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23098

Inspection – Final Report
Project
Elektrosteel, Mashad, Iran

Industrie Service

Kompetenz.
Sicherheit.
Qualität.

Plant location:	Electro Steel Co. Daneshgah Avenue Mashad Islamic Republic IRAN
Plant:	The converted factory included: 1. Pentane storage area (tank, pipes, loading system) 2. Pentablend 3. M1+M2: Pentan HP 100/50 (2x) 4. Drypart: Enclosure with carrousels (moulds not complete installed during 2nd inspection) Enclosure for 4 fixtures (2 fixtures partly installed during 2nd inspection) 5. Safety system
TÜV - No.:	304 527
UNIDO Project No.:	MP/IRA/97/196
Responsible/ Expert:	Dipl.-Ing. K.J. Richardt, Dipl-Ing. (FH) A.Lips TÜV Industrie Service GmbH Bau und Betrieb, Branch Ulm
Inspection Dates:	General Statement - 27 January to 29 January 1999 Pre-inspection - 13 April 1999 First Inspection on site - 11 May to 13 May 2002 Second Inspection on site – September 2003 Meeting in Ozone Office Teheran – 20 September 2003 Deficiencies list – 23 September 2003 Installation of new tank by OMS until April 2005 Final Report – June 2005
Participants:	Mr. Perego – Impianti OMS Mr. Ebadi, Mr. Rafiei – Sitco Mr. Zadeh – Elektrosteel Mr. Ahmadzadeh – Elektrosteel Mr. Zamani – UNIDO - Iran
Report is sent to:	Impianti OMS, Mr. Perego UNIDO, Mrs. Latrech, Dr. Malayeri, Elektrosteel Mr. Ebadi

Date: 9 June 2005

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1. OBJECTIVE AND SCOPE OF THE PLANT EVALUATION

The Elektrosteel Co. in Mashad, Iran is operating polyurethane plants for the manufacture of refrigerators.

As substitute for the previously used CFC blowing agent R 11, c-pentane (C 5) is used now for the PU foam production. C 5 is a flammable fluid constituting a class AI hazard. The use of C 5 necessitates fire and explosion protection measures for the C 5 storage and the PU production facilities.

In conjunction with the progressive change-over to combustible blowing agents (C 5) the experts of the Ulm branch of TÜV Süddeutschland have developed German and International safety standards and accumulated a wealth of expert knowledge in this field.

All safety evaluations by the TÜV experts are based on International, European and German standards and the experience gathered with plant inspections, the evaluation of solutions based on measurements and the investigation of accidents since the start of plant conversions in 1993. A special safety strategy was developed for fire and explosion hazards.

Safety evaluations by the TÜV experts basically cover the following tasks:

- Co-ordinate of the safety strategy with fire and explosion protection measures
- Review the feasibility of the proposed safety strategy
- Inspect existing buildings and technical facilities and components
- Functional testing of safety-related equipment at the plants
- Measurements at plant components under fire and explosion protection aspects
- Evaluate existing organisational procedures/requirements
- Review relevant parts of the documentation
- Define the state of the art of safety Engineering by a comparison with plants used for similar purposes

2 DOCUMENTS AND INFORMATIONS USED AS A BASIS FOR THIS PLANT EVALUATION

2.1 Inspection

The first planes were checked in January 1999. The pre-inspection has been done in April 1999.
The first inspection in Mashad took place 11th May 2002 – 13th May 2002

The second inspection took place 16th September 2003 – 19th September 2003

The results of this inspection are mentioned in this report.

The inspection could not be completed because some of partswere not finally installed or in no good condition.

