ELECTRICAL SAFETY in the food and drink industry

NORTHERN FOODS HAS BEEN ON A JOURNEY TO CAPTURE AND REDUCE RISKS ACROSS ITS OPERATING SITES OVER THE LAST SIX YEARS. THIS ARTICLE OUTLINES THE PRACTICAL, PROGRESSIVE STEPS TAKEN TO IMPROVE ELECTRICAL WORKERS SAFETY ACROSS THE BUSINESS

THE REGULATIONS and guidance on safe electrical working have been around for some time now and provide sound information to help us avoid preventable injuries and fatalities. However, as with so many of our regulations and guidance, the challenge is to turn these documents into safe, routine working practices that employees will follow in the middle of the night, during a busy food production run. Engagement has been a key theme throughout the delivery of the improvement initiatives outlined, along with supportive assessment of capability and competence as well as the creation of some very practical media and procedures – so please read on and find out how easily you can make a difference and avoid an electrical incident in your business" said Graham Finn, group SHE director at Northern Foods.

Mike Frain FIET MCMI of Electrical Safety (UK) has written safety rules and procedures for many household names in industry and commerce and carried out risk assessments for the power industry. Both bring their experience to highlight some of the challenges which can be prevalent in these industries.

The purpose of this article is to give a high level overview of electrical safety in the food and drink industries. This is clearly a complex area and factory premises often have different challenges. Jackie Wooldridge MSc CMIOSH is an ex-factory inspector with 15 years experience in the Northern Foods Group.

November 2010 saw Jackie Wooldridge of Northern Foods organising the IOSH networking event on Electrical Safety in the Food Industry. The project, supported by Mike Frain of Electrical Safety (UK) and the HSE, commanded a considerable amount of attention. Featured issues were the key aspects of electrical safety – including the hazards of shocks and burns, through to the implementation of robust but pragmatic electrical safety rules.

Why is electrical safety in the food industry different? Wet, sometimes dusty environments, a fast pace and continuous operation all increase the level of risk. All of these areas must be properly managed to reduce risks and ensure compliance with the Electricity at Work Regulations 1989 and associated guidance. Regulations particularly relevant to the food industry include; Regulation 6 which requires electrical equipment to be constructed to withstand wet and dusty environments, Regulation 8 which requires the earthing of non circuit conductors such as the metallic outer casings of machines; Regulations 13 & 14 require precautions to be taken to prevent re-energisation when working on electrical equipment which has been made dead (principally electrical isolation procedures) and suitable provisions to be made (or precautions to have been taken) where it has been proven absolutely necessary for work to be carried out live (live working rules and procedures).

Design for safety

Hygiene standards and electrical safety standards can sometimes be in conflict with each other. The need to ensure production equipment is kept clean means routinely employing aggressive cleaning techniques using water jets and chemicals often leading to water ingress into electrical equipment. To quote a food industry electrician "if a jumbo jet landed in our car park and we were asked to clean it – it would never fly again"".

The need for production line flexibility can also lead to conflict with electrical safety standards. This can manifest itself in the use of long temporary leads which can become permanent, the excessive use of plug and socket outlets and a lack of attention to earthing and bonding of equipment. Complex production equipment may be supplied by a single earthing conductor in a flexible cable via a 400v plug and socket. Lots of equipment, on packing lines for instance, is also insulated from the ground via plastic feet or wheels. Faults on electrical equipment in such circumstances can lead to

dangerous touch voltages to adjacent equipment and exposed conductive parts.

The environmental conditions that commonly prevail mean design standards governing water ingress and earthing and bonding must be of a high order.

The first question a designer should ask is - Does the electrical equipment (such as control panels) need to be in the high risk production environment? Can it be installed remotely?

Experience shows different makes of equipment, such as enclosures and socket outlets, perform differently in wet or dusty environments even though the ingress protection specifications are identical. Designers should specify equipment carefully rather than 'get what they are given' by contractors and suppliers. It should be remembered water in electrical equipment is not only bad for electrical safety, but is a significant cause of equipment breakdown. The costs of reactive maintenance and loss of production make this a very important issue resolve.

