



HSE Human Factors Audit An Operator's Perspective.

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Background

- Tessengerlo Fine Chemicals is based in Leek, Staffordshire, part of Tessengerlo Group (Belgium).
- Manufactures acetate esters and aldehydes for cigarette, foundry and industrial perfumes market.
- Originally Lower Tier for Toxic substances, but currently Lower Tier for Environmentally Hazardous substances.
- Employs approximately 80 staff.
- 28 staff are shift based, operating mainly batch processes, which are semi automated, 24/7 with two annual shutdowns.

Audit arrangements.

- **Audit carried out on 1st November 2005**
- **Three inspectors involved – two specialist and our designated inspector.**
- **Human Factors Inspection Toolkit provided prior to audit.**
- **Tessengerlo supplied SOP's and organisational structure.**
- **Focussed on two specific topics:**
 - ◆ **Reliability and usability of procedures, and**
 - ◆ **Competence and training.**
- **Interviewed a range of personnel, Operations Director, Plant Managers, Plant Operator/Safety Rep, Engineering Craftsman/Safety Rep and Health and Safety Manager**
- **Site inspection – review of operating instructions.**

Outcome

- **HSE concluded:**
- ***“The company has a good positive approach to the management of health and safety but they are struggling to keep pace with the rate of change on the site”.***
- ***“Elements of the safety management system, e.g. Written procedures, are out of date, incomplete, or both”.***
- ***“There is a reliance on operators knowledge gained through years of experience in the company. With an aging workforce this knowledge is likely to be lost as the company are not effectively capturing it in written procedures and training material”.***

Procedures

- HSE comments:
- ***“There is an inconsistency of format and content”***
 - ★ There are two plant areas, Aromas and Acetates, where the format and content reflected the individual manager’s approach.
- ***“There appears to have been some attempt at producing good written procedures. However these are not keeping pace with engineering and process changes, so they are rapidly becoming out of date. Coupled with a reliance on experienced staff being “used to how things are done” , there is a real risk of human failure.***
 - ★ The business has a philosophy of improving processes, however keeping SOP’s up to date was not seen as a priority when changes were made to the plant. There was (and is) a very low turn over in staff at operator level, hence the comment on reliance on experience.

Competence and Training

- HSE comments:
- *“Self learning material and assessment sheets ... were fairly comprehensive and contained some information and test questions on why certain actions were taken, not just how. However there was no explicit reference to major accident hazard potential and control”*
 - ★ The assessment material was written more from operation and quality perspective, rather than major hazard.
- *“There was also concerns over succession with an aging workforce and reliance on their knowledge. ...There was no evidence to a structured approach to competence assurance.”*
 - ★ The business was (and is) committed to training personnel but employed an “ad hoc” approach to training and competence, but no method of ensuring that all training required was complete and method of competence validation defined.

HSE Actions

- *“The company should review their written procedures prioritising where there is a major accident potential and/or there has been significant change to the plant or process”.*
- *“The company should review the training of operators and maintenance staff and where there has been a significant change in plant, process or operating procedures”.*
- *“The company should review their competence assurance system in order to minimise the impact of the loss of experienced staff and maintain or improve their control of major accident hazards”.*

Procedures

■ ***Standardise SOP contents:***

◆ Health Safety and Environment

- ★ The major accident hazard scenarios associated with the process and the preventative and protective devices used to control the hazard (basis of safety). The action of any process interlocks is explained.
- ★ Dealing with the chemicals involved
- ★ General outline of Personal Protective Equipment required.

◆ Operating Procedures

- ★ the detailed start up, running, shutdown and emergency procedure. Include photographs as appropriate. (Operating step, detail of what to do, other information)

◆ Troubleshooting and faultfinding guide

- ★ what to do when process is not operating to SOP.

◆ Process flow diagram of process

- ★ a basic outlay showing main process equipment.

◆ Chemistry of process

- ★ a basic explanation of the chemistry of the operation.

■ ***SOP becomes the training document.***

Training

- *Training requirements identified for staff:*
 - ◆ *Core Health, Safety and Environmental knowledge*
 - ◆ *Specialist Health, Safety and Environmental knowledge*
 - ◆ *Training in process operation*
 - ◆ *Quality, analytical and technical skills*
 - ◆ *IT skills (e.g. SAP, Planet, Microsoft Office)*
 - ◆ *Personal training (e.g. Team working, communication)*
 - ◆ *Improvement skills (Root cause analysis, Kaisen)*
- *Training matrix drawn up*
 - ◆ *Defining what knowledge is needed for the role*

Training Matrix – Health Safety and environmental requirements for process operators and team leaders.

