

Human Factors – An Overview

EIGA Approach to Human Factors

Within EIGA we have many documents that deal with avoiding incidents through the application of proper design standards, operating procedures and safety management systems.

This document is the first of a series of Human Factor Safety Information sheets which are intended to:

- explore the Human Factors specific to the industrial gases industry,
- raise awareness on these issues and
- provide guidance.

In some cases, these information sheets will demonstrate how and where Human Factors are already addressed and included in existing documented best practice and guidance.

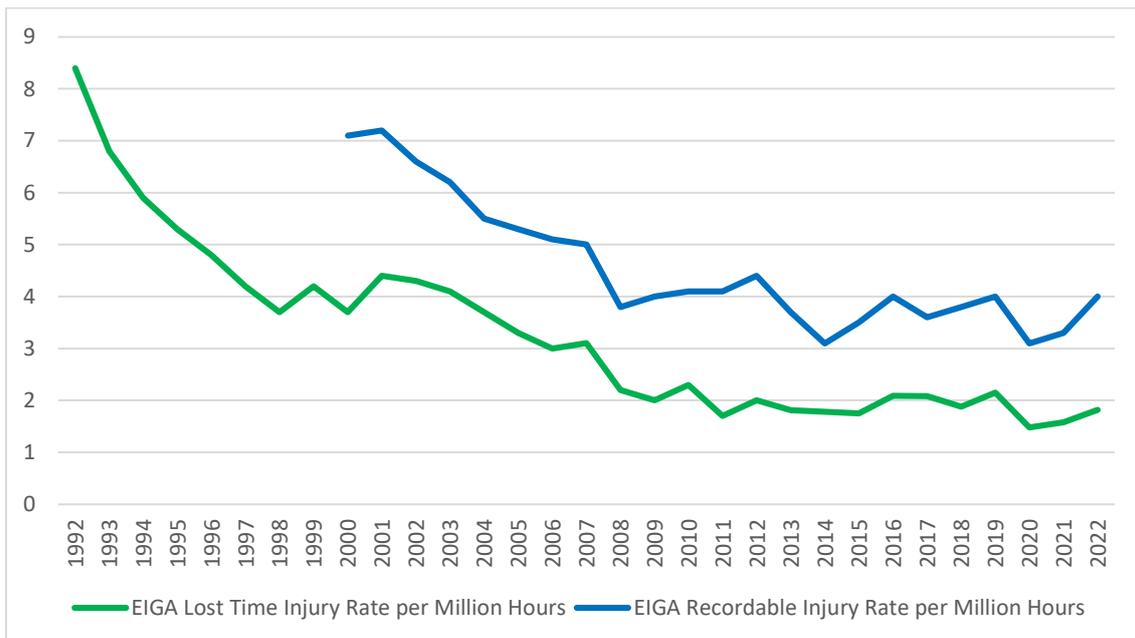
Although the Human Factors Safety Information sheets are aimed primarily at supervisors and managers, they may be of benefit to others who work within our industry.

What do we mean by Human Factors?

Human Factors are organisational, job and people related factors that influence behaviour at work. We focus here on factors that could affect health and safety at work.

Why Human Factors? – The background

EIGA member companies have made good progress in worker safety as can be seen below. Over the years from 1992 to 2023 our industry has reduced the lost time injury rate from 8.5 to 1.8 per million hours worked, representing an 80% reduction in the rate. The industrial gas industry made significant reductions in accident rates between 1992 and 1998 but the rate of reduction has slowed down.



