A passion for instrumentation

Mr. Kuldeep Singh kick-started his career in instrumentation as an operations and maintenance engineer in a chemicals plant in India. He then worked for Siemens India before joining Haldor Topsoe in January 2009 as a senior instrumentation engineer. Today, as Group Manager-Global Instrumentation, his primarily focus is on ensuring the smooth functioning of his team, yet he still frees up time to help address challenging technical issues.

By David Sear

Mr. Kuldeep Singh posing in front of the Haldor Topsoe-office in Faridabad, India.

For the outsider, the instrumentation discipline can appear to be vast and varied. Fortunately, Mr. Singh is one of those articulate experts who can break down subject matter into much more easily digestible portions. Says Mr. Singh: "the instrumentation discipline can be divided into three main components. Firstly we have field instruments which can be further subdivided into categories such as sensors, switches and final control elements – including control valves and shut off valves. The second top-level component concerns process control systems. These are nowadays mostly DCSs, or distributed control systems to give them their full name. DCSs are popular because plant operators can easily enter the set points required for different process parameters. Moreover, operators can quickly spot any emerging trends, such as temperature increases. The third main component concerns safety and so includes for example emergency shutdown systems, or ESDs. ESDs require their own set of dedicated field instruments to generate appropriate signals. Based on a predefined programme, the ESD system can then trigger certain actions in the field. For example, the quick closure of shut-off valves to ensure plant safety."

Green hydrogen

Given such broad scope, instrumentation offers engineers a rich and rewarding career, continues Mr. Singh. "At Haldor Topsoe, my team work on a whole scale of projects, such as plants for ammonia, hydrogen, methanol, hydrotreater and sulphur technologies, etc. And that list continues to grow, with for example renewable energy and green hydrogen facilities. The normal starting point for an instrumentation engineer to become involved in projects is when the P&IDs are being prepared. Tasks then include selecting the most suitable instruments and control schemes for the application and preparing the best possible arrangement for the measurement and control of different process parameters such as flow, temperature, pressure, level and analysis."

Variety is said to be the spice of life and in the instrumentation world no two projects are ever the same, emphasizes Mr. Singh. "Even similar plants can have different feedstocks, different capacity ratings, different client requirements, etc. So the work of an instrumentation engineers is always varied, and never a 'copy and paste' exercise!"

Trip diagrams

Other jobs tackled by instrumentation engineers include developing so-called trip diagrams, which may also be referred to as cause and effect diagrams. Says Mr. Singh: "In the event of a process irregularity, these systems ensure that the facility remains in a safe and

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stable state. To give an example, if the temperature rises above a set point then perhaps the logical thing is for a valve to be closed, thereby shutting off the flow of fuel. Another important task is to prepare instrumentation data sheets for all inline instruments such as control valves, flow elements, pressure safety valves and so on. Our job is not all desk work either, as instrumentation engineers may be required to make site visits to support commissioning teams during plant start-ups as well as to attend review meetings or inspections. Such work has taken me to locations in India, China, Vietnam, Mexico , UK , USA and Middle East ."

As a final note, Mr. Singh indicates that instrumentation teams also prepare detail drawings of special thermocouples, create functional block diagrams of complex loops and special control schemes, conduct SIL assessments, etc.

Actuated valves are critical

Listening to Mr. Singh, it is clear that actuated valves receive a lot of attention within the instrumentation group. "Actuated valves are critical elements in ensuring the efficient and safe operation of a plant," stress Mr. Singh. "They have to respond timely and accurately to all signals from the DCS or the ESD systems. That is why we look at these valves from all angles. The first step is to size the valves for the intended control applications. Our involvement with valves then goes much deeper, as for example we specify the materials of construction for the body, the internals, the trim, etc. As technology licensors we really do know the application challenges, so can indicate the optimum materials for each type of fluid."

