



TOGETHER
for a sustainable future

OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.



TOGETHER
for a sustainable future

DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

23086

Final REPORT

CFC - Phase out project

Report No.:
qsgw0702-BUR-BIE.doc

Version Vol. 01

Manufacturer: **QS-Group**
Customer: **Sherkat Mohandes Mousa Bahar**

Factory Location: **Teheran, IRAN**
Visit dates: **27.01.-28.01.2005**

ISSUE: 10. February 2005

ACCREDITED TESTING AND CALIBRATION LABORATORY,
INSPECTION AND CERTIFICATION BODY
NOTIFIED BODY ID-NUMBER 0408

TÜV
ÖSTERREIC

Division
Electrical Engineering
Test Laboratory Vienna
A-1230 Vienna
Deutschstraße 10
Tel.: +43 1/610 91-0
Fax EXT 6505
eMail:pzw@tuev.or.at

Division Manager:
DI F. BITTERMANN
EXT 6400
E-mail: bm@tuev.or.at



Accredited as
Testing Laboratory,
Inspection Body,
Certification Body,
Calibration
Laboratory

Notified Body 0408

Head Office:
Krugerstrasse 16
1015 Vienna/Austria
Tel.: +43(1)514 07-0
Fax Ext. 6005
office@tuev.or.at
http://www.tuev.at

Branch Office in
Dornbirn, Graz,
Innsbruck, Klagenfurt,
Lauterach, Linz,
Mattersburg, Salzburg,
St. Pölten, Wels,
Vienna and
Filderstadt (D)

Subsidiaries in
Athens, Budapest,
Munich, Prague,
Tehran and Vienna

Banking
Connections:
BA 0066-28978/00
BA 220-101-949/00
PSK 7072.756

DVR 0047 333

1 Abstract

According to the definitions of our offer qsgw1121-BUR-BIE an inspection visit to verify the plant safety after the conversion of the refrigerator plant using Cyclopentane as blowing agent had been performed by the safety engineers of TÜV Austria in January 2005 during commissioning of the plant. The visit concerned all duties as mentioned in the Description of offered services, including the check of safety relevant installations and testing and verification of safety procedures and systems. The inspection has been based on the requirements of international standards and is documented in this final report.

Any residual minor faults and deviations to the applicable international standards are listed related to the main areas and systems. Under the term „corrective action“, the possibilities to eliminate each inadequacy or incompleteness and the company concerned with that matter are mentioned.

As final conclusion the inspection visit in January 2005 resulted in a mainly positive result and, under the condition that the deviations stated in this report are eliminated in near future, there are no objections against the operation of the refrigerator production plant of Sherkat Mohandes Mousa Bahar (Zagross II) in Teheran, Iran.

The following brief description shall provide a general overview for readers of this report to summarize the present situation at the converted plant the compliances with and the deviations to the applied international standards.

Equipment and production areas:

The machinery and the foaming equipment of Sherkat Mohandes Mousa Bahar (Zagross II) foaming production store is supplied by QS-Group, Italy.

The 5000 l CP storage tank is produced by an Italian company, CO.MET.srl, all quality and test documentation during and after the production of the tank is available.

The production equipment consists of the aboveground storage tanks (double wall), an aboveground welded and flanged distribution piping, a premixing (ECOMIX) and a dosing unit (ECODOSING) for the cabinet and the doors production.

The foaming process takes place:

- in a combined safety box with two foaming heads (one for cabinet, one for door foaming).
The cabinet foaming head is equipped with an external nozzle for the inertization of the jigs.
The door jigs are of smaller size; there is no inertization system prepared.

At the inspection dates the commissioning of the plant was pretty finalized, the commissioning personnel of QS-Group have made the equipment ready for testing (and usage).

The critical points which are to be eliminated are listed below; all details are mentioned in the full-length report:

- Gas monitoring system – sensor calibration:
 - The equipment has been produced about five years ago, the sensors had a calibration certificate of the manufacturer. There is no valid actual calibration record of the gas sensors and no calibration kit available on site.