Like:
- Storage tank equipment
- Moulds of the drypart not finally installed
- Cabinet part (only 2 fixtures which were partly installed were available)
- Back up generator

The main problem was that OMS had to install a new underground tank for Pentane because the installed tank was not according to the rules.
It was agreed during a meeting (see TÜV Minute of meeting from 23 September 2003, File OMS/ELE-IRA/04/03)) in Teheran, were all the pending points were discussed, that the project can be closed when Elektrosteel will confirm all the open points and OMS will supply a new tank and will sent to TÜV experts all the related papers of the tank.
A new inspection to check all the details on site were not foreseen by Elektrosteel, OMS and UNIDO.

From Elektrosteel the experts got a confirmation that all deficiencies mentioned in the deficiencies list written after the second inspection were solved by Mr. Lotfali.
In the meantime OMS has sent to TÜV the related papers of the new tank.

2.2 Technical regulations

This plant evaluation is based on International, European and National regulations - in that order - as far as these are available and applicable. The plant were plant in 1999 with the related standards.

These include the following essential regulations:

- International standards (ISO, IEC)
- Ordinance Regulating Facilities for Storing, Racking and Transporting combustible Liquids - Germany: VbF
- Decree for electrical plants in explosion dangerous areas, Germany: ElexV
- Decree for pressure vessels, Germany DruckbehV
- Law for immissions protection: Germany BImSchG
- Law for water protection: Germany WHG (protection against water-pollution)
- Electrotechnical regulations: International: IEC / European: EN / National: DIN VDE e.g. IEC 60073, IEC 439-1/A2, IEC 204-1, IEC 1310-2, EN 50054, EN 50013, EN 50020, EN 50081, EN 60529, pr. EN 1050, DIN VDE 0165, EN 349, EN 418, EN 294
- Fundamental safety aspects to be considered for measurement and control equipment: Germany DINV 19250
- Safety requirements for automated manufacturing systems: Germany VDI 2854
- Personal protection regulations / accidents prevention - European: EN..EC / Germany: UVV/ZH
  e.g. VBG 1, VBG 5, VBG 61, ZH 1/200, ZH 1/255, ZH 1/8, ZH 1/10
- Technical regulations for combustible liquids and for gases: Germany TRbF / TRG
  e.g. TRbF 100, 110 / TRG 280
- Ex-proof / spark-proof for ventilators: Germany VDMA-24169 part 1
- Homologation of technical plant and equipment - European: conformity certificates (e.g. PTB, Cesi, Damko)
- EN 378, Refrigerating systems and heat pumps, Safety and environmental requirements
- pr EN 1612-2 Reaction moulding machines
- EG machine directive (89/392/ESG, revised edition 91/368/EEC)
- CEI/IEG 335-2-24, Safety of household and similar electrical appliances

- IEC 79-10/EN 60079-10/VDE 0165 Part 101: Electrical apparatus for explosive gas atmospheres - classification of hazardous areas.

2.3 Documentation of the PU plants and the peripherals

The first part of the documentation was delivered in January 1999
The documentation of OMS was on site and will be delivered to the experts before the final inspection.

Following was available on site:

Tank 25.000 litre Series

Pentablend work order 120/98, Serial No.: 0905

Foaming machine Penta HP work order 120/98, Serial No.: 0906
- Technical Dokumentation
  Pentanisation of Cabinet plant
- Item list and Drawings
  Pentanisation of Cabinet plant

Foaming machine Penta HP work order 120/98, Serial No.: 0907
- Technical Dokumentation
- Item list and Drawings

Dokumentation Notifier CAE-200

Electrical Diagrams

Documents received after the new tank has been installed:

Inspection Certificates of Tank 046578

- design approval on 02/12/2004 by TÜV Industrie Service
  it was confirmed that all drawings, material certificates were available and a pressure test were done and the tank is suitable to content Pentane.
- confirmation letter of OMS related the grounding 09/03/2005
- a confirmation letter related
  the training of Elektrosteel technicians
  the proper installation of devices
  the function tests of all parts
  This document were also signed by Mr. Ebadi on 14/04/2005
- Pictures related the tank

