

DSEAR; EARLY EXPERIENCE OF IMPLEMENTING THE NEW REGULATIONS, CONTROLLING THE STORAGE AND USE OF DANGEROUS SUBSTANCES

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The Dangerous Substances and Explosive Atmospheres Regulations were made in October 2002, to implement the fire and explosion aspects of the Chemical Agents Directive, and the Explosive Atmospheres (ATEX) user directive. They have allowed the most extensive changes to the health and safety law relating to flammable substances in 30 years. Extensive supporting guidance has been provided by HSE, but most of the significant new requirements are not yet fully in force, and their impact is not yet clear. This paper discusses issues that havearisen during the development of the new regulations and supporting guidance.

Hazardous area classification, dangerous substances, ATEX, notified bodies

INTRODUCTION

Ever since the Health and Safety at Work Act was passed, and HSE was established, in 1974/5, there has been a planned programme of replacement of health and safety law. Two principal driving forces were set out by the Robens report that preceded the HSW Act; first that health and safety law should apply to all places of work, and not just factories, and secondly that modern legislation should be of a goal setting type, not providing prescriptive solutions that could be rapidly overtaken by technological progress. Earlier attempts to update the law relating to storage and processing of flammable materials have foundered, for reasons that need not detain us now, but new regulations, titled Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) 2002 represent the last big package of revision of pre 1974 legislation, made under the Factories Act 1961.

ANOMALIES OF OLD LEGISLATION

Taking a broad view we would have to say that there certainly are some curiosities about the law to be repealed. Why should you need a licence from HSE to store Calcium Carbide, but not other products with similar hazards? The minimum flash point of solvents used for dry cleaning has been specified precisely since 1949, but the regulations take no account of the manner in which the solvent will be used. Given the range of standards for ignition protected electrical equipment, is it really necessary to keep an absolute ban on installing a motor within a ventilation duct drawing flammable vapours from a process?

External events of course have shaped our scope for action, and almost all new H & S legislation has its roots in European law, and DSEAR is no exception. Not all our European colleagues are quite as steeped in the risk assessment approach as HSE, and so the directives

that come from DG Employment, the EU commission department that deals with H & S law, sometimes have more specific requirements in than we might wish, and the EU parliament also has a significant voice in drafting legislation.

So this paper will look at some of the issues that have caused most discussion during the drafting of the regulations, the supporting Approved Codes of Practice, and as a consequence of the consultation phase. In particular, these have been the formal requirement for hazardous area classification to be applied in areas where it has never been done before; the interaction of the ATEX product directive and DSEAR; the hierarchy of control principles and the changing responsibilities of the local authority Petroleum Licensing Officers.

HAZARDOUS AREA CLASSIFICATION

Hazardous area classification (HAC), as a technique has been round for a very long time, with a gradual development of the principles, both for zoning, and for the construction of ignition protected electrical equipment over the last 50 years. So in a real sense, the law this time is catching up with good practice from the chemical and oil industries, and laying down that the same framework should be used more widely. In doing so, it has brought to light assorted grey areas, where the logic for our approach is not as rigorous as we might like, and has exposed some inconsistencies in earlier advice.

Hazardous area classification began as a system for deciding where fixed electrical equipment needed special designs to control the ignition risk, and we are all familiar with the terms flameproof, and intrinsically safe, even if they are sometimes used incorrectly. It is obvious that handheld, or mobile equipment can also create a risk, and many sites place controls over the use of vehicles, cameras, grinding equipment and power saws around their sites, because they need to control ignition risks. Overcautious zones and a strict application of the rules about what can be used where may seem to lead to anomalies. An everyday example is the petrol filling station, where people drive into one side of a pump, while another vehicle is filling up on the other side. We build the pumps to a high standard, they will be ATEX category 2 in future , but cannot be too surprised that some customers fail to understand why should not use their mobile phones, leave the car radio on, or fill up a unsuitable containers! In the same sort of way, we have in the past specified LPG cylinder stores as zone 2, but have been willing to allow in normal delivery vehicles, full of ignition sources.