- General electrical supply (electrical safety):
 - There are some ratings of the fuses for the electrical panels higher than the allowed limits for the used cables and the nominal current of the electrical panels:
Safety Panel Fuse rating: 63 A (should be reduced to max. 25 A)
Ecomix Panel Fuse rating: 63 A (should be reduced to max. 25 A)
 - The cross-section of the cable for the chiller has to be increased:
Existing cable 4 x 4 mm² (63A fuse); necessary cable 4 x 16 mm² (63A) or 4 x 10 mm² (50A)

INDEX:

1	<u>ABSTRACT</u>	2
2	<u>SAFETY RELEVANT SYSTEMS</u>	5
2.1	EXPLOSION PROTECTION	5
2.1.1	ARTIFICIAL VENTILATION SYSTEM	5
2.1.2	NITROGEN BLANKETING (INERTIZATION) SYSTEM	6
2.1.3	GAS MONITORING SYSTEM	7
2.1.4	GENERAL EXPLOSION PROTECTION MEASUREMENTS	7
2.2	SAFETY CONTROL PANEL - EMERGENCY SHUT-DOWN SYSTEM	8
2.3	FIRE PROTECTION AND FIRE ALARM SYSTEM	9
2.3.1	FIRE PROTECTION SYSTEM (SHERKAT MOHANDES MOUSA BAHAR)	9
2.3.2	FIRE ALARM AND FIRE FIGHTING SYSTEM (QS-GROUP)	9
3	<u>STORAGE AREAS</u>	10
3.1	STORAGE TANK AREA FOR CYCLOPENTANE (INCL. LOADING STATION)	10
3.2	ISOCYANATE AND POLYOL STORAGE AREA	10
4	<u>DISTRIBUTION PIPING SYSTEM</u>	11
5	<u>PREMIX AND DOSING AREA</u>	11
6	<u>FOAMING AREAS REFRIGERATOR CABINET AND DOOR</u>	12
7	<u>GENERAL CLAUSES</u>	12
7.1	ELECTRICAL INSTALLATION	12
7.2	DOCUMENTATION	13
8	<u>SAFETY REQUIREMENTS DURING OPERATION OF THE PLANT</u>	15
8.1	SAFETY INSTRUCTIONS	15
8.2	PERIODIC SURVEILLANCE	15
8.3	PREVENTIVE MAINTENANCE	16
9	<u>CONCLUSIONS</u>	16
10	<u>STANDARD LIST (INTERNATIONAL, EUROPEAN AND NATIONAL)</u>	17
11	<u>ANNEX</u>	18
11.1	MEASUREMENT AND FUNCTIONAL TEST PROTOCOL (11 PAGES)	18

2 Safety relevant systems

Safety relevant systems in general shall provide a suitable degree of protection against all dangers which can occur from the handling and storage of an easy flammable liquid (Cyclopentane - CP). This includes a safe design under consideration of the hazards of fire, explosion and leakage's.

2.1 Explosion protection

GENERAL DESCRIPTION:

The explosion protection system is based on primary and secondary protection equipment. Primary protection is the prevention of the occurrence of potentially explosive atmospheres by means of ventilation and inertization in endangered areas. A secondary explosion protection system is the detection of explosible atmospheres and the shut down of ignition sources when reaching the gas alarm level of 30 % of the lower explosion limit (LEL).

Where the limitation of the concentration of an explosible gas mixture is not secured or an electrical device has to work in an explosion endangered area (Zone 0, 1 or 2), the device must be properly explosion-proofed for the degree of danger. The minimum degree for Zone 1 is explosion group IIA and temperature class T2.

2.1.1 Artificial Ventilation system

DESCRIPTION:

Local artificial ventilation systems are provided with local ducts for the foaming area inside the safety box and the housing of the premixing / dosing units. There are two double speed ventilation motors provided for the foaming area and one double speed fan motor for each of the machine units. Ventilation systems are equipped with a function monitoring (differential pressure switches).

The potentially gas containing air is sucked from the bottom of the boxes; the exhaust openings into fresh air are located on the roof of the factory building.

The air exchange rate has been calculated to keep the CP/air-mixture in the safety boxes during production below 15 % LEL

When the gas concentration exceeds the limit of 15 % LEL (level 2 - warning) the fan motors are switched to the second speed level, the machine is stopped in emergency level (cut-off control energy). The ventilation systems continue operation when the level 3 - alarm limit (30 % LEL) is reached, additionally, the whole electrical energy of the machine is cut-off (like in general alarm situation). Therefore the ventilation systems are qualified for the use in Zone 1 (e.g. fan impellers are of anti-sparking design).