2.4 Documentation of Elektrosteel Co.

Confirmation list from Mr. Lotfali with the solved points related the deficiencies list on 28 September 2003

Final Confirmation list from Mr. Lotfali with the solved points related the deficiencies list on 5 November 2003

3. General definitions of c-pentane-foaming-plants

3.1 C5 safety data

Media	Hazard class	Flash point (°C)	Ignition temp. (°C)	Explosion-group	Temp. class	LEL / HEL (vol. %)	Density (air = 1)	Partially inert max. O_2 (%)
Cyclo-pentane	AI	< - 30	380	II A	T 2	1.1 / 8.7	2.42	11

3.2 Definition of Zones

The areas of the zones are mentioned in this report are related to the realised safety strategy.

a) Explosion Zones

At the foaming plant which works with c-pentane following explosion zones are existing:

Explosion Zone 0
Explosion Zone 1
Explosion Zone 2

The physical definition of these ex-zones is based on standard 94/9/EG-Atex 100a.

The area definition of the checked foaming plants is based on the standard IEC 79-10.

For the plants which are using pentane a special safety strategy has been developed which contains also other relevant safety zones.

The size of the area of the explosion and safety zones of the particular plants are described under the consideration of the realised safety strategy.

b) „Alarm Zone„

The alarm zone is a zone which has been defined in relation with the pentane safety strategy by using particular parts of IEC 7910.

The definition is as follow:

Definition of alarm zone:

Defined area in which the development of an explosive atmosphere answering the description of explosion zone 0,1 or 2 is prevented by technical measures in accordance with IEC 79-10 and all potential sources of ignition are switched off automatically before an explosive atmosphere arises.

Technical measures in accordance with IEC 79-10 include:

- Plant sections carrying polyol / C 5 must be technically leak-proof (e.g. special seals, leakage monitoring)
- Technical ventilation dimensioned in accordance with IEC 79-10 to reach a non dangerous zone
- Automatic gas warning system tested and certified in accordance with EN 50054 which automatically switches off of all potential sources of ignition at 40% LEL or lower.
- Only equipment which is absolutely necessary for operating the polyol / C 5 plant must be installed within the alarm zone.

d) Fire danger zone

Around 5 m of the pentane-foaming plant a fire danger zone must be defined.

The installed technical equipment must meet following general requirements:

- The electrical equipment and units must meet the IEC-standards.
- Smoking and using fire is strictly forbidden.
- Special work with the danger of fire like welding and soldering is only allowed with a special permit.
- The flammable materials must be reduced to a minimum.

d) Zone of Nitrogen (N_2) inertisation
This is an area in which through the inertisation of N_2 no explosive atmosphere can be.

4. Results of inspection and evaluation

All the tests stated here were made during the 2nd inspection of Elektrosteel plant. If there are further test made it is especially mentioned.
The deficiencies were confirmed and are not mentioned here again.

4.1 Parts of TÜV inspection

Following plants and equipment are part of this inspection:

- c-Pentane supply area
- Pipe to the mixing unit
- Pentablend
- Penta HP 100/50
- Safety relevant parts like Backup Generator, Inertisation system, Fire fighting system could not be tested properly etc.

Not Part of the final inspectionon site were

- Final installation of Door Foaming area with carousels for moulds
- Final installation of Cabinet Foaming area with fixtures

Not part of this TÜV inspection are:

- Polyol and Isocyanat Storage areas

4.2 C 5 supply station

4.2.1 Brief description of the plant

Pentane will be stored in an underground tank with a capacity of 25.000 litre.

This tank with Number 046 578 is suitable according the documents for the Project but were not inspected by the signed experts. The situation around were checked during the second inspection.

The tank is located in a concrete basin inside of sand. The C 5 pipe to the premix system is partly inside the ground and controlled and the part inside of the factory is aboveground.

The area in which C 5 will be released in the event of leakage during the filling process is designed as a liquid catch basin.

