For background information on this series of publications, please see Briefing Note 1 - Introduction

HF INTEGRATION: *There are two aspects to human factors integration:*
- *Integrating human factors methods and procedures into the organisation itself - all employees become aware of its meaning and how it is used.*
- *Integrating human factors methods and procedures into specific projects - human factors analysis is carried out at the right time within a team working together on engineering, design, managerial and human factors issues as a whole.*

human factors integration

Case study

The head of the Health, Safety, and Environment department suggested that the company should use human factors engineering (HFE) as a tool in their overall effort to reduce accidents on their new offshore platform. The company:

- Used a consultant trained in HFE and with experience of applying it to marine issues
- Based HFE inputs on established HFE research data, and existing HFE design standards. This was to gain better acceptance of the HFE inputs by the other engineering and operational disciplines involved
- Concentrated HFE effort on design and operational issues that had caused or were anticipated to cause human errors
- Set out an HFE programme to cover all aspects of human factors (e.g., equipment and workplace design, personnel selection, training, management organisation, manuals and procedures, and control of the working environment) to reduce the potential for human error.
- The HFE programme was designed (from most to least preferred option) to:
  - Design out the chance for human error
  - Guard against the consequences of human error
  - Warn the operator about the chance for human error
  - Train personnel to reduce the opportunity for human error
  - Write procedures to reduce human error.

When HFE was first introduced, the platform design had been ongoing for almost two years. Much of what could have, or should have, been done to include HFE in the design was not possible for reasons of cost or programming but on future projects HFE was added to the design team at its formation.

Another lesson learned was that HFE could contribute to improved operations and safety in ways other than just through better hardware or workplace design. As an example, the HFE specialist created training programs, wrote or reviewed operations manuals and procedures, established management policies and practices on work schedules and job safety programs, set environmental standards for work places, and carried out studies of human reliability.

Source: reference 4

Why human factors integration?

For systems to operate safely and effectively, they must be designed to support the people who operate them. Human factors is regarded by the HSE as having an essential contribution during the development and operation of systems. Experience shows that it is ineffective to address them as an afterthought. Human factors is not a stand-alone activity. Best practice is achieved only when human factors are integrated into the mainstream of systems development.
Source: reference 1

Are human factors integrated in your company?

For any new 'project' (build or modify a facility, introduce a new process, begin a major campaign of maintenance, etc), would your company:

1. Develop a plan showing what human factors activities will be done at each stage in the project from initial concept to operation?
2. Appoint a 'champion' for the human factors work to be done?
3. Make available or commission specialists to advise and to train project teams in human factors?
4. Carry out human factors audits at regular intervals during the project?
5. Keep a log of human factors issues that arise (and provide resource to ensure that these are closed out within a reasonable time)?
6. Ensure that human factors specialists exchange relevant information with other members of the project team concerning, for example:
   - workspace requirements
   - design of controls, displays and tools
   - workload on operators
   - number of staff required for key tasks
7. Invite end users of equipment to participate in the design or assessment of facilities?
8. Build prototypes or mock-ups for testing/training?

If the answer to any of the above is 'no', then your company needs to take steps to integrate human factors into its existing procedures.

What should my company do about it?

Your company should realistically assess its current approach or maturity with respect to human factors using, for example the methodology in reference 3. On that scale, companies range from those that are barely aware of human factors and typically carry out human factors studies in response to accidents, to those that proactively pursue best practice. Your company should determine how to take the next step towards best practice. Integration of human factors procedures and methods into the company's existing procedures and methods seems to be the most appropriate way ahead. There are many ways of achieving this; this briefing note suggests one.

Policy

The company should set out a policy or 'vision' for human factors which expresses their overall intentions. An example policy is: 'To improve overall system performance and reliability, by optimising personnel performance, health, and safety through effectively integrating human factors engineering principles into a project lifecycle' (see reference 2). It is important that high-level company management show their commitment to this policy, perhaps by appointing a human factors 'champion' to drive it forward. This person needs to have enough resources and influence within the company to ensure that the necessary changes are made and is likely to be a manager. It is equally important that the workforce - those who will be most affected by the change - are involved (consulted at each stage and also actively encouraged to set and modify policy and to make some of the changes).

Action plan/implementation plan

The company now has an assessment of where it currently stands on human factors, a policy, and 'champion' with a team and resources to develop human factors.

One of the first tasks of this team will be to put together an action plan or implementation plan for changing its processes and procedures to include human factors. These are, essentially, decision making tools and guides that specify when and how to carry out specific activities. For example, near the start of a safety analysis, a project team will usually conduct a hazard identification (HAZID) exercise. As part of the human factors integration, the HAZID will be checked and, if necessary, revised to incorporate guidance on using human factors expertise in HAZIDs.

The plan should also prepare employees for the changes by providing human factors training/familiarisation courses, literature/briefings/guidance documents. Again, where possible, involve employees in developing the appropriate means of raising awareness.

Human factors integration plan

For every large project (e.g. design and build a new plant), the company should set out a Human factors integration plan. This should indicate:

- Areas to be addressed (see 'key areas' below)
- How all those involved in the project will cooperate and communicate with each other on human factor issues
- The scope of human factors work to be done (and resources needed)
- Links between human factor activities and other project activities (programming)
- Milestones (important inputs and outputs)
- Constraints - things that cannot be changed (e.g. existing equipment)
- How problems will be recorded and resolved

Key areas

The human factors integration plan for a project should estimate and schedule the amount of work that needs to be done on each of the following key areas:

- **Staffing** - number of people required to operate and maintain the system; their workload; job specifications; team organisation
- **Personnel** - competence requirements (selection, training, physical characteristics) for the tasks to be done
- **Training** - developing and maintaining the required knowledge, skills and abilities to operate and maintain the system; training documents and courses; training facilities; team training; specialist training etc
- **Human factors engineering** - considering human characteristics in design of equipment, workstations/consoles; layout for maintenance access; computing facilities and screen design; working environment (temperature, lighting, noise etc)
- **Health hazards** - short or long term hazards to health resulting from normal operation of the system e.g. exposure to: toxic materials, electric shock, physical injury, 'musculoskeletal' injury (e.g. heavy lifting; repetitive movement), extreme heat/cold
- **System safety** - how to avoid the safety risks which humans might cause by operating or maintaining the system abnormally; sources of human error; effects of misuse or abuse.

The company should identify the relevant legislation and standards that need to be satisfied in relation to the above areas.

Useful reference information

1. *Human factors integration: implementation in the onshore and offshore industries* HSE Research Report 001 2002 HSE Books (2002) ISBN 0 7176 2529 X.
2. *Effective integration of human (and organizational) factors into health, safety and environmental management systems* McCafferty, D. B. et al. (2002) (American Bureau of Shipping) Working Group 5 - *2nd International workshop on human factors in offshore operations* Houston, Texas April 2002.
3. *Framework for assessing human factor capability* HSE Offshore Technology Report 2002/016 OTO 02016 2002 HSE Books (2002) ISBN 0 7176 2338 6.
4. *The past and projected role of human factors engineering (HFE) in the commercial maritime industry* Miller, G. E. (1999) bcpe website: www.bcpe.org/newsletters/detail.asp?RecordID=76