For the function detection of the ventilation system differential pressure switches are installed. In case of a failure of the ventilation system the electrical supply in the ventilated areas is switched off after a short time delay of 3 seconds.

The exhausted air is conveyed outside the building through chimneys with a weather protected opening above the roof.

For the chimneys there is either a lightning protection system (lightning rod) properly installed or they are protected by the roof construction. In order to prevent the entry (reduce the amplitude) of high energy lightning currents in the production building a connection of the ventilation ducts to the steel construction of the roof is provided.

REQUIREMENTS/DEVIATIONS/RECOMMENDATIONS:

No safety critical deviations have been observed.

2.1.2 Nitrogen blanketing (inertization) system

DESCRIPTION:

The system of nitrogen blanketing is used in order to reduce the amount of oxygen in a gas/air-mixture below the critical point for inertization, where no ignition of the mixture can take place because of the lack of oxygen (11,6 % O₂).

The nitrogen is generated with a N₂-generating system (compressor, cooler, generator, compressor tank) in a separate room. The general arrangement and electrical installation are appropriate.

Nitrogen Generator:

Type: Aquila NG 17

Compressor:

ALUP 302711; 16 bar, 350 l

N₂-intermediate tank:

Metal Products MB 31027216; max. pressure 11 bar; safety valve 11 bar; line pressure switch <11 bar

The nitrogen is supplied for inertization to the cabinet foaming systems, the CP storage tank and tank jacket and the tanks in the Ecomix and Ecodosing units. The minimum nitrogen pressure in the line is detected.

REQUIREMENTS/DEVIATIONS/RECOMMENDATIONS:

No safety critical deviations have been observed.

2.1.3 Gas monitoring system

DESCRIPTION:

The control unit of the gas monitoring system is situated in the safety control panel. There are gas detectors provided for the mixing/dosing units, the storage tank and the foaming areas. One sensor is installed in the cabinet production, one in the door production, one at the CP storage tank close to the CP pump and one sensor in each of the machine safety boxes. The gas sensors in the foaming area are mechanically suitable protected.

The gas monitoring system (central unit type: Draeger Polytron SE-EX PR) works with Draeger Polytron SE-EX PR catalytic sensors and has a non-interruptible battery emergency supply. A new sensor calibration with a calibration kit has not been done during the inspection visit.

The functional tests of the gas monitoring showed no deviations.

REQUIREMENTS/DEVIATIONS/RECOMMENDATIONS:

a) Calibration of gas sensors:

The catalytic gas sensors have been installed about five years ago. At shipping time, the sensors had a valid calibration by the manufacturer. Due to the fact, that catalytic EX-sensors should be calibrated usually all 3 months (see guidance of manufacturer Draeger), the original calibration is no longer valid.

At inspection dates there was no calibration kit available in the factory, therefore no sensor calibration could be performed.

Corrective action:

Provide a calibration kit and calibrate gas sensors.

QS-Group / Sherkat Mohandes Mousa Bahar

2.1.4 General explosion protection measurements

DESCRIPTION:

In explosion endangered areas, Zone 0 and Zone 1, measurements to prevent the occurrence of electrostatic charging or measurements against the ignition of dangerous charged materials have to be implemented. Furthermore there are protection measurements against possible different potentials of conductible equipment necessary. Electrical equipment has to be qualified for the use in explosion classified areas.

Grounding and Equipotential bonding measurements have been properly implemented; surfaces in Zone 1 areas are electrostatic grounded. The electrical equipment, where necessary, is qualified for the use in explosion endangered areas. Materials of equipment used in Zone 0 or Zone 1 is generally electrostatic conductible and correctly grounded.

There are no descriptions for intrinsically safe circuits available; therefore the correct data and arrangement of all intrinsically safe equipment has been checked during the inspection visit. The proper selection and appropriate connection of intrinsically safe apparatus and cabling could be verified by the inspection body.

The minimum classification for all explosion protected electrical equipment in Zone 0 or 1 is:

EEEx .. IIB T3 (Ok)

REQUIREMENTS/DEVIATIONS/RECOMMENDATIONS:

No safety critical deviations have been observed.