The electrical control panels are installed outside the explosion zone of the C 5 storage area.

4.2.2. Explosion zones / fire hazard zone

Based on the above standards, the following explosion zones must be defined:

a) Explosion zone 0

- The interior of the C 5 storage tanks (without controlled inertisation)
- The interior of C 5 pipes which are not constantly filled with C 5

b) Explosion zone 1

- Inside the tank pit
- The interior of the C 5 catch basin (temporarly)
- A circle with a radius of 1 m about the end of the C 5 tank exhausting systems

c) Explosion zone 2

- The environment of the C 5 tank pit over a distance of 2,0 m up to a height of 0.8 m from the floor additional to the Zone 1.
- Leakage catch system in tank area

d) Zone of Inertisation

- Inside of tank with controlled inertisation

e) Fire hazard zone

- Total C 5 storage area (minimum 5 m around the area)

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4.2.3. Measurements / safety functional tests

- Pentane supply area -

Plant/component	Effect	Conforming to safety strategy		Remarks
		yes	no	
A) Storage Tank				
1. Actual Drawing available		x		
2. Certificate of TÜV for tank production		x		
3. Confirmation of OMS and Elektrosteel related installation on site				accepted
B) Function tests during 2nd inspection				
1. Pentane emergency push button				
– pentane emergency push button (1st level)	Close tank fail safe valve	x		
	Stop pump	x		
	Signal on remote panel	-		Not installed, only signal of OMS available
2. Leakage sensors				
2.1 Leakage from pneumatic pump	Close tank fail safe valves	x		
	Stop pump	x		
	Flashing light red	x		
	Acoustic signal(2nd tone)	x		
	Signal on remote panel	x		
3. Tank N_2 pressure				
3.1 N_2-min of tank	Stop feeding pump	x		Electrical tests OK
Set 0,8 bar	Acoustic signal	x		
	Signal red light	x		
	Signal on safety panel	x		

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Plant/component	Effect	Conforming to safety strategy		Remarks
		yes	no	
4. N_2 pressure of jacket				
4.1 min (0,2 bar) and max (0,5 bar)pressure	Close tank fail safe valves	x		
	Acoustic signal	x		
	Signal red light	x		
	Signal on safety panel	x		
5. Overfilling alarm				
5.1 Pentane tank	Close fail safe valve	x		
	Acoustic signal	x		
	Signal red light	x		
	Signal to remote panel	x		
	Installation			
6. c5-basin		x		confirmed
7. Grounding truck	Close tank fail safe valve in filling pipe	x		
	Signal to safety remote panel	x		
9. Safety relief valve of pipe	8 bar	x		
10. Alarm signals to guard room		x		
11. Sprinkler system	Start water pump	x		
	Open solenoid valve	x		
12. Fire extinguisher		x		confirmed
13. Light		x		confirmed
14 Control valve in water pipe		x		confirmed

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Plant/component	Measuring result	Conforming to safety strategy		Remarks
		yes	no	
C) Measurements during 2nd inspection				
1. Electrical resistance of floor (conductivity)				
– Floor of basin	20 Mohm<10^8 Ohm	x		
– Floor over tank	20 Mohm<10^8 Ohm	x		
2. Ground/earth resistance				
– Potential equalisation				
• tank equipment	0,1 ≤ 0.3 ohm	x		
• tank		x		Were confirmed for the new tank
3. Lightning protection	9 Ohm	x		
4. Electrical circuits/control panel				
– over current protection	adjustments and system o.k.	x		
– over voltage protection		x		- Power supply from safety panel
5. Sprinkler system				
– over current protection		x		
D) Function tests after 3rd inspection with new tank				Confirmed by OMS and Elektrosteel

4.3 Pentamix

4.3.1 Brief description of the plants

The OMS Pentablend Nr. 0907 (120/98) is used.

From there 2 Penta HP 100/50 are supplied.