It is also important to carefully specify equipment entries for cables into equipment. It is sometimes overlooked that a high IP specification panel needs the same specification or better for glands and other entries.

The fixed electrical installation needs to be taken as close as possible to the point of use where plug and socket arrangements are in use. Additional flexible cables add earth loop impedance and increase touch potential to adjacent exposed conductive parts.

Competence

Probably the most important of the Electricity at Work Regulations 1989 is Regulation 16, relating to competence. It is an absolute requirement that individual workers should be assessed for competence in terms of their knowledge, training and experience. In addition, they will need to understand the system and associated electrical hazards and be able to consistently recognise whether the work is safe to continue.

It is not unusual to find engineers in the food and drink industry working in energised high power electrical equipment with no formal electrical training at all. Refrigeration control equipment regularly contains high current bus bar systems in excess of 800 amperes at low voltage. It is often the case that electrical training is an 'add on' to a refrigeration engineer or perhaps a skill that has just been acquired over time.

Where do we start in assessing competence? For existing direct employees it is probably best to start with a framework for competence followed by a reappraisal comprising of an interview and a short technical competence test. Managers often are mistaken in the belief that this will be somehow demoralising; when in fact it can be motivating to find that one's skills are being formally recorded and recognised in such a way.

For contracting electricians in the United Kingdom the requirements of the Electro-technical Certification Scheme (ECS) is a very good start. The scheme is administered by the Joint Industry Board (JIB) for the Electrical Contracting Industry. It not only covers the traditional electrical contracting electrician but other electro-technical disciplines such as electrical fitters, instruments technicians, maintenance electricians, wireman/panel builder, building controls and telecommunications fitters. Before a card can be issued the individual will have to prove technical and vocational qualifications, age and minimum experience and health and safety awareness.

Sometimes there is a requirement for technicians and engineers from abroad to be assessed. The Joint Industry Board has links to various organisations that can help in comparing the qualifications of individuals from outside the United Kingdom. One such organisation is called UK NARIC and can be contacted through www.naric.org.uk

There are still employers who think if they subcontract work it is the contractor's duty to ensure the competence of their employees. The following case in the food industry proves that this is not the case: "A contractor's employee was removing a redundant cable from a trunking and was killed when he made direct contact with an un-insulated live cable at an in-line connector joint. The subsequent HSE prosecution resulted in a fine of £220,000 and £30,000 costs to the company ordering the work for (i) not ensuring that the subcontractor was sufficiently competent to perform such work and (ii) not ensuring a safe system of work was in place."

Safety rules

This second deficiency listed above ((ii) not ensuring a safe system of work was in place) brings us to the need for safety rules. A recent IET discussion paper revealed 55% of electrical accidents cited the cause as procedural and figures released by the HSE say that inadequate safe systems of work account for 68% of electrical accidents.

Electrical safety rules should be in place and adhered to for any electrical work. A good starting point for the content of Safety Rules is HSG85 - Electricity at Work Safe Working Practices published by HSE Books. There are, however, no sample safety rules for low voltage work as they should be specific to the site organisation and environment. The following is a list of basic issues that should be considered:

- Clear roles and responsibilities for all, especially the principal electrical duty holder.
- Assessment and specific authorisation of individuals who may carry out electrical work.
- Clear rules that define work on dead conductors and equipment.
- Rules for working on or near live conductors, under what circumstances, by whom and defining risk assessment and control measures.
- Approval and control of instruments, specialist electrical safety equipment and PPE.

Emergency procedures

These measures can be backed up by safe working procedures for operating and maintaining the electrical system and equipment. There should also be appropriate guidance provided within the procedures to avoid any ambiguity.

Equipment in production areas should be appropriately maintained to the highest achievable standard. Testing of equipment in very wet or dusty environments is all too often

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at the same frequency as equipment in dry, lower risk environments. Sometimes the earth integrity is never checked.

The most important maintenance is possibly the simplest, specifically user checks which can be embodied into formal pre-start up inspections. Very little training is required for production staff to realise potentially dangerous conditions such as cable or equipment damage.

