Dan Spence

*Chemical engineers have many different roles in process safety and I talked to **Dan Spence** who studied for an MEng in Chemical Engineering from the University of Nottingham (2017) followed by an MScEng in Process Safety and Loss Prevention (2019). Dan is an Associate Member of the Institution (currently applying for chartered membership) and is working as a Process Safety Engineer at Prax Lindsey Oil Refinery Ltd.*

Dan, what are the chief responsibilities in your current role?

I am responsible for planning and participation in hazard studies (e.g. HAZOPs, LOPAs, PHRs), at all stages of asset life. I drive the development of ALARP arguments to justify safe operations at our refinery and propose additional risk reduction measures where "reasonably practicable" to do so. I also lead risk assessments for situations where we find ourselves in compromised situations (e.g. loss of a safety critical barrier).

Sometimes I provide "intelligent customer" level human factors input into safety critical task analysis sessions. Finally, I have led the re-design of the refinery's safety management system performance indicators, with increased automated data collection and development of interactive dashboards.

Can you describe an average week?

A very enjoyable aspect of my job is being able to employ a broad range of skills to different situations. Some days I am using my knowledge of explosion science to understand the hazardous extent of our major accident hazard scenarios, other days I may be using probability theory to develop quantified risk assessments, and some days I am developing computer programming skills to enhance the way we report process safety KPIs.

I thoroughly believe process safety offers some of the best opportunities to work with multi-discipline teams, and every week I am engaging with a wide range of engineering disciplines as well as colleagues such as competence assurance colleagues in human resources.

Working with so many different specialists makes every day interesting. Whilst I am a chemical engineer at heart, I still find most aspects of all the other engineering disciplines very interesting, and genuinely love learning something new each day. I'm also a believer that in understanding how something works, you can better predict how it can go wrong.

Whilst I may be a bit biased, I feel a chemical engineer has the broadest range of knowledge and skills to bring together all this understanding, seeing the 'wider picture' and supporting the overall goal of proposing practicable solutions.

What achievements in Process Safety have given you the most satisfaction?

Even as a safety engineer I don't always find safety studies such as HAZOPs thoroughly entertaining. However systematically identifying all potential hazardous scenarios and ensuring that we have sufficient protection in place leaves me with the feeling I have done my duty as a responsible engineer not to expose people to intolerable levels of risk.

I have also greatly enjoyed developing new safety management system dashboards, as it has allowed me to develop my programming skills and use them in practice – I have always been a bit of a computer geek…!

What skills and experience have been key to your achievements in Process Safety?

Technical skills such as knowledge of the basic principles of engineering (thermodynamics, heat transfer, separation processes etc.) are of course highly important, but I feel the ability to effectively communicate (verbally and in writing) is key to your success as an engineer. You need to be able to clearly articulate your points and arguments, to ensure your discipline is heard as part of a wider team of engineers.

The most important aspect of my early development has been to develop the broad range of technical and non-technical skills to meet the requirements for chartership. Being part of such a large community has helped me to develop these skills through attendance to many IChemE facilitated seminars and webinars. With this input, I hope to submit my chartership application in the very near future.

How does your role contribute to solving society's grand challenges?

Society is becoming less tolerant of risky operations. I got chills down my spine when I saw footage of the Philadelphia refinery explosion in 2019 – we must continue to strive for greater protection in our highly hazardous processes. We also need to revise the way we meet society's energy demands, new technologies are being developed, all of which come with their inherent hazards. Process safety engineers will be fundamental in ensuring that whilst we adopt these new technologies, we do so whilst maintaining risk at tolerable levels. I am very interested to track the progress of the proposed replacement of natural gas by hydrogen for domestic fuel supply, given the different hazards presented by hydrogen.

What are the key Process Safety challenges being faced by your sector and what skills will be needed as we move towards 'Net Zero'?

It's no secret that the energy sector has a huge transition to go through to achieve "net zero". There are many new exciting technologies under development, and these will filter into our society over years to come at ever increasing pace. Whilst these technologies do come with their inherent hazards, we shouldn't be "put off", and rather we should see opportunity to practice inherent safety from the onset and design out as many of these hazardous scenarios as possible. This is a call to all engineers to be thinking of ERIC PD at all stages of their work!

What led you to choose a career in Chemical Engineering?

I like to think I've always been an inquisitive character, seeking answers to how things work and pondering on if there is a better way of doing something. Chemical engineers take on these big challenges, and use their broad understanding of many different fields of engineering to understand the problem from a bird's eye view, and use this understanding to solve the problem. It became a no brainer for me to pursue a career in this field.

What advice would you give to an early career chemical engineer who wants to work in Process Safety?

Keep it simple! With ever more reliance on numbers to demonstrate tolerable risk levels, I worry that we are often forgetting what we are trying to achieve (ever safer processes). I don't think anyone has

summed up the field of process safety better than Gordon MacDonald following the Buncefield incident, when he asked if companies can answer three simple questions. Look these up, if you have not already heard them!

Also stay true to yourself! It's important you understand where your own baseline is in relation to tolerable risk. To avoid uncomfortable moments in the workplace, don't let others, or more importantly yourself, compromise on your own values. This way, you and your colleagues get to go home at the end of the day with the knowledge that you did all you could to protect your workforce and the wider surrounding society. For me that's job satisfaction!