2.2 Safety control panel - emergency shut-down system

DESCRIPTION:

The safety control panel is positioned outside the safety boxes on the production area platform; a small (safety) control panel for the storage tank area is installed besides the tank area. The safety control panel includes the control of the ventilation system, the emergency switches, the gas monitoring system and the fire detection system.

The electrical supply of the foaming machines and the equipment inside of the safety boxes is switched off automatically and immediately in case of a general, a gas or a fire alarm (fail safe).

The gas monitoring system and the fire detection system are equipped with an uninterruptible power supply by battery; all other systems are fed in case of a general power failure by the central emergency power generator.

The emergency shut-down system (ESD), all push-buttons including the general alarm buttons have been tested. All tests were finished positive.

REQUIREMENTS/DEVIATIONS/RECOMMENDATIONS:

No safety critical deviations have been observed.

2.3 Fire protection and fire alarm system

2.3.1 Fire protection system (Sherkat Mohandes Mousa Bahar)

DESCRIPTION:

The company provides a sufficient fire extinguishing system close to endangered areas for the first and enhanced aid with hand-operated powder extinguishers on easy accessible position.

To guarantee the efficiency of fire fighting a sufficient water supply and a fire brigade with foam for flammable liquids is necessary (company or local fire brigade). An emergency plan designed in case of fire shall be established.

Near the production area there is a sufficient amount of fire extinguishers (powder, close to the electrical panels also CO₂) prepared for the first aid.

In the tank area, there are two 50 kg powder fire extinguishers prepared for the first aid. Additionally there is also a fire hydrant and a fire hose arranged near the tank area.

The fire alarm and the general alarm buttons cause an acoustic alarm and switch off the electrical power in the specific area concerned by the alarm.

A fire fighting water line (app. 3-4 bar pressure) runs outside the factory building, the water pressure is provided by a manual started diesel pump. A fire brigade is located close to the company.

REQUIREMENTS/DEVIATIONS/RECOMMENDATIONS:

No safety critical deviations have been observed. Nevertheless it is recommended to implement a fire alarm plan including all fire prevention and fire fighting measurements as well as the regular training of the personnel and the information path to the local fire brigade.

2.3.2 Fire alarm and fire fighting system (QS-Group)

DESCRIPTION:

There is a fire detection system (central unit type: Notifier AM-6000) installed for all endangered areas. There are thermal fire detectors inside the Ecomix and the Ecodosing safety boxes; in the foaming area and the tank area there are infrared flame detectors mounted.

For the Ecomix and the Ecodosing machine automatic CO₂-fire fighting systems are installed. In case of a fire alarm the concerned safety box is automatically flushed with carbon dioxide.

All fire alarms cut-off the electrical energy to the alarm area and stops the ventilation system (to prevent the further expansion of the fire).

REQUIREMENTS/DEVIATIONS/RECOMMENDATIONS:

No safety critical deviations have been observed.

3 Storage areas

3.1 Storage tank area for Cyclopentane (incl. loading station)

DESCRIPTION:

The storage tank is a 5000 l double wall steel tank arranged aboveground on a basin made of reinforced concrete. The jacket of the tank and the tank itself are filled with nitrogen; the pressure inside the tank and the jacket are monitored for leak detection. All test certificates, manufacturers declaration and settings of safety valves are available and proofed as suitable for the intended usage. A weather protection roof is mounted.

The control panel is located about 3 m from the storage tank separated from the tank by a concrete wall. The grounding system for the tank and the metal roof are already installed.

There is a monitored earthing connection clamp (ICMI ISEO 1(2)) provided for the filling procedure; a gas sensor is mounted for the detection of leakages (e.g. at the CP pump on flanges or during the filling operation).

The filling operation takes place from the loading station with a pneumatic pump out of a 200 l barrel (or drum). A gas return system is provided. The loading operation is described for the operation personnel in a safety procedure issued by QS-Group.

REQUIREMENTS/DEVIATIONS/RECOMMENDATIONS:

No safety critical deviations have been observed.

3.2 Isocyanate and Polyol storage area

DESCRIPTION:

Isocyanate and Polyol is stored in barrels (drums) inside the factory building and been transported with pumps to the Ecomix unit. The storage area is not especially marked or protected. There are no sufficient safety instructions for the working personnel on-site available (as the people wear gloves according to information by the company) at the storage area.

REQUIREMENTS/DEVIATