield the inner core tube. This is a low cost option that the plant implemented immediately. Although financial and environmental benefits were not quantified, the manager informed the Team that downtime and maintenance cost of the heater could be reduced by 40 to 50%.

KEY WORDS

China, Chemicals, Steam Distribution and Utilization

OBSERVATIONS

During the walkthrough of the plant the Team observed the following:

- Due to superheated steam usage for heating, process heaters such as the Line #1 Synthesis Preheater operate at lower OHTC (Overall Heat Transfer Coefficients). Therefore, operators tend to open all steam trap bypasses, wrongly believing that as they do so, more steam will flow through the heat exchangers, and this will heat the process fluid faster. The reality is that the superheated steam is not fully condensing, thereby not releasing its full latent heat, and hence inefficient heating occurs. On close inspection, only 800 kg/hr of condensate is generated inside the preheater at that time. $P = 2.3$ MPag.
- Because operators have opened all steam trap bypasses, the steam flow rate through the Preheater is far greater than design requirements. Judging from the steam flow at the vent stack, about 2000 kg/hr of steam is wasted to atmosphere at this heater alone.
- Due to the high steam velocities, severe internal erosion has cut through the core pipe (process fluid side see Figure 1), leading to severe heating failure and causing the entire heater to be taken off line to repair these internal core pipe leaks. During the site visit, the Team witnessed how such a problem caused such a stoppage of Line #3 (i.e. 33% of total production lost) while the Preheater is under repairs for one whole day.

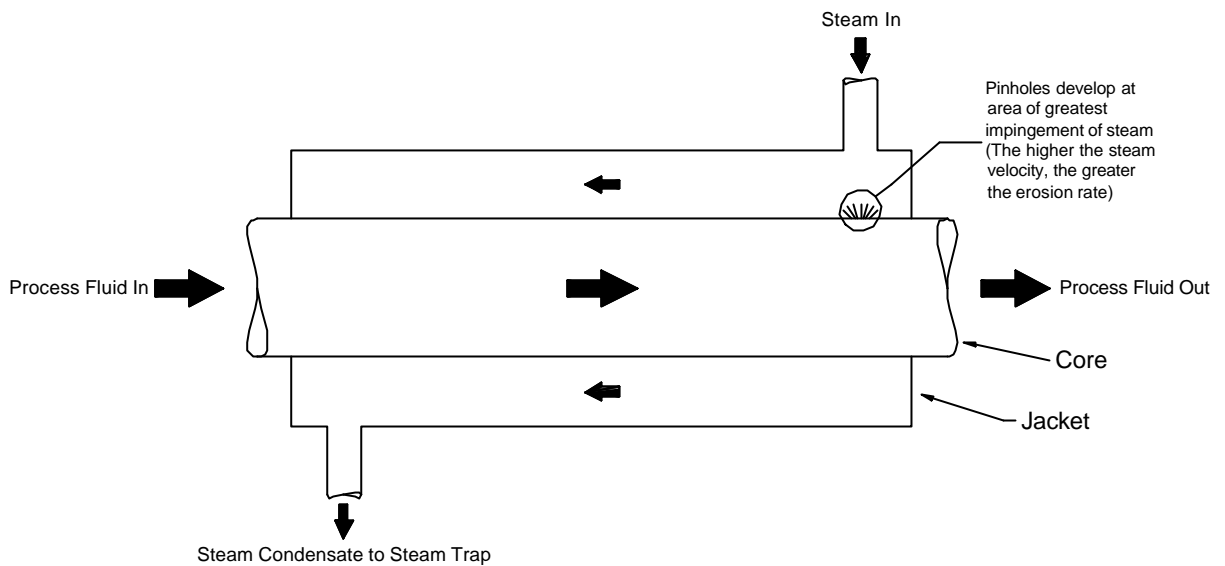


Figure 1: Common Failure Mode of Jacketed Preheaters at Synthesis Plant

OPTIONS

It was recommended to weld “Impingement Plates” to shield the core, as shown in Figure 2, for each steam inlet point in the jacketed heater. By minimizing the occurrence of pinholes in the core, the plant also manages to minimize downtime, and hence maximize production rates. Average specific heat consumption would then decrease.

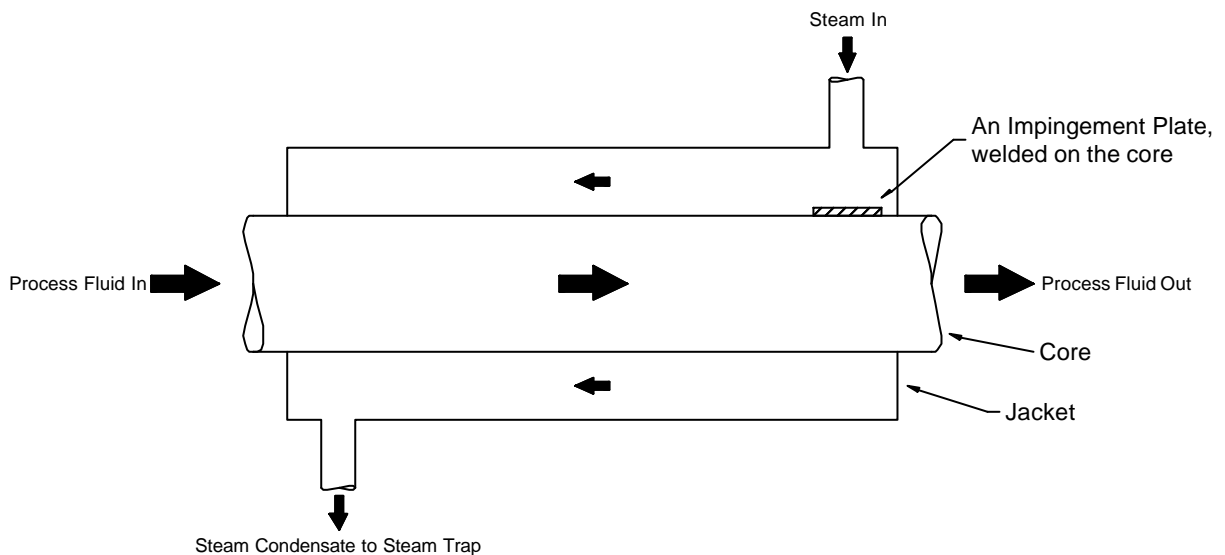


Figure 1: Recommended Modification to Jacketed Heater

RESULTS

Investment costs were very low (maximum of a few hundred dollars). Financial and environmental benefits could not be quantified. The downtime has been reduced by 40-50% resulting in a significant increase in production rates.

FOR MORE INFORMATION

GERIAP National Focal Point for China

Mr. Wang Xin,
Project Management Division I,
Foreign Economic Cooperation Office of State Environmental Protection Administration
No. 115, Xizhimennei Nanxiaojie
Beijing 100035, the People's Republic of China
Tel: +8610 66532316, E-mail: wang.xin@sepa.gov.cn

GERIAP Company in China

Mr. Song Peizhong
Technical Deputy General Manager
Shanxi Yuanping city Chemical Co. Ltd
No 1, Santiao, Qianjin West Street, Yuanping city, Shanxi Province, P.R.China
Tel: +860350, 8222889

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