Night view of BP's Lingen refinery in Germany.

A world of opportunities

In an informal interview, Principle Machinery Engineer Jillian Toussaint discusses her work with steam turbines, explains why digitalization will be increasingly important and – almost in passing– reveals exactly why engineering really should be every school-leaver's first choice of profession.

By David Sear

As a Principal Machinery Engineer for a world-scale company like BP, Mrs. Toussaint's job brings plenty of opportunities. Opportunities to practise applied engineering, to map out maintenance strategies, to discuss emerging technologies with vendors, to help formulate industry standards with external bodies like API and very definitely to travel.

When VW caught up with her, for example, she had just arrived in Germany to visit one of BP's four refineries in Europe. "I will be here for a couple of days, talking extensively to the local Subject Matter Experts. Providing machinery technical support and strategic direction to refineries is part and parcel of my job. For example, if they want a better understanding of why a certain item of equipment may require extra maintenance, or why there has been an unexpected shutdown. My role is to consult with local engineers, providing high level engineering input and helping to determine the best solution within a limited timeframe. That invariably means balancing technical and financial considerations. As everyone knows shutdowns carry a hefty price tag due to lost production and so need to be kept to an absolute minimum."

"Changing from a ferritic steel to Inconel significantly slowed the rate of magnetite formation and lengthened the service life of the valve."

With BP Mrs. Toussaint gets to work on a wide scope of equipment, including pumps, reciprocating compressors, turbo machinery and steam turbines. "Steam turbines can be very interesting for engineers, as many were installed during the 60s, 70s and 80s. This means that there is a significant call for assistance during maintenance and overhauls, especially in view of the fact that these aging assets often have third party vendor support. That delivers superior flexibility but does require operators to have sufficient technical knowledge."

A key factor to ensuring longevity in a steam turbine is apparently controlling

and carefully monitoring the steam quality. For example, silica content can lead to formation deposits, loss of efficiency and stress corrosion of blades. Mrs. Toussaint explains: "When steel is exposed to steam, then the iron in the steel will react to form various compounds, including a dense and compact protective magnetite oxide layer (Fe304). However, care has to be taken to properly manage magnetite growth as if the layer becomes too thick it could have a negative effect on control and trip valves functionality. Some of the valves typically found in a steam turbine have tolerances of just 0.1mm between the closing element and the body. You can imagine that with such a close tolerance between moving parts, magnetite growth after long periods can lead to problems such as valve sticking. In a previous function before joining BP I saw a trip valve fail within twelve months of being put into service. Changing from a ferritic steel to Inconel significantly slowed the rate of magnetite formation and lengthened the service life of the valve."

Aerial view of BP's Gelsenkirchen-Scholven Refinery in Gelsenkirchen, Germany.

Steam quality is therefore absolutely vital. Mrs. Toussaint: "changes in pH, the choice of conditioning agents, work done on upstream piping; factors such as these need to be very carefully monitored to prevent degradation."

Digitalization

Problem-solving and taking responsibility under pressure are clearly aspects of the job which come naturally to Mrs. Toussaint. However, she is definitely an advocate of the 'prevention, not cure' approach. "Looking at this industry as a whole I believe we need to become more proactive in terms of maintenance. To me that means digitalization, so being able to access performance data real-time. Seeing critical performance data via a central condition monitoring platform can help to identify production step-outs and therefore prevent incidents from occurring. That's much better than simply waiting for the alarm to go off."

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Implementing digitalization and across an organization as vast and complex as BP is a huge undertaking, yet one that the company is actively pursuing, continues Mrs. Toussaint.

Digitalization will also help combat an expected manpower scarcity. Mrs. Toussaint: "Engineering is currently not a popular career choice so there simply aren't enough talented people entering the industry. That is a problem as the baby-boom generation retires. Digitalizing the 'deep knowledge' of all our engineers will create an important repository of valuable information for the generations to come, helping them to keep mature plants running efficiently and safely."

In terms of job potential, engineering is therefore a very promising career, she agrees. As to her own future, Mrs. Toussaint sees a world of opportunities within BP. "Our chairman recently announced an ambitious plan to become a net zero company by 2050 (see box). There are projects coming up such as in Teeside that involve carbon capture and sequestration where my prior experiences may well come in handy. Right now my husband and I are happy in The Netherlands but with BP there are world-wide opportunities for those who are willing to take them!"

Meet Jillian Toussaint

Born and raised in the USA, Mrs. Toussaint has a B.S. in Mechanical Engineering and Mechanics, and an M.S. in Mechanical Engineering.

She started her career as an R&D engineer, later working as a machinery engineer for a company running ASU and HyCO plants to extract gases from the air. In October 2019 she joined her current employer, BP. Her role is to provide high level machinery support for 8 global refineries.

In 2013 she seized the opportunity to relocate to The Netherlands and has, she reveals, embraced the European culture, learning to speak Dutch and French along the way.

Interesting point: her great-grandparents emigrated from France to the USA during the second half of the nineteenth century!

Net Zero by 2050

In a recent press release, BP revealed its ambition to be a net zero company by 2050 or sooner. And to help the world get to net zero. The statement continued: "This will mean tackling around 415 million tonnes of emissions – 55 million from our operations and 360 million tonnes from the carbon content of our upstream oil and gas production. Importantly these are absolute reductions, to net zero, which is what the world needs most of all. We are also aiming to cut the carbon intensity of the products we sell by 50% by 2050 or sooner."