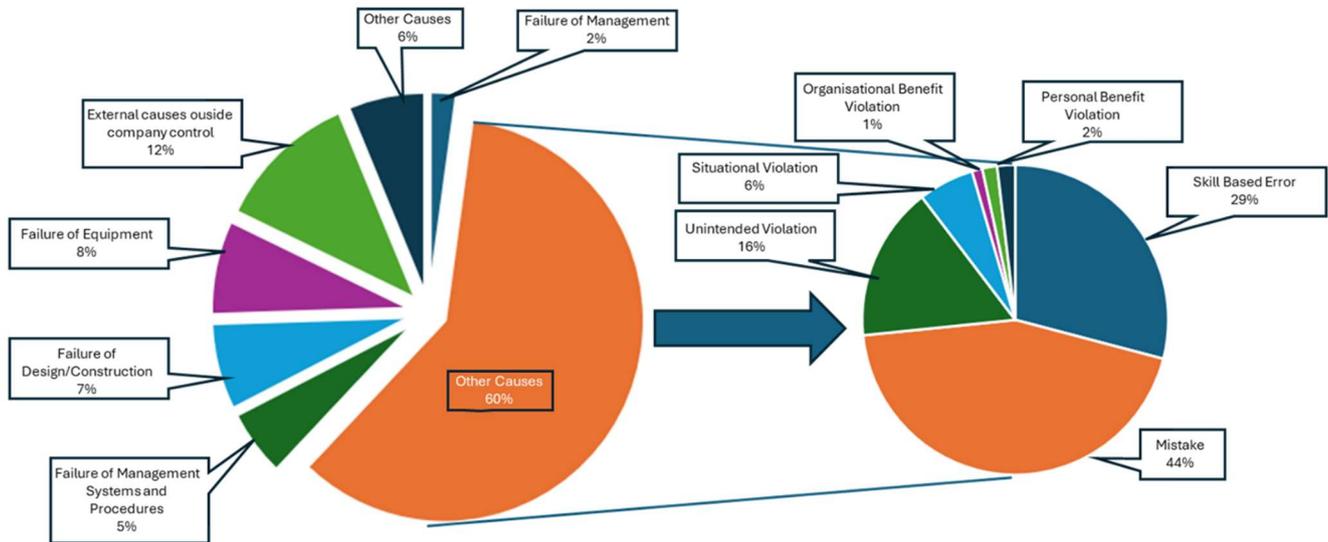
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Over the 22 years from 2000 to 2022 the number of recordable injuries steadily decreased from 7.1 to 4.0 per million hours representing a 43% reduction in injury rate.

Since 2020 the collected data set has been expanded to contractors also in order to have a more precise overview of injuries.

If we analyse the causes of the Lost Time Injuries and Recordable Injuries reported to EIGA, 70% were attributed to human factors which were classified as 60% human failures, 2% management failures and 5% failures of management systems and procedures.

Since 2011, EIGA has been analysing these human errors in more detail by asking members to subdivide human errors as different types of human failure, to better identify and manage these contributing factors.



Why do incidents happen?

After an incident has occurred it is, with hindsight, easy to identify many factors that contributed to the situation. Investigation becomes more difficult when we want to understand why people acted in a certain way or made certain decisions. Too often the individual who was most directly involved is blamed. By applying a human factors approach we reveal many more underlying factors which influenced people’s behaviours. These can include poor design, poor maintenance, attitudes to health and safety in the organisation, lack of clear visible leadership, inadequate training or supervision, poor work planning and organisation or individual attitude and skill.

Consideration of Human Factors

Human Factors can be grouped in the following three aspects which interlink with and overlap each other:

- Organisation
 - the company, its management, its safety culture and its management systems
- Task
 - job,
 - workplace and equipment design,
 - environment
- Individual
 - a person’s individual characteristics and attitudes



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Organisational Factors

People's behaviour in the workplace is affected by the collective characteristics of the business, organisation and teams in which they work.

Employees respond to the visible and invisible messages they receive from others within their organisation, though not always in the way intended. Safety culture influences human behaviour which in turn influences the organisation's culture.

To manage health and safety effectively it is important to consider how all the organisational factors listed below influence and affect human behaviour.

- managing organisational change [10]*
- safety culture [11]
- behavioural safety [15]
- leadership and supervision
- communications on safety [7]
- resource, staffing levels and organisation workload [10] [16]
- human reliability – human error and systems failures [13]
- human factors in incident investigation [3]
- human factors integration
- emergency response. [6]

Task Factors

The way jobs are designed to interface with equipment and the workplace environment has a direct effect on the health and safety of workers. The timing of shifts, the length and frequency of breaks, the task workload, the physical and mental demands due to the design of the task, equipment and environment are all important factors to consider which influence human performance and can affect both the individual and the integrity of the whole work system. Consideration should be given to the following factors in designing jobs:

- manual handling, repetitive actions and ergonomics
- work-related stress (e.g. high workload)
- fatigue from working patterns - shift work and overtime [9] [16]
- alarm handling [8]
- interfaces with plant and equipment [12]
- design and effectiveness of procedures [4]
- routine and non-routine work. [5]

Individual Characteristics

People vary in many ways, physically, mentally and in their personality, mood, knowledge and experience.

The individual's characteristics including their competence, skills, personality, attitude and risk perception, influence behaviour in complex ways. Some characteristics such as personality are more constant; others such as skills and attitudes may be changed or enhanced. Finally, people have different knowledge and experience on which to draw.