MINIMUM QUANTITIES

Considerable unease has been expressed by those new to HAC, who have read the regulations, and wondered if they will have to fit explosion protected lighting in their shops or warehouses. It has not helped that almost all technical committees who have looked at the problem, have shied away from discussing the issue of package sizes or minimum quantities; consequently we have been asked ‘do I still need to assign zones where quantities of material liable to be spilt will be very small?’

Any attempt to pin this down has to be surrounded by caveats, as we know that even 100g of petrol, evaporated and dispersed inside a fuel tank can kill someone foolish enough

to apply a welding torch to the outside. Similarly, there is a world of difference between storing a few small tins of acetone, and using an acetone rag to clean up sticky polymer on an item of machinery. You might not formally draw up a zoning diagram for places where small quantities are stored but the need to handle it safely and avoid igniting the vapours is the same.

AREA CLASSIFICATION FOR THE DUST HANDLING INDUSTRIES

The extension of the concepts of hazardous area classification to dust handling plant creates some tricky problems, and sometimes it seems like a complication that will do little to improve plant safety. If we look at the issue of dust clouds, and explosions, we find from any examination of the incident history, that almost all explosion incidents start within the handling system. There are some exceptions, for example, the General Foods incident at Banbury in 1981 started with bursting of a conveying system caused by pneumatic pressure, and a recent fatality in the chemical industry started with a fire under a Flexible Intermediate Bulk Container containing a plastic additive. This caused the bag to melt and fail so that a large dust cloud escaped, which ignited and engulfed an operator nearby.

Faulty or unsuitable equipment does ignite dust clouds causing explosions, and there are many examples from grinding, blending and conveying processes. We cannot however, make high speed powerful equipment as safe as 'ia' intrinsically safe electrical equipment, and so regardless of whether the inside of your plant is described as zone 20 or 21, additional protective features are likely to be needed.

Fires are of course much more common than explosions, and can be just as devastating in the damage they cause, but the risks to people are quite different. Fires involving dusts in layers commonly grow quite slowly at first, and are likely to give those in the premises time to tackle the incident, if only someone is alerted in time. The consequence of this, is that we need to ask ourselves, how we should zone places where dust layers may collect over an extended period, yet no dense cloud ever exists, unless perhaps a primary explosion rocks the building? By this time, worrying about the control of ignition sources is a bit late.

These sorts of arguments have been rehearsed in various committees, and the footnote to the zone definitions found in DSEAR was the result of a last minute compromise by those who were writing EN 1127 part 1, 'Explosion Prevention and Protection, basic concepts and methodology'. The same issue came back during the writing of the European dust area classification standard, EN 50281 part 3, and has been settled by the text in annex B.

My own view is that you should decide if there is a need to prevent fires as well as explosions. If so, then no matter whether you choose to describe a place where dust layers form, but dust clouds are unlikely as zone 22 or unclassified, the equipment selection criteria are essentially the same. With the long delay in availability of anything published elsewhere in English, HSE is intending to plug the gap, with some industry specific leaflets, but it is, for instance, difficult to pitch something for the woodworking industries correctly for both a large chipboard factory, and a small jobbing joinery shop.

SOPHISTICATED OR SIMPLE APPROACHES TO AREA CLASSIFICATION?

A recurring comment from the consultation exercise on DSEAR, was that existing guidance on hazardous area classification was written from the standpoint of high hazard industry, and was difficult to apply to lower hazard industries. There is some validity in this, and back in the 1980s, the complexity of the topic was recognised, and a more rigorous analysis made clear a need for work that cut across the boundaries of individual engineering disciplines. The consequence was a unique cooperative exercise between the I Chem E, the I Mech E, the I Gas E and the I.E.E which resulted in the book by Cox, Lees and Ang. No one would claim that this was easy reading for a small company, worried whether to make their process area zone 1 or zone 2. For them a much cruder system of classification may be appropriate, while recognising that this might in turn throw up difficulties.

Much more recently in Aug 2002 the Institute of Petroleum launched an update of their code on the subject, which provides sophisticated risk assessment arguments to produce hazard radii from release sources, which may be used to set zone boundaries. A particular advance is the methodology provided to address releases from high pressure sources. The driving force for a new approach to the topic was a wish to move away from broad brush zoning, to something more closely linked to the reality of the situation. Potentially there are significant capital equipment cost savings, at the expense of more detailed analysis at the outset. However, some of the low hazard industries want to specify no zoned areas, but also avoid the costs of paying anyone consultancy fees to justify their position. Perhaps sector specific advice could help here, but the range of special groups looking for help is rather long.