Mr. Singh adds that, depending on the client's preferences, Haldor Topsoe is often called upon to procure valves. "Our vendor group has established a good network of reliable valve sources, in particular for globe, ball and butterfly valves. Often we may need around 100 actuated valves, which can mean dealing with five separate vendors. I appreciate that manufacturers all have their specific fields of expertise, but it would certainly be much more convenient if we could obtain all our needs from a single source – provided the quality and delivery times were not compromised, of course!"

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Open to new suppliers

As an aside, Mr. Singh notes that Haldor Topsoe remains open to new manufacturers looking to establish business relations. "Vendors who wish to reach out to us can find a contact form on our website. The vendor group will then follow up, liaising with us or other groups as appropriate. The vendor list is a living document which we keep updating to ensure we work with top quality suppliers." New vendors can help to ensure the ready availability of certain valve types. Mr. Singh: "to give an example based on my own experience, large diameter butterfly valves with a very high pressure class may only be available from one or two vendors. Having even a few additional sources would be advantageous."

On the topic of actuators, Mr. Singh says that the standard policy is to procure valves and actuators as fully assembled units. "About 98% of the valves we specify are pneumatically actuated. There are just a handful of very specific applications when we opt for an alternative. For example, if it is important for the valve to 'fail in place'; in other words, the valve should permanently maintain its position should the power source fail. In such cases electric actuators are the current industry standard."

Mr. Singh notes that in theory, pneumatic actuators can also be provided with 'fail in place' options. "I have seen solutions that rely on air lock relays or other arrangements. However, these systems are not yet infallible meaning that the valve may move its position under certain circumstances. Still, I understand that companies making pneumatic actuators are continuing their development programmes, so I am certainly open to new ideas."

Ongoing developments

In all areas of industry, it seems that processes and equipment are constantly being refined, improved and upgraded. That definitely also holds for the instrumentation discipline, indicates Mr. Singh. "Nowadays we take efficient DCSs and robust ESD systems almost for granted, yet when I started working in a plant

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twenty years ago we still had individual controllers, plus a wide range of other instruments that were limited in the field. Sensors have also become far more sophisticated, allowing us to capture a huge amount of data which is most helpful for plant optimization."

Training for plant operators has also become much more high-tech, continues Mr. Singh. "Take the training simulators that are widely used nowadays. Plant operators can therefore practice complex procedures such as start-ups as well as emergency situations. This means that when a new plant operator starts work, he is much more competent and confident."

Asked about challenges in his work, Mr. Singh replies as follows. "Haldor Topsoe is a real innovator, constantly refining and improving plant designs. We are proud of that. However, being a technology frontrunner means our group sometimes has to identify unique instrumentation solutions for new situations. But my whole team absolutely thrives on such challenges, which we see as a way of serving the customer and also contributing to an advance in engineering knowledge."

Mismatch

Another challenge for Mr. Singh sometimes comes from a more unexpected angle. "As stated, we put the client's interests first and foremost. But on occasion there can be a mismatch between the customer's requirements and our own experiences." Asked to clarify, Mr. Singh states that: "suppose we have a client operating a fully-fledged refinery where they have standardized on linear control valves. Now based on our track record we may recommend an equal percentage valve as the best option for a specific application. So the challenge is to discuss this thoroughly with client in order to find the best solution. It can take time and effort to balance their existing practices and rich experience with our know-how."

After reflecting for a moment, Mr. Singh sums up the overriding vision at Haldor Topsoe. "As a technology licensor our goal is to deliver an efficient plant that will give many years of trouble-free operation. In short, we provide our customers with effective engineering solutions."

Meet Kuldeep Singh

After qualifying with a B. Tech in Instrumentation, Mr. Singh started his career working at a chemical plant. After a stint with Siemens India he joined Haldor Topsoe in 2009. He was appointed Group Manager-Global Instrumentation in June 2017 and now leads a group of engineers based in Haldor Topsoe offices in India, Moscow and Copenhagen. Keen to acquire and share the latest technical insights, he regularly attends trade events and has been an active participant at previous FCE shows in India. Outside working hours, Mr. Singh enjoys playing with his two children and also running.