The design of the job, the equipment, information and work environment should all take account of the variety of individual capabilities and limitations. People should have the appropriate knowledge, skills and abilities to be

* Further information can be found in the noted Human Factors Safety Information, e.g. [10] refers to Info HF 10 Organisation - "Managing Organisational Change"

able to carry out their work effectively and safely. They also need to have the appropriate attitudes and awareness of the risks in order to work in a safe manner. It is therefore necessary to ensure everyone has the appropriate training and personal development if they are to work efficiently and safely.

It is also important to ensure that the workplace is designed ergonomically to support rather than hinder people's task performance. When people are recruited, or change their jobs, it is sensible to check if any adaptations to the workplace would reduce the risk of human error, injury or ill-health as well as increasing their efficiency or productivity.

Consideration should be given to the following factors, where legislation allows:

- training and competence [2]
- motivation and attitudes
- adaptation of the job to the individual (see job, environmental and equipment factors above)
- private personal, medical or family matters that can adversely influence work performance
- stress and psychosocial risks in the workplace.

References

Unless otherwise specified, the latest edition shall apply.

- [1] EIGA Safety Information HF 01 - *Human Factors - "An Overview"* www.eiga.eu
- [2] EIGA Safety Information HF 02 - *Individual - "Training and Competence"* www.eiga.eu
- [3] EIGA Safety Information HF 03 - *Organisation - "Human Factors in Incident Investigation"* www.eiga.eu
- [4] EIGA Safety Information HF 04 - *Task - "Design and Effectiveness of Procedures"* www.eiga.eu
- [5] EIGA Safety Information HF 05 - *Task - "Maintenance Error"* www.eiga.eu
- [6] EIGA Safety Information HF 06 - *Organisation - "Site Emergency Response"* www.eiga.eu
- [7] EIGA Safety Information HF 07 - *Organisation - "Communications on Safety"* www.eiga.eu
- [8] EIGA Safety Information HF 08 - *Task - "Alarm Handling"* www.eiga.eu
- [9] EIGA Safety Information HF 09 - *Task - "Fatigue from working patterns - Shiftwork and overtime"* www.eiga.eu
- [10] EIGA Safety Information HF 10 - *Organisation - "Managing Organisational Change"* www.eiga.eu
- [11] EIGA Safety Information HF 11 - *Organisation - "Safety Culture"* www.eiga.eu
- [12] EIGA Safety Information HF 12 - *Task - "Human Factors in Design"* www.eiga.eu
- [13] EIGA Safety Information HF 13 - *Organisation - "Human Reliability"* www.eiga.eu
- [14] EIGA Safety Information TS 01 - *Transport Safety Information, an Overview* www.eiga.eu
- [15] EIGA Safety Information TS 07 - *Human Behaviour within Transport Operations* www.eiga.eu
- [16] EIGA Safety Information TS 13 – *Managing Driver Fatigue* www.eiga.eu

Useful Reference Information

1. Energy Institute, Training and Competence, *Human Factors Briefing Notes No 7* www.energyinst.org
2. Health and Safety Executive, Competence, *HSE Human Factors Briefing Note No 2*. www.hse.gov.uk
3. Health and Safety Executive, *HSE Human Factors Toolkit*, www.hse.gov.uk

4. Health and Safety Executive, *Reducing Error and Influencing Behaviour*, HSG48, 1999, HSE Books ISBN 9780717624522. www.hse.gov.uk
5. EU-OSHA 2014–15 Campaign: *Healthy Workplaces Manage Stress*. <https://osha.europa.eu/en/healthy-workplaces-campaigns/healthy-workplaces-manage-stress>
6. Communication from the Commission to the Council and the European Parliament on the Interpretative Communication on waste and by-products. COM/2007/0059 final. 21.2.2007
7. Case C - 416/02 - - Commission v Spain. Judgment of the Court (Third Chamber) of Justice of the European Union of 8 September 2005. <http://curia.europa.eu>
8. Case C - 121/03 - Commission v Spain. Judgment of the Court (Third Chamber) of Justice of the European Union of 8 September 2005. <http://curia.europa.eu>
9. EIGA Doc 134 Potentially Explosive Atmospheres - EU Directive 1999/92/E. www.eiga.eu
10. ADR *European Agreement Concerning the International Carriage of Dangerous Goods by Road*

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