HSE Human Factors Briefing Note No. 12

Human Factors in the MAPP

Briefing Note 1 – 'Introducing Human Factors' explains the background to these Briefing Notes.

In the Major Accident Prevention Policy (MAPP) that all COMAH sites are obliged to provide to regulators, you are strongly recommended to refer to the different ways that your company or site controls human factors. This Briefing Note gives an outline of the specific information you could consider providing.

Case studies

Since 1999, HSE has published two reports on Major Accidents (EC Reportable Accidents or 'ECRAs') at COMAH sites. The reports show that the number of accidents per year at COMAH sites is broadly the same as they were before the COMAH regulations came into force. Some examples with human factors root causes are described below:

Three incidents were caused by erosion or corrosion of pipework or other components. In some cases, there was no adequate inspection procedure in place. **Inspection** may thus be regarded as a critical task in that failure to carry it out could lead to a major accident.

Maintenance failures also feature in HSE's reports, for example, a maintenance fitter removed a sensor from a pressurised pipe. Inadequate plant maintenance procedures caused the failure of a compressed air supply and thus, the failure of an isolation valve. In both these cases, ethylene gas was released.

In a near miss incident, 500 kg of vinyl chloride monomer was released because of a series of operational errors during the **commissioning** of a filter unit.

Competency problems and inadequate commissioning **procedures** were cited as causes in the report.

Operators heated up a road tanker filled with molten sodium but failed to vent the pressure that built up inside the tanker as required by **procedures**. The sodium had solidified in the outlet vent valve and operators cleared this with a metal rod causing sodium to escape and subsequently to catch fire.

A large quantity of liquid propane was released when a fitter attempted to drain off a sample but there was no flow. The maintenance crew then failed to close a valve fully before removing an adaptor assembly from the drain point to investigate why.

Following the death of an employee during sampling, HSE issued 4 improvement notices: 2 of these related to a recent reorganisation of the site and required the development of a training strategy for production technicians and a review of risk assessments and staffing levels.

Source: Ref. 1

HSE Concerns

In Ref. 1 HSE state that they are concerned about '..the magnitude and frequency of these accidents and the repeated underlying causes of major accidents'.

The MAPP should state, in general terms, how the human factors issues that may impact on major accident hazards have been managed. This should include reference to other company documents, assessments and standards.

Overall human factors content of the MAPP

Your MAPP might refer to other documents but should contain enough information to assure the reader that you have at least the following matters under control:

Critical tasks – those that, if carried out incorrectly, could lead to a major accident. Ensure that the hazards in those tasks are identified and risk assessments are done with a view to lowering the risk or making sure that the hazard is kept under control.

Emergency tasks – are practised and can be carried out as required.

Procedures – written instructions for carrying out critical operations or maintenance tasks are clear, up to date and actually *used* by operators

Competence – employees involved in major hazard work are properly selected trained and have been assessed as competent and suitably experienced in the work they need to do.

New plant - is properly designed, constructed, installed and commissioned

Accidents and near misses – are reviewed for lessons: i.e. all causes are considered and any human factors deficiencies highlighted are remedied.

Most of the above topics are the subject of Briefing Notes in this series.

Learning more about human factors in the MAPP

Example MAPP statements regarding human factors

Three examples of (edited) statements about human factors from the MAPPs of several leading companies are given below:

1) "…five separate areas have been chosen to demonstrate how systems have been designed to take into account the needs of the user and be reliable:

- Equipment design
- Procedural tasks
- Operational and maintenance training competency
- Work patterns and overtime arrangements
- Manning levels and supervision adequacy"

2) "…operator fatigue is avoided by virtue of the shift rota and having a spare man to cover some of the holidays and sickness. Hazard studies on new and modified plant consider the risk of operator error following a procedure and automation is used where necessary to improve safety. Staff competency in safety is through regular training. Human factors such as layout and access to process equipment (and particularly valves) are designed to standards. Lighting standards are

detailed in *(internal document)*, the noise standards in the Noise at Work Regulations are applied. The Manual Handling Regulations give weight and lifting guidelines."

3) "Human error probably contributes most of the risk from the site, therefore, it is essential that the potential for error in all aspects of the company's business is identified. This can be done by a systematic analysis (task analysis) of all operations involving human activity, and, in particular, where mistakes can have serious consequences. The examples below … illustrate error types:

- Equipment design and construction – design error – e.g. poor specification or dimensions of materials
- Plant maintenance – introduction of failures by damaging equipment or leaving equipment misaligned or open after maintenance; failure to install the correct replacement part
- Control room operations – failure to respond correctly to an alarm situation (failure to control, or make situation worse)
- Testing checking and auditing – failure to detect worn or failed components; failures to carry out tests and falsifying of results

Source: Confidential – extracts from actual Major Accident Prevention Policies

Additional Points

Most of the information about how you keep major accidents under control by attending to human factors will probably be contained in other documents. The MAPP should refer to these. Examples of such information are: risk assessments, the safety management system, site inspection records, management of change procedures, training records and emergency arrangements documents.

It would be useful to consult your employees when developing the human factors aspects of the MAPP, because they will have insights into human factors risks.

You should update the human factors material in the MAPP whenever there are any significant changes to their management that could affect performance, for example, staff reductions/increased workload, new equipment/process as they affect tasks, organisational or procedural changes.

Keep human factors issues under regular review: the Guidance Notes will help to identify the issues that you need to consider.

References

1. COMAH Major Accidents Notified to the European Commission England, Wales & Scotland 1999-2000 and 2001-2002 (two documents)
2. HSE (1999) Major Accident Prevention Policies for Lower-Tier COMAH Establishments. Chemical Information Sheet No 3. HSE Books, PO Box 1999, Sudbury, Suffolk CO10 6FS