The pipes are on a pipe bridge.

The electrical control panels for the machines are installed outside the enclosure nearby.

The enclosure is equipped with a fire detection and fire fighting system

Further details are described in the OMS documentation.

4.3.2 Zone definitions and dimensions

a) Alarm zone
   - The interior of the cabin with the Pentablend

b) Explosion zone 2
   - The interior of the exhausting system
   - A circle with a radius of 2 m about the end of the exhausting systems at the open air

c) Explosion zone 1
   - The pipes which have connection with the pentane / pentane –polyol material and which are not complete filled.

d) Fire hazard zone

   A surrounding of 5 m around the enclosure

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4.3.3 Measurements / Function tests

- **Wetpart/ mixing unit**
  - Pentablend

Plant/component	Result	Conforming to safety strategy		Remarks
		yes	no	
A) <u>Function tests</u> 1. Gas alarm system – 15 % LEL – 30 % LEL – system error		 x x x		
2. Emergency push-button – pentane emergency push button (1st level) – emergency push button (control panel)		 x		
3. Alarm signals		x		-Contact of OMS available
4. Exhausting system – flow sensor – test smoke – start 2nd fan		 x x x		
5. Leakage system – sensor in enclosure		 x		
6. Door monitoring wet part		x		
9. Fire fighting / detecting system Alarm from sensor Connection to C_{O2} system Stop both fan Cut off power Visual and acoustic signal Signal to remote panel Limitation of work of C_{O2} system – maintenance key off – maintenance key on	 C_{O2} can not work C_{O2} can work	 x x x x x x		 - only Signal of OMS available

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Plant/component	Measuring result	Conforming to safety strategy		Remarks
		yes	no	
B) Measurements				
1. Electrical resistance of floor (conductivity)				
– inside of enclosure	< 0,3 ohm < 10^8 ohm	x		floor is metal
– inside of fence area	< 3 Mohm < 10^8 ohm	x		
2. Ground/earth resistance				
– Potential equalisation				
• Pentamix	≤ 0.3 ohm	x		
• enclosure	≤ 0.3 ohm	x		
• Ventilation tubes	≤ 0.3 ohm	x		
3. Electrostatic filed strength				
– enclosure of pentamix	< 50 kV/m	x		
– Insulation of tank, pipes etc.	4 kV/m	x		
4. Electrical circuits / control panels				
– insulation resistance	< 500 Mohm	x		
– over current protection	o.k.	x		
– Motor protection	o.k.	x		
5. Exhausting system				
Channel enclosure Mixing unit	- speed 1: 2,4 m/s	x		
	– speed 2: 6,0 m/s	x		

4.4 Dosing machine Penta HP 100/50 and Drypart

4.4.1 Brief description of the plants

From the feeding pump of the mixing part both Penta HP are supplied.
The wetpart consist of two Penta HP 100/50 (No. 0905 and 0906).
The drypart consist of
- carrousel line for doors within one enclosure.
  These parts were not ready during the inspection and could not be tested. No moulds were available.
- 4 fixtures within one enclosure
  only 3 cabinets were available but not complete ready installed and could not be used for tests

Before the foam injection starts, the moulds and fixtures will be filled with nitrogen. An suitable inertisation system has been installed by OMS and was partly tested. But the test could not be made together with the drypart.

The electrical control panels for the machines are installed outside the enclosure near the enclosure.

For the lines one safety panel is available.

The dry and wetpart is connected to a sufficient ventilation system.

Further details are described in the OMS documentation.

4.4.2 Zone definitions and dimensions

a. Alarm zone
   - The interior of the cabins with the wet part
   - The interior of the area/enclosure with the dry part.

b. Explosion zone 2
   - The interior of the exhausting system

- A circle with a radius of 2 m about the end of the exhausting systems at the open air

c. Explosion Zone 1
   - 100 mm around the moulds and fixtures during the foam rising time
   - A circle with a radius of 100 mm around the pouring hole of the moulds and fixtures

d. Zone of Nitrogen inertisation:
   - The interior of the polyol / C 5 blend tank
   - The interior of the moulds and fixtures after flushing by nitrogen

e. Fire hazard zone
   - A surrounding of 5 m around the wet-part and the dry-part.

