RVA GROUP

Explosives Engineering
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Features

Explosives engineering in modern-day demolition: a specialist insight

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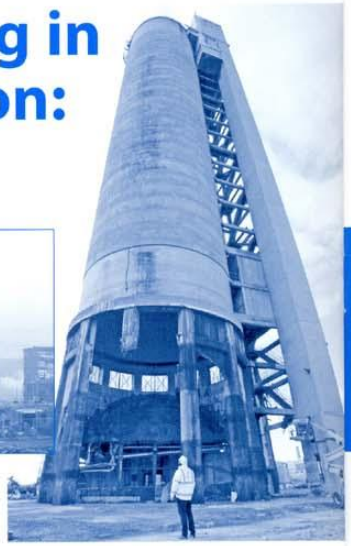
Despite the seemingly ever-increasing size of long-reach excavators, the controlled use of explosives still has a crucial role to play in the safe and efficient execution of complex demolition projects. Here past President of the IExpE and IDE and managing director of RVA Group, Richard Vann, describes what a career in explosives engineering involves, and evaluates the discipline's importance within the modern-day demolition environment.



The modern-day role of explosives engineering in demolition

The world of demolition is becoming increasingly varied. Assets across the globe are reaching their end of life and there is an unprecedented need to demolish these safely, cost-effectively, in an environmentally sound manner, and often within strict programme constraints. But as the nature of demolition projects continues to evolve, so too do the possible methodologies used to carry these projects out.

Whilst there has been limited radical advance in demolition technology over the last few years, plant manufacturers are managing to build larger machines capable of dealing with taller structures. In 2009 for example, RVA Group oversaw the mechanical demolition of a 50m chimney stack that was brought down using an excavator with a 60m telescopic boom and even this machine is dwarfed by more recent models.

However, it isn't all about size and in certain instances the controlled use of explosives is still selected as the preferred demolition method. Often this is because it provides a safer and faster alternative to demolishing structures of all types, whether they are high-rise residential dwellings or steel-framed industrial buildings or process plants. A structure may be too tall or complex for conventional machinery for instance, but the alterative of manually dismantling it piece by piece would necessitate operatives working at height for extended periods of time. Not only may this have implications for the project programme, but the risks posed to the operatives is also unnecessarily heightened.

There are also many other potential influencers. The structure may have become unstable due to working life stresses, concrete decay or even poor build quality, so mechanical demolition could simply be too dangerous; the structure might be positioned in close proximity to assets that require absolute protection; environmental and/or community disruption may need to be kept to an absolute minimum; and cost can even play a deciding factor too.

Ultimately though increasingly sophisticated explosives systems tend to ensure greater predictability of the outcome. Last year for instance, RVA Group project managed and coordinated the safe demolition of a 17-storey tower block in Greenock, Scotland. Meticulous planning and robust scientific methodology was needed to protect a nearby Network Rail infrastructure, the boundary of which sat just 3m from the building. Disruption to the electric rail commuter services also had to be kept to an absolute minimum.

The controlled use of explosives posed the most suitable methodology by far for bringing down the tower – not only would the alternatives of mechanical demolition or floor-by-floor dismantling have increased the possibility of debris falling onto the railway line, but a longer demolition period would have heightened the potential risk for project workers and the community. Furthermore, this demolition plan meant that only one railway line possession was needed and as the blowdown took place at night, commuter service disruption was minimal. At the time of the project the client – social landlord River Clyde Homes – praised the fact that site operations were carried out safely, the integrity of Network Rail's assets was not compromised and ultimately the demolition programme was a great success.

How does an explosives demolition project come to life?

Having assessed a structure and considered the suitability of explosives methodology, the explosives engineer then has a series of justifications to make with regard to a suite of factors including project safety, cost and programming.

Before proceeding with any demolition exercise, the engineer must therefore be able to conclude that the level of risk presented by the controlled use of explosives is manageable and acceptable. Of course every single job presents specific challenges, so extensive preparatory work is always crucial. Numerous precautionary measures can be employed:

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- Construction materials and even process residue samples can be taken to assess the degree of contamination – if any – within a given structure. Decontamination strategies can then be devised and executed accordingly;
- Test blasts can be carried out prior to the blowdown to validate the design of the charge weight, drilling pattern and primary protection;
- Vibration specialists can determine that the demolition will not cause disruption or damage to the surrounding environment.

Before a blast is carried out the project team should also liaise closely with all relevant external stakeholders, including the community, local authority and emergency services. Because the explosives engineer takes ownership of the project when the explosives phase is underway, responsibility for risk assessments, exclusion zones and contingency and misfire arrangements must also be assumed. Once a structure has been demolished, the rubble should be inspected to ensure inherent stability and to certify that no undetonated explosives remain. Debris and dust should also be cleared from the surrounding area – not only does this protect the environment but it allows any site neighbours to return to normality as soon as possible.

Getting to know the discipline...

Demolition is only one very small sector within the explosives industry, but there is still great scope for the discipline to excel within this engineering arena. The number of large-scale production facilities being closed worldwide remains staggering, and there is a need to clear these sites safely, cost-efficiently and with minimum environmental impact. Even regeneration projects that have been temporarily shelved as a result of economic difficulties will need to be addressed in the near future.

There is no reason why the role of explosives engineering within demolition cannot therefore have longevity. Yet unfortunately there are very few experts within this compelling field and the evidence of new blood wanting to make a career in this sector is also sparse.

There are two main elements to the explosives engineering discipline. Of course there is the need to truly understand pure explosives technology – how to handle them safely, the different types, how they should be stored, how they work and how they can best be used.

But engineers are simply utilising the explosive product as a tool to effectively achieve an objective. To be of value, pure explosives knowledge must therefore be aligned with a practical understanding of the defined profession, whether this is demolition, mining, tunnelling, quarrying or special effects for example.

So in demolition the engineer should also have an understanding of structures and a comprehension – perhaps with the input of other specialists such as structural engineers – of what the project needs to achieve in terms of collapse. The engineer must analyse and design where to place the detonator, how much charge to use, where to place the charge, what delay sequence to employ, what detonation methods to implement in order to reduce the quantities of explosives required, and what the suitable exclusion zone should be.

The considerations are numerous, and the competencies of a skilled explosives engineer multi-layered. An appreciation of the product science should be complemented with a level of articulacy and comprehension within the discipline to follow creative yet meticulous procedures and methodology. A respect for the power of explosives, within any field, is also essential. But knowledge grows with experience, and the importance of continuous professional development cannot be underestimated. Where possible, engineers should attend educational seminars and events not only to learn more about advances in explosives, but to remain abreast with safety systems and standards, environmental issues and ever-changing legislative control measures too. A true explosives engineer will have empathy for all related project factors.

Professional bodies such as The Institute of Explosives Engineers ensure that explosives engineers, scientists, logisticians, academics and legislators alike are recognised in terms of occupational competence, as membership of the Institute is earned by achievement not subscription. All industry specialists should equally acknowledge their duty to help shape industry developments and nurture the explosives engineering talent of the future.

To what extent people beyond the industry understand the exact science and extensive preparation involved in an activity which appears to last less than 10 seconds, is difficult to say. However the truth is that a career in explosives engineering – whilst hard work – will always offer new, exciting and challenging opportunities that are perhaps not comparable to those in many other professions.

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