Competency
Induction
STAR Tours
Accident, Near Miss Reporting
Accident, Near Miss Investigation
Risk Assessments
Safe Systems of Work
Chemicals & Substances
Personal Protective Equipment
Health & Safety Law
COMAH
Environmental Law
Environmental Management - ISO 14001
Waste Management
Basic first Aid
First Aid Certificate
Respiratory Protective Equipment
Emergency Procedures
Housekeeping - 5S
Fire Extinguishers
Fire Safety
Safe Use of Ladders & Scaffolds (SEP 010)
Fork Lift Truck Awareness
Fork Lift Truck Driving
Manual Handling Techniques
IOSH or IEHO Working Safely

Breathing Apparatus
Isolation & PTW System (PTW 001, 002, 003 & 004)
PTW - General Issuer
PTW - Hot Work Issuer
PTW - CSE Issuer/Acceptor
Pipebreaking (PTW 005)
Using an Electric Drill in a Process Area (PTW 006)
Entry into Bunds upto 1.5m Deep (PTW 007)
Using Portable Battery Powered Equipment in Zoned Areas (PTW 008)
Incident Controller
Manual Handling Trainer
NEBOSH Certificate in Occupational Health & Safety

Training Matrix – Technical Skills identified for engineering craftsmen.

Technical Skills	98	Project Management (SEP 017)
	99	2 Fault Finding & Problem Solving
	100	Scales & Weighbridge Calibrations (SEP 013 & 014)
	101	1 Coded Welder
	102	2 Pipework Installations
	103	2 Isometric Pipe Drawings
	104	1 Cleaning Bath (Decontamination)
	105	3 Pump Changes
	106	1 Pump & Motor Alignment
	107	1 Pump Repairs
	108	1 Ball Valve Assembly
	109	2 Handling & Installation of Bursting Discs
	110	3 Basic Pneumatic Installations
	111	Advanced Pneumatic Installations
	112	2 Pressure Vessels, Systems & Testing
	113	2 Hydraulic Pressure Testing
	114	2 Pneumatic Leak Testing (PTW 010)
	115	1 Pressure Regulator Maintenance, Inspection & Testing
	116	1 Pressure Relief Maintenance, Inspection & Testing
	117	3 Gasketed Joints
	118	1 Centre Lathe
	119	1 Pedestal Drill
	120	1 Radial Arm Drill
	121	1 Grinding Wheel
	122	1 Bandsaw
	123	1 Pipecutters
	124	1 Pipe Threader
	125	1 Welding Equipment & Bottled Gases
	126	Bottled Gas Safety Valve Inspections
	127	Boiler Water Condition Monitoring
	128	1 Electricity at Work (PTW 009)
	129	2 SIL Assessment
	130	3 Critical Instrument Checks (SEP 016)
	131	1 Portable Appliance Testing (SEP 004)
	132	2 ATEX/DSEAR (SEP 015)
	133	2 Electrical Hazardous Area Equipment Inspections
	134	3 Mechanical Hazardous Area Equipment Inspections
	135	2 Electrical Installation & Testing (17th Edition)
	136	2 Motor Changes
	137	2 Pot Light Changes
	138	3 Basic deltaV Knowledge
	139	2 Basic MOST Knowledge
140	Advanced deltaV Programming	
141	Advanced MOST Programming	
142	3 Working on Live Electrical Equipment	

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Key

- Control Measure
- Level of effort
- Control Measure ID
- Control Measure Name
- Control Measure Description
- Control Measure Category
- Control Measure Status
- Control Measure Owner
- Control Measure Start Date
- Control Measure End Date
- Control Measure Progress
- Control Measure Risk
- Control Measure Impact
- Control Measure Cost
- Control Measure Resources
- Control Measure Dependencies
- Control Measure Risks
- Control Measure Opportunities
- Control Measure Challenges
- Control Measure Lessons Learned
- Control Measure Feedback
- Control Measure Review
- Control Measure Update
- Control Measure Archive
- Control Measure Delete

