

Design and Fabrication of High Pressure Feed Effluent Heat Exchangers Low Alloy Steel 2¹/₄ Cr 1 Mo With Weld Overlay

Fabrication, Technology and Challenges

PIDEMCO

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ما را که درد عشق و بلای خمار هست

یا وصل دوست یا می صافی دوا کند

در اوایل سال ۱۳۹۵ خورشیدی شرکت پیدمکو موفق به اخذ سفارش در خصوص طراحی و ساخت تعدادی مبدل خاص پوسته و لوله از نوع Effluent Heat Exchangers از شرکت مهندسی و ساخت نارگان جهت فاز توسعه شرکت پالایش نفت اصفهان گردید. از آنجاییکه این مبدل ها برای نخستین بار در کشورمان ساخته می شدند و بار علمی و تجربی خاص و ارزشمندی برای این مجموعه _ شرکت طراحی و ساخت قطعات و ماشین آلات صنایع پتروشیمی (پیدمکو) _ به همراه داشتند، بر آن شدیم تا با ثبت و درج تجربیات گرانقدر حاصل از این پروژه، دستاورد های خود را به اشتراک بگذاریم.

در این راستا شایسته است از مدیریت و کارشناسان محترم شرکت مهندسی نارگان بخاطر همکاری های ثمربخش خود بویژه اعتماد ایشان به صنایع داخل کشور سپاس گزاری نمایم. آنچه بیش از هر چیز دیگر انگیزه خاصی در نگارش این صفحات گردید شاید دقایق حساس، ظریف و دشواری بود که قدم به قدم در تمامی فرآیندهای تولید این تجهیزات خاص و شگفت انگیز با قدرت و سماجت خاصی پنهان گشته بود و روی نمی نمود. تلاش بسیار گردید تا از تاریکی های نگران کننده آن سلامت عبور کنیم و در این مسیر خداوند یاریاور عاشقان حقیقت است.

امید است نتیجه تلاش های شبانه روزی و دلسوزانه همه کارشناسان صدیق شرکت پیدمکو بتواند راهنمای کوچکی برای سایر پویندگان این مسیر باشد. مسیر توسعه، پیشرفت و بومی سازی هر چه بیشتر صنایع سنگین در ایران عزیز.

به امید تحقق آن روز -/ پیدمکو - پاییز ۹۶

سیامک رحیمی

جا دارد از زحمات برادر بزرگوارم جناب آقای مهندس جهدکاران که در نگارش، تنظیم و تدوین این صفحات ما را یاری رسانده و با رهنمودهای صمیمانه خود این مهم را ختم به خیر نمودند سپاسگزاری نموده و از خداوند منان برای ایشان توفیق روزافزون را خواستارم.

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Abstract

Diesel is one of the largest contributors to environmental pollution problems worldwide. Recent changes in environmental norms worldwide have forced all major refineries in the world to produce oil with low sulfur level. Thus Heavy Wall Feed Effluent Heat Exchangers are being designed and manufactured as a vital part of DHT plant. They are used to preheat gas oil (Diesel+H₂) in the shell side before entering the reactor preheater furnace and cool the treated feed (Diesel + H₂ +H₂S) in the tube side that is taken from the reactor discharge nozzle. The presence of hydrogen under very high pressure and high temperature creates potential situation for hydrogen disbonding and cracking. A way to protect exchangers from these harmful effects is using 2 ¼ Cr 1 Mo Gr-22 clad with SS 347 steel plate with special manufacturing technologies.

The complexities of equipment and the design requirements made a number of challenges in design, manufacturing technologies and fabrication methods.

Some of the manufacturing technologies are:

- 1- Warm rolling plate & self- reinforced nozzle fit up.
- 2- Robotic internal bore weld overlay cladding and TIP TIG machine for GTAW of self- reinforced nozzles and pipes.
- 3- Precision beveling of plate edges and nozzle opening area by portable milling machine.
- 4- Dissimilar metal joining.
- 5- Development of modular furnace (large capacity furnace) to avoid local heat treatment.
- 6- Final PWHT and relevant considerations.
- 7- Various welding and cladding methods and technology SMAW/SAW/GTAW/ESW.
- 8- Hydro-Tests & clad-passivation of surface with pickling + drying + cleaning and N₂ pressurizing.
- 9- NDT methods and effectiveness.
- 10- Seamless dish head hot forming.