CHEMICAL LABORATORIES

Area classification for chemical laboratories was a particular special case raised during consultation. Here we are faced with some uneasy realities. A huge range of electrical laboratory equipment is supplied in a form that is not ignition protected, and some of it is of considerable size. Heating mantles for glass reactor vessels are available up to 50 l in size, ovens for drying off samples can easily be up to 200 l in size. Smaller scale glass equipment can be very fragile, which laboratory worker has never broken a glass tap, or pipette?

No one wants to zone university laboratories where the cost of chemicals looms large, and all work is done at less than 10 g scale. Where however, do we draw the line as the scale goes up? Should I be allowed to distil 5 or 10 l of ethyl acetate on the open bench, from an isomantle? How do I make a system handling unstenched hydrocarbon gases, supplied from a high pressure cylinder, via plastic or rubber hose, sufficiently certain not to leak to justify no zones? If I carry out my larger experiment within a fume cupboard, will the forced draft encourage fire growth if a liquid spill is ignited? Would a large spill flow out of the front in any case? Current guidance from the Royal Society of Chemistry is of limited help in coming to a sensible basis for justifying either a policy of no hazardous areas, or defining where these should be specified.

INTERACTION BETWEEN THE TWO ATEX DIRECTIVES

The interaction between the ATEX equipment directive (EC/94/9) and DSEAR exposes the difference in origins and purpose between the two pieces of European legislation. The product directive concerns the single market, and the need to remove safety issues as an excuse for barriers to trade. Consequently it gives countries little flexibility in implementation. If a product meets the defined safety criteria, it must be acceptable for sale anywhere in Europe, and conversely, if the product does not meet the criteria, it is not acceptable.

To complicate matters, the product directive applies not only to the act of placing something on the market, but also to putting it into service. This has some sense, as it makes clear that as an end user , you cannot sidestep the safety standards, either by direct import of substandard equipment from the outside the European Economic Area, or by building it for your own use. There is no element of risk assessment here, nor an option of preventing the explosion risk by other means.

In contrast, European health and safety legislation specifies minimum standards for worker protection; firstly to give fair weight to the wishes of working people to have a safe workplace, and secondly to prevent industry in one country undercutting another, by permitting low safety standards. Individual countries have the right to enact or retain stricter law if they wish. DSEAR does have built in the concepts of risk assessment, and in particular the wording of schedule 3 allows some flexibility in the otherwise mechanistic link between ATEX equipment category, and the zone in which it will be used. We have debated whether this should only allow ATEX equipment of a lower category to be used (e.g. category 3 in a zone 1), whether it extends also to using safe but not ATEX certified equipment in a zone 2. In fact there are so many and varied possibilities , it seems unwise to be too dogmatic about this.

NOTIFIED BODIES

The European Commission recognises that the whole single market rests to some degree on trust. Can we trust self certified products to meet all the relevant safety criteria, or when third party testing is specified, will all the test houses adopt similar standards? Without this trust, even if legislative hurdles preventing free trade are removed, commercial considerations and bias will remain to distort the market. This is of course not simply an ATEX question, and similar legislation in other fields has spawned a huge growth industry of testing.

There are currently about 1000 notified bodies, test houses with the right to issue certificates of conformity, and this number is set to rise to 1250 when the construction products directive is fully in place. The consequence of this is pressure from Brussels, first to look at the competence of notified bodies some of whom actually have very little work, and secondly to press countries to report back about the nature and amount of enforcement activity they undertake for this single market legislation.

No one wants to see a league table of competence among such notified bodies, but this is a touchy subject for many countries. Equally touchy for many are the systems they have for enforcing this product legislation. HSE has the responsibility for enforcing the ATEX equipment rules, but there are many other competing pressures for inspectors' time. Experience shows that taking effective action against substandard equipment made outside

the UK takes considerable time and a strong case. We need to be clear that the resources involved bring safety benefits.

