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How to reduce Hydrogen Refuelling Station Complexity



Breakthrough
engineering for
a better world

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Breakthrough engineering for a better world

We create breakthrough solutions which accelerate the safety, reliability and performance of everyday processes. Our valves and complete system solutions control liquids and gases, enabling machine builders to improve design functionality and keep safety and sustainability at the forefront of innovation.

For over 80 years, we have helped our customers improve the reliability and efficiency of their machines for diverse end markets. Working in close customer partnership, we continuously push the boundaries of technology, offering a wide selection of components and tailored solutions. Meeting equipment manufacturers' needs includes everything from helping provide traceability for consumers, to reducing waste in critical resources and delivering a premium cup of coffee.

Through flexible, scalable and agile innovation, we help our customers solve their current challenges and create competitive advantage for the future.

Breakthrough engineering you can count on.

3 Ways to reduce Hydrogen Refuelling Station Complexity and improve OPEX by up to 10%

Are you looking for ways to reduce complexity and operational expenses in your hydrogen refuelling station design? Well, look no further! We have been involved in more than 100 station builds, we've put together a list of the top three ways to do just that.

It's no secret that current hydrogen refuelling infrastructure is too complex. This complexity drives up both operational expenditures (OpEx) and capital expenditures (CapEx), making it difficult for hydrogen refuelling stations (HRS) to operate profitably.

If we want to get hydrogen refuelling infrastructure right, we need to focus on simplification.

In many cases, the high degree of complexity is driven by the need to satisfy certification requirements and functionality demands.

•• Most hydrogen refuelling station providers and operators tell us they struggle with the three challenges described on the next pages. ••



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The three challenges in HRS design and operation

① Complexity & Constraints

Design engineers are faced with complex station designs which are required to satisfy certification and functionality requirements. With numerous subsystems such as the compressor, dispenser and storage panel, hundreds and hundreds of components are required to make the overall system work. Not even mentioning all the piping. Given the recent ramp up of hydrogen infrastructure projects, engineers also face time constraints. And at the same time, they have to ensure they keep up-to-speed with industry developments, evolving standards and growth demands.

② Reliability & Serviceability

Once the station is up and running, the operations team may have to grapple with unreliable and difficult to service components, which can lead to unplanned and expensive station downtime. In many cases, key components such as valves, regulators and filters were not designed specifically for hydrogen use and have a limited lifetime. And when things fail, servicing them is a complex and time-consuming undertaking.

③ Fragmented supply chains

Alongside complex design and operational issues, the importance of the supply chain and purchasing requirements for the station cannot be underestimated. Many operators are faced with a fragmented and difficult to manage supply chain; one that places upward pressure on total cost of ownership for the station lifecycle.

Three ways to reduce HRS complexity and operating expenses

Having been involved in more than 100 hydrogen refuelling station projects here are our three key ways to tackle complexity:

1 Electric actuation:

A typical hydrogen refuelling station's piping and instrumentation system will encompass 15 - 20 valves alone, as part of a multitude of components that also include regulators and process control solutions.

In most applications these are air or pneumatically operated, which require an entire sub-station of their own including an air compressor, FRLs and air preparation equipment, plus the associated piping and tubing. The sub

system must also comply with all safety-related requirements such as ATEX, as well as being able to operate successfully in both warm and cold environments.

An answer to reducing system complication lies in the specification of electric actuation solutions that help focus on reducing the number of subsystems needed. This provides cost and operational benefits by way of a significant reduction in the total number of components. In turn, delivering fewer potential leak points, higher component reliability and, ultimately, a less complex system design.

System solution developments - including those supplied by Norgren - are increasingly emerging to seamlessly facilitate a transition to purely electrically operated components. Both OpEx and CapEx considerations can be influenced through having less components to purchase, service, or at risk of failure. Add in the advantages of BUS systems to further reduce wiring complexity and electric actuation should be viewed as a real driver for system improvement across several areas.

2 Component integration:

Again, the typical hydrogen refuelling station requires the purchase and implementation of many fittings, tubes, pipes, and general assemblies. But is the prescribed way the best way? Is there an opportunity to eliminate a percentage of the many components that add to the

multipart and potentially inefficient running of the hydrogen refuelling station, and at the same time tackle the issues associated with fragmented supply chains?

The promising attributes of manifolds equipped with modular functionality offer a credible solution. Through integration of different functions such as valves, regulators, and filters, it is feasible to

reduce the overall quantity of fittings and piping. This not only eliminates potential leak points in the system, but it also delivers installation timescale benefits, as well as reducing the overall footprint of the station section. Such an approach has already gained traction in the development of CNG refuelling stations, as well as traditional hydraulic applications.

3 Serviceability:

The reliability of components so they deliver a prolonged and improved lifetime is key to operational efficiency. This means specifying component solutions that have a proven testing and simulation background and have been developed for the exact needs of station builders and operators.

Where servicing is required, the high-pressure environments components operate within can often prove problematic. Typical systems see entire components removed from process lines for servicing which is time-consuming and can lead to leak issues when reassembled.

The remedy lies in cartridge type components which can be serviced without the need to remove the entire body from the piping. Again, potentially difficult servicing needs are mitigated, time is saved, and servicing costs minimised.

Finally, condition monitoring of essential components can support overall aims to reduce complex system need and increase efficiencies. Integrated solutions that feature sensors and transmitters to monitor pressure and temperature are ideal in this sense. Generated data not only provides a transparent view on the status of the component, but it also enables better informed decision making for predictive maintenance schedules in the future.



●● Ready to reduce complexity and cost in your HRS design? ●●

Hydrogen

Conclusion:

As the demand for hydrogen-based energy solutions intensifies, it is vital that the supporting infrastructure (such as refuelling stations) required to support it is effective both from a cost and operational perspective.

Pursuing all three avenues outlined above will result in simpler, more cost-effective hydrogen refuelling stations that are easier to maintain and operate.

●● Book a call with the IMI Hydrogen experts today: ●●



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