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1	Control Measure 1	Control Measure 1 Description	Control Measure 1 Category	Control Measure 1 Status	Control Measure 1 Owner	Control Measure 1 Start Date	Control Measure 1 End Date	Control Measure 1 Progress	Control Measure 1 Risk	Control Measure 1 Impact	Control Measure 1 Cost	Control Measure 1 Resources	Control Measure 1 Dependencies	Control Measure 1 Risks	Control Measure 1 Opportunities	Control Measure 1 Challenges	Control Measure 1 Lessons Learned	Control Measure 1 Feedback	Control Measure 1 Review	Control Measure 1 Update	Control Measure 1 Archive	Control Measure 1 Delete
2	Control Measure 2	Control Measure 2 Description	Control Measure 2 Category	Control Measure 2 Status	Control Measure 2 Owner	Control Measure 2 Start Date	Control Measure 2 End Date	Control Measure 2 Progress	Control Measure 2 Risk	Control Measure 2 Impact	Control Measure 2 Cost	Control Measure 2 Resources	Control Measure 2 Dependencies	Control Measure 2 Risks	Control Measure 2 Opportunities	Control Measure 2 Challenges	Control Measure 2 Lessons Learned	Control Measure 2 Feedback	Control Measure 2 Review	Control Measure 2 Update	Control Measure 2 Archive	Control Measure 2 Delete
3	Control Measure 3	Control Measure 3 Description	Control Measure 3 Category	Control Measure 3 Status	Control Measure 3 Owner	Control Measure 3 Start Date	Control Measure 3 End Date	Control Measure 3 Progress	Control Measure 3 Risk	Control Measure 3 Impact	Control Measure 3 Cost	Control Measure 3 Resources	Control Measure 3 Dependencies	Control Measure 3 Risks	Control Measure 3 Opportunities	Control Measure 3 Challenges	Control Measure 3 Lessons Learned	Control Measure 3 Feedback	Control Measure 3 Review	Control Measure 3 Update	Control Measure 3 Archive	Control Measure 3 Delete
4	Control Measure 4	Control Measure 4 Description	Control Measure 4 Category	Control Measure 4 Status	Control Measure 4 Owner	Control Measure 4 Start Date	Control Measure 4 End Date	Control Measure 4 Progress	Control Measure 4 Risk	Control Measure 4 Impact	Control Measure 4 Cost	Control Measure 4 Resources	Control Measure 4 Dependencies	Control Measure 4 Risks	Control Measure 4 Opportunities	Control Measure 4 Challenges	Control Measure 4 Lessons Learned	Control Measure 4 Feedback	Control Measure 4 Review	Control Measure 4 Update	Control Measure 4 Archive	Control Measure 4 Delete
5	Control Measure 5	Control Measure 5 Description	Control Measure 5 Category	Control Measure 5 Status	Control Measure 5 Owner	Control Measure 5 Start Date	Control Measure 5 End Date	Control Measure 5 Progress	Control Measure 5 Risk	Control Measure 5 Impact	Control Measure 5 Cost	Control Measure 5 Resources	Control Measure 5 Dependencies	Control Measure 5 Risks	Control Measure 5 Opportunities	Control Measure 5 Challenges	Control Measure 5 Lessons Learned	Control Measure 5 Feedback	Control Measure 5 Review	Control Measure 5 Update	Control Measure 5 Archive	Control Measure 5 Delete

Keeping it visual – matrix in Engineering Manager’s office

Competence Assurance

- **Competence defined for each training requirement:**
- **Internal training – validated by self learning workbooks and assessment material developed for the task.**
- **Internal training – check understanding by inspecting task “on the job”.**
- **Assessors are defined.**
- **External training – passed course and issue of certificate (e.g. First Aid Training, FLT training, NEBOSH).**

Conclusions

- **Audit highlighted deficiencies in our systems for operating procedures, training and competence.**
- **Encouraged us to adopt a more rigorous approach – we advised HSE what we were going to do.**
- **Benefits: ensures that training of new operators and engineers is not dependant on the “next to Nelly approach”. Personnel have awareness of major accident hazards associated with the plant operations. Complements the business philosophy of continuous improvement.**
- **Concerns: maintaining the systems. It takes a lot of effort by the line managers to ensure that procedures, training and competence assessment material is kept up to date. E.g. use appraisal systems, KPI’s (SOP’s updated against programme etc) to track progress.**