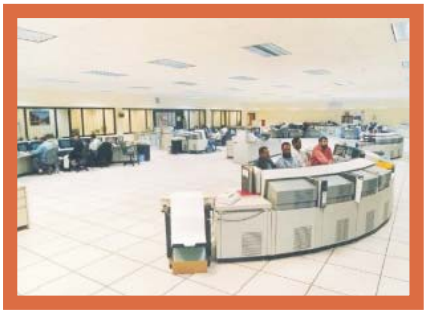
IPCOS

CASE STUDY: BALANCING H_2 PRODUCTION & DEMAND

A unique multivariable controller configuration was implemented on three parallel trains to optimise a hydrogen production unit at a refinery in the Middle East. The outcome was much smoother operation, minimising the impact of disturbances to the hydrogen plant. By enabling automatic as well as manual adjustment to the load according to demand, savings of $350,000 per year were achieved from Year 1. Moreover the successful technology transfer to in-house personnel has ensured these benefits are sustained in the long term.

Balancing a refinery's demand for hydrogen with its production can be difficult. Changes in the hydrogen plant feed gas pressure can be wide and cause big disturbances to the units. There can also be fast and significant changes to the demand for Hydrogen, which require fast process changes to balance production against demand. Sam Dhaliwal and the team were asked to smooth the operation of three parallel hydrogen units at a single refinery in the Middle East. All were usually in operation simultaneously and they had the same design, namely a common feed compression and treatment section, followed by a hydrogen reformer, high temperature shift converter (HTSC), a low temperature shift converter (LTSC) and a methanator. The product Hydrogen fed into a common network that provided Hydrogen to the entire refinery.



Working with refinery personnel, the team designed one large DMCplus multivariable controller on all the three units, separated into several sub-controllers. Hydrogen production had to be managed dynamically to match demand and often with a rapid response. The final product quality had to be maintained, with minimum hydrogen loss to flare and changes to HTSC and LTSC. Sub-controllers were implemented on each train, and a separate sub-controller managed feed and product sections. Inferential calculations were used to predict hydrogen purity and methane slippage, maximising controller uptime and minimise reliance on analysers. The final controller had 27 manipulated variables, 15 disturbance variables and 43 controlled variables.

Description	Savings $ / yr
Feed compressor steam consumption	60,588
Fuel gas consumption for train no. 1	330,264
H2 loss in flare	58,212
H-101 reformer steam	-80,784
Total	**368,280**

The success of the new control system was demonstrated in the first year after commissioning with almost 100% uptime and savings of over $350,000. Operators can control the units smoothly and still have the flexibility to carry out manual operations such as changing the load between trains, if they need to. Moreover, the inferential predictions for hydrogen and methane are so accurate that they are used as standard when the anaylsers are being repaired.

For more information please contact us at

IPCOS (UK) Ltd

Tel. + 44 (0)1223 833228
Fax. + 44 (0)1223 834162
Email info@ipcos.com
Web www.ipcos.com