4.4.3 Measurements / Function tests

- **Dosing machine and dry part (Line M1 and M2)**
  - Foaming machines, Typ Penta HP 100/50 (2x)
  - Line for 2 Door Carrousel (dry parts)
  - Line for 4 Fixtures (dry part)

Plant/component	Result	Conforming to safety strategy		Remarks
		yes	no	
A) <u>Function tests</u>				
1. Gas warning system				
– 15 % LEL		x		
– 30 % LEL		x		
– system error		x		
2. Emergency push-button				
– pentane emergency push button (1st level)		x		
– emergency push button (control panel)		x		
3. Alarm signals to guard place				only contact from OMS

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Plant/component	Result	Conforming to safety strategy		Remarks
		yes	no	
4. Exhausting system – flow sensor • wet part (line M1 and M2) • dry part ((line M1 and M2) – test smoke – function if 15 % LEL Flap in Channel		 x x x x x		The ventilation must be tested again after the drypart has been installed finally
5. Leakage system – basin wetpart (level 1) – HP pump (level 2) – stirrer tank wet part (level 2)		 x x x		
6. Polyol / C5 tank – Super max – N_2-min – Safety thermostat – safety relief valve		 x x x x		 Ispesl
7. Door monitoring wet part		x		
8. Fire detecting/fighting system – Fire sensor – Connection to CO_2 system Sprinkler system		 x x		 Wetpart installed
9. N_2-inertisation of dry part – N_2-pressure monitoring – N_2-flow monitoring – Quality of inertisation		 x x x		
10. Block opening of moulds and fixtures after pouring during foam rising				Could not be tested must be tested after the final installation

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Plant/component	Measuring result	Conforming to safety strategy		Remarks
		yes	no	
B) Measurements				
1. Electrical resistance of floor (conductivity)				
– within fence area	< 0,3 ohm < 10^8 ohm	x		metal
inside of enclosure	< 3 Mohm < 10^8 ohm	x		
– dry part	< 10^8 Ohm	x		
2. Ground/earth resistance				
– Potential equalisation				
• foaming machines	≤ 0.3 ohm	x		
• dry part plants				Must be done after final installation
• Ventilation tubes	≤ 0.3 ohm	x		
• mixing heads	≤ 0.3 ohm	x		
3. Electrostatic filed strength				
– window of dosing machines	< 20 kV/m	x		
– plastic curtain	< 100 KV/m			Will be evaluated after the final installation
– moulds during opening	??			Must be tested after final installation
– fixtures during opening	??			Must be tested after final installation
– Insulation of tank, pipes etc.	2 kV/m	x		
4. Electrical circuits / control panels				
– insulation resistance	o.k.	x		
– over current protection	o.k.	x		
– Motor protections				
– heater resistance	o.k.	x		
- overvoltage protection	o.k	x		

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Plant/component	Measuring result	Conforming to safety strategy		Remarks
		yes	no	
.5. Exhausting system				
Channel Penta HP (M2)	– speed 1: 11,0 m/s speed 2: 19,0 m/s	x x		
Channel Penta HP (M1)	– speed 1: 9,5 m/s - speed 2: 18,0 m/s	x x		
Channel Dry part fixture left side	– speed 1: 5,8 m/s – speed 2: 7,2 m/s			Measurement were not made together with the final installation
Channel Dry part fixture right side	– speed 1: 6,8 m/s – speed 2: 7,2 m/s			Measurement were not made together with the final installation
Channel Dry part door left side	– speed 1: 5,8 m/s – speed 2: 7,2 m/s			Measurement were not made together with the final installation
Channel Dry part door right side	– speed 1: 5,9 m/s – speed 2: 6,9 m/s			Measurement were not made together with the final installation
6. Inertisation Cabinet				Were made with an example of the cabinets
– flushing time	– 20 s			
– 0_2 concentration	- 5,1%			

4.5 General safety devices

4.5.1 Brief description

To use pentane in a safe way a lot of separate safety devices has been installed.
For the dry and wet part each an separate ventilation system which is controlled by a flow switch is available.