Electrical maintenance should be reviewed to ensure risk based inspection and testing is being carried out. This should include earthing integrity.

In many instances water ingress into equipment is attributable to poor maintenance of door seals. Damaged door seals need to be replaced immediately and there can be a case for periodic replacement. The seals also need to be cleaned after entry as product can become trapped and create a water bridge.

High voltage operation and control

Most large factories in the food and drink industries require great amounts of power; either because of large refrigeration plants or simply because of the scale of operation. As a result, high voltage supplies are usually required with a private high voltage network comprising of switchgear and transformers. If this is the case then the HV network will need to be controlled, operated and maintained. This means competent HV engineers working under strict HV rules and operating procedures. The question that electrical duty holders have to ask is – Have I got the necessary skills in-house or should I buy in the expertise? If it is the latter, this is usually through a control, operate and maintain agreement (COMA) where a specialist HV contractor takes over the HV network on your behalf.

Some duty holders mistakenly may feel that they have no responsibility for the HV network, because they subcontract the maintenance to a specialist HV company. The contract may only be for maintenance and call outs so the only time the specialist is in control is during maintenance periods. The agreement wording will therefore need to be carefully read. The 'acid test' of who has control of the HV system will be – Whose locks are on the switchgear, enclosures and transformers? If the duty holder still has access then he/she will retain control in which case HV rules and competent HV engineers must be in place. To summarise the options available:

- In house HV rules and authorised competent HV engineers.
- Subcontract to a specialist competent HV contractor with the resources to respond to emergencies under a COMA agreement.
- Some specialist companies offer to purchase private HV networks and then to charge a rent which will include all costs associated with operating and maintaining the network.

The Northern Foods experience

During a visual inspection of a 1600 amp electric oven to check for debris one Saturday morning at a Northern Foods factory, things went wrong. The machine was isolated and locked off. Everyone applied their locks. The guards were removed and the inspection commenced. More guards were removed, a 'catch tray' was inspected and an electric shock was received. The catch tray was actually not a catch tray at all but an open 800 ampere bus bar support. Luckily the damage was not fatal but it could have been much worse. So what went wrong?

HSG85 states 'most electrical accidents occur when people are working on or near equipment that is:

- thought to be dead but which is live; or
- known to be live but those involved do not have adequate training or appropriate equipment, or they have not taken adequate precautions'.

In the above case, the isolation point used only removed motive power to oven drive belts and not the power to the main bus bars used to heat the oven. An enquiry began and new procedures were developed with the support of the executive sponsor, Graham Finn (SHE director).

As part of the adoption of the rules electrical surveys were carried out at all of the sites to measure the baseline performance and enable priorities to be determined. Targets have also been set, e.g. for the completion of panel inspections and competence assessments.

Lessons learnt include the need for robust control over contractors – especially those managing high power equipment such as refrigeration plant, the need for regular information distribution regarding electrical hazards and controls to all employees (even time served highly qualified electricians) and the need to educate managers that live testing cannot be undertaken without a risk assessment and adequate justification. Perhaps the most significant lesson is the empowerment of the electrical workers through adoption of the rules and the enthusiasm and capability of the highly skilled electrical champions who have been appointed. One very experienced chief engineer stated "this is the best thing Northern Foods have done in the last 10 years". Perhaps an exaggeration, but praise indeed!

References

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Electrical Maintenance – 2nd Edition (IET)
Code of Practice for In Service Inspection and Testing of Electrical Equipment (IET)
Methodical Process for Risk Identification for Live Working (download from HYPERLINK "http://elecsafety.co.uk/livework"http://elecsafety.co.uk/livework)
HSR25 Memorandum of Guidance on the Electricity at Work Regulations 1989 (HSE books)
HSG85 Electricity at Work – Safe Working Practices (HSE books)
INDG163REV2 Five Steps to Risk assessment (HSE books)
IND354 Safety in Electrical Testing at Work (HSE books)
GS38 Electrical Test Equipment for use by Electricians (HSE books)
Guidance on Safe Isolation Procedures for Low Voltage Installations (Electrical Safety Council)