"I KNEW ELECTRICITY COULD BE DANGEROUS, BUT HAD NO IDEA IT COULD BE SO AGGRESSIVE AND VIOLENTLY FATAL" AN EXPERIENCED MECHANICAL ENGINEER FROM A GLOBAL ENERGY SERVICES COMPANY TOLD TAS MD, JOHN MAPLESDEN, FOLLOWING HIS RECENT PRESENTATION ON ARC FLASH AT THE HAZARDEX EXHIBITION IN ABERDEEN APRIL 2007. MAPLESDEN ELABORATES

AWARENESS of the potentially fatal dangers of electrical arc flash amongst engineering professionals is, perhaps, not as high as it could be. When an arc flash occurs, the effects can be –

- ▲ Burns caused by radiant and convective energy.
- ▲ Lung damage from inhalation of arc products.
- ▲ Barotrauma – the effect of pressure waves on brain, nervous system and lungs.
- ▲ Hearing damage.
- ▲ Temporary blindness.
- ▲ Equipment Damage and loss of output or production
- ▲ Fire / Explosion Risks

Safety and Engineering Managers and Directors have the responsibility to implement electrical systems risk assessments and preventative measures. But in this dynamic environment, where multiple projects, plus ever increasing workloads, make high demands on the professional's time and overstretched staff, completing prioritised projects can sometimes be challenging.

In order to help reduce the risk of electrical arc flash, a number of steps could be implemented:

- ▲ Over 70 % of Arc-Flash incidents (in Europe) occur during or immediately after electrical maintenance.
- ▲ Old equipment, and high fault level LV. equipment (that is frequently operated) is also at HIGH risk

In order of priority, the methods for risk reduction are:

- ▼ By engineering
- ▼ By procedures
- ▼ The last line of defence – personal protective equipment (PPE)

Always remember. It is the upstream fault level that is key, not the size of the drive In an ideal world, all legacy systems could be replaced with new installations, so the arc flash hazard could be minimised at the design stage of new projects, however, this is unreasonable – so here are some practical steps to a safer legacy system:

1. Document your system. Be clear about fault levels and protection, derive, and then minimise arc energy levels.
2. Determine calculated fault levels.
3. Conduct protection grading study to establish protection clearance times.
4. Use remote switching for HV and LV Systems.
5. Conduct arc energy calculations to IEEE Standard 1584 & NFPA 70E. You would need to know - prospective fault current, fault duration, and system X/R ratio. Calculations conducted by professional electrical engineer using industry specific software.
6. Implement engineering task risk assessment.
7. Implement procedural task list.
8. Look at internal PPE philosophy, and calculate specific requirements following arc energy assessment.
9. Ensure the PPE arc thermal performance values (ATPV) are adequate. Use practical PPE for LV Systems – fire retardant overalls & balaclava, gauntlets, helmet and visor – particularly after electrical maintenance.
10. Ensure all equipment is correctly labelled
11. Update all system records
12. Introduce training
13. Develop regular audits.