The safety panel, exit light and the ventilation will supplied by an backup generator, this installation must be finished.

The safety control panels consists the gas alarm system and the most safety relevant electrical installation.

Further details are described in the OMS documentation.

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4.5.2 Measurements/Function tests

– General safety devices

Plant/component	Measuring result	Function Conforming to safety strategy		Remarks
		yes	no	
Tests / Measurements				
A) c5-safety control panel				
1. Function tests – monitoring of circuit breakers and fuses – push button for testing of signalling – supply by UPS		x x x		- during inspection only battery
2. Presence and adjustment-control – timer relays – over current protection device – over voltage protection device		x x x		
3. Measurements – circuits-insulation	≥ 30 Mohm	x		
B) Back-up Generator				– could not be tested
1. Function tests – running without load – running with load – automatic start in case of power failure				
C) Sprinkler system				– could not be tested finally
D) Emergency exit light				– were installed after our visit

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4.6 Remarks to the detected deficiencies and required actions

	Responsible	
	OMS	Elektrosteel
1. Remark The most deficiencies detected at the inspection has been solved by OMS and Elektrosteel during the inspection time. The open points mentioned in our deficiencies list were solved according to the agreement during the meeting in the ozone office between Elektrosteel, OMS and UNIDO. The pending points were solved by OMS and Elektrosteel until 14 April 2005. This were confirmed by OMS and the related documents were also signed by Elektrosteel Mr. Ebadi.		
2. TÜV Inspection a) TÜV has inspected the plant on May 2002 and September 2003. The detailed results mentioned here are related to this inspection. b) All the solved pending points are in the responsibility of Elektrosteel and OMS because TÜV experts got only the confirmations. UNIDO has not asked for final inspection on site so TÜV could not test the final plant. c) The new tank were installed on site and the test were done by OMS		

5. Safety relevant working conditions of the pentane foaming plants

5.1 Organisational requests

To run these plant in safe conditions following safety requirements are essential:

- All parts of the machine documentation and operator instructions must be followed
- The safety checks must be done regularly.
  The results of the checks must be recorded.
  The management must follow the pending points
- The management, team leader and technicians which are in charge of the plants must be educated regularly by experienced people.

5.2 Change of units of the plant

Before units or parts of the plants related to safety will be changed experienced people must be consulted.

This must be people of the supplier of the machines related to the process and experts related to the safety.

5.3 Regularly inspections

5.3.1 General requirements

According to the safety strategy regularly safety inspections, maintenance and function tests must be done.

The aim is to keep the safety related to water protection, fire and explosions on the highest level and run the plants according to the state of the art.

The work must be done by internal experienced technicians (competent people) and by the signed TÜV experts.

Definitions:

Competent people (CP)

Experienced people must have a special education of the plant and of the safety issues.

The people should get an appointment to this particular work by the management.

Experts

The experts are experienced in this field. They have additional the knowledge of a lot of different plants and also of the accidents who happened. They are independent and have a special approval by the government.