A particular concern is the difficulty of expecting notified bodies to test equipment where there is no previous tradition of independent testing in most countries, so available test equipment and expertise is very limited. This is the case for explosion suppression systems, dust explosion barrier devices, explosion vent panels and doors, and probably other items classed as autonomous protective systems.

HIERARCHY OF CONTROL MEASURES

Regulation 6 sets out a hierarchy of control measures, none of which, of themselves are contentious. So employers must look at reducing quantities of dangerous substances; minimising releases; controlling releases at source; preventing formation of explosive atmospheres; avoiding ignition sources; avoiding adverse conditions that create danger; and segregating incompatible substances.

Many people can see situations in which some of these steps are not possible, or when taken to a logical conclusion would increase the risk. For example, if your business is selling fuel, you cannot sensibly avoid storing some, and if you store less, that may mean more deliveries and more transfer operations. Similarly, you cannot avoid releasing material if your business is painting by spray gun or brush. You can control the release at source by local exhaust ventilation, but new hazards are created if the exhaust stream is fed to a thermal oxidiser instead of dispersing through a high vent stack.

Preventing the formation of explosive atmospheres might seem a good idea, but if this is done inside process plant by displacement of air with inert gas, new hazards arise if workers ever need to enter the enclosed space.

Controlling ignition sources is all very well, but clearly does not apply to plant for controlled combustion, and in this case if too much fuel gas is released before the ignition source is applied an explosion may follow.

So we can find exceptions and arguments against all these types of control measures. That does not make them invalid, and all we are really providing is a framework for the risk assessment. Can you replace your cleaning solvent with something safer? Can you make the LEV on your paint booth more effective, reducing not only the safety risks but the health hazards? Can you prevent the formation of an explosive dust atmosphere, not by inert gas, but by using a paste or pelletised product?

So, whatever the wording of the actual regulation, it is often going to be the case that all the options need to be properly considered, and that within a single plant different options may be appropriate at different locations. At least we do now have a legal framework that is comprehensive.

PETROLEUM LICENSED STORES

The old Petroleum Consolidation Act of 1928 used a system of licensing to ensure safe keeping of petrol and other products deemed as similar. This did not extend to use of the product, and this was highlighted by Flixborough as that site needed a license to store cyclohexane, but the large amounts in the process were not subject to the licensing.

Licensing officers employed in the main by the local authorities look after conditions at more than 20,000 bulk or container stores for petroleum spirit, and a further 12,000 licenses are issued for dispensing petrol at non retail sites.

It is clearly possible to argue that it is more efficient to have a single body enforce all aspects of health and safety at a single site, and HSE doubted that a licencing regime was appropriate for simple storage sites. As with the ATEX product legislation, finding the correct enforcement regime is an issue of resources: how much safety benefit is there from a given level of activity?

There are no absolute answers to this question, it is really a matter of political judgement. In a slight change from the proposals HSE presented in the consultation document, the Health and Safety Commission decided that for the time being licensing would remain for workplace dispensing of petrol. This reflected concerns about the safety of the public at retail sites, and evidence of poor standards at some non retail sites with very low throughput. The non retail group includes some rather diverse premises, from taxi firms and farmers, through to vehicle builders who put a gallon of petrol in cars coming off the production line. Storage of petroleum spirit in containers will however no longer be subject to a licensing regime, but covered by DSEAR in the same way as other substances.

CONCLUSIONS

As the requirements that come directly from the ATEX user directive, such as area classification of new plant do not come into force until June 2003 for new plant, and transition arrangements extend this for existing plants, it really is rather early to assess the impact of the regulations, except where diligent employers wishing to be ahead of the game have already raised questions with HSE. The targets set by the Government on HSE, in the Revitalising Health and Safety programme have caused HSE to concentrate on issues that create the most accidents and ill health, and fire and explosion hazards are not one of the priority programmes. Consequently these new regulations will have to take their place alongside other priorities when your inspector next calls.

It would be good to think that this was the end of the change process, but a major review of all the fire legislation is under way, and a consultation exercise from the Office of the Deputy Prime Minister was undertaken during 2002. A prime objective is to make the legislation simpler to understand, so that all involved may concentrate their efforts to best effect. HSE is actively involved in the review.