5.3.2 Safety relevant checks, organisation and education

The relevant works, which are listed in the following table must be done:

No	Plant	Kind of check	Qualification	Check time
1	Foam plant complete	Visual check	CP	daily
2	Foam plant complete	technical maintenance	CP	monthly
3	Safety equipment e.g. Pentan control system, ventilation, grounding system, fire detection/fighting system, warning signs	visual check	CP	monthly
4	Safety equipment E.G. gasalarm system, Inertisation, Battery supply	technical inspection	CP	monthly
5	Gasalarm system	calibration of sensors	CP	each 6 month
6	Foamplant complete and relevant surrounding	- visual check - function check	CP	yearly
7	Organisation - Records of check - training of people - Records of changes	check the documents	CP Management	yearly
8	Training	theoretically and practically	CP or Experts	yearly
9	Foamplant complete	check of all safety relevant aspects	Experts	each 3 year
10	Essential changes of the foaming plant or safety parts	check of all safety relevant aspects	Experts	before run the plant again

5.4 Incidents / accidents

In case of special incidents and especially accidents (fire, explosion, industrial accident) the signed experts must be informed immediately.

5.5 Regularly information's

The carried out inspection is valid maximum till September 2006.

During this time the supervision by the experts will be realised as follow:

- The experts can inspect the yearly record of the internal competent people (CP's) of Elektrosteel
- Information about the training of the CP's must be transmitted.
- The experts can visit the factory at any time especially on request of UNIDO.

5.6 Issue of the Certificate

It was suggested from UNIDO that the experts get the related papers of the new tank and that Elektrosteel will be responsible for the final installation of the cabinet and door parts but that the plant will not be checked by TÜV experts after the final installation again.

For that reason it is agreed that the experts issue only the final report.

Industrie Service

6. Conclusion

The inspection of the installation of the related plants of UNIDO Project Elektrosteel in Mashad, Islamic Republic Iran took place from 16th September 2003 – 19th September 2003.

On 20 September a meeting in ozone Office in Teheran took place. All the mayor pending points came up during the inspection were discussed and finally a solution to solve it were fixed between UNIDO, Elektrosteel and OMS.
The biggest problem were the Pentane tank which were not according to the technical standards and could not be accepted during the inspection by TÜV. After discussions it was agreed that OMS will supply a new tank which is checked in the producer workshop by TÜV.

The most other installed components were in a good order and fulfilled the technical safety requests regarding the safety strategy for c5-plants.
During the inspection Elektrosteel and OMS took much effort to solve the detected deficiencies immediately.
The pending points were mentioned in a deficiencies list and these points were solved by the responsible party. TÜV got the related confirmation but did not re-check it on site.
It was confirmed that the old Pentane storage tank were exchanged against a suitable one and installed with the checked equipment.

The signed experts can state that the most safety related parts of the plant were in a good order during the 2nd inspection. The pending points were solved according to confirmations.
Elektrosteel must take care that all parts of the plant must be run according to the requirements for Pentane plants.
The requirements of chapter 5 of this report must be respected.
The experts

signed
K-J Richardt

signed
A. Lips

الکترواستیل
ELECTRO STEEL
گروه صنعتی محمدزاده

شماره :
تاریخ :
پیوست :

We confirm that the following jobs have been done during the final commisioning of the plant UNIDO/MP /RA/97/166-contract NO.98/015.

1.The nitrogen generator is working properly on its own capacity , 12.5 m^3/hr . (the problem mentioned in minotes of meeting on 14-04-2005 was regarded to input air pressure and output delivery valve, in the generator which by adjusting of them the problem was solved).

2.For preventing of back-flow foam to the cleaning system, one job has been done on each mixing head, concerning to open a parallel line of N2 flow during the pouring cycle .

3- One truck of cyclopentane around 16 tons has been unloaded to storage tank and the level has arrived to 75 % .

4- The cyclopantane was calibrated in pentablend and after wards , the foaming machines were loaded with 10 – 12 % of pentane mixed with polyol , for door and cabinet area , respectively , the foaming has been done , and now the plant from 12 : 00 oclock is in production with pentane till now .

For Electrosteel

R.Ghaemi
21-04-2005 5:40 PM

For OMS

H.Ebadi
21-04-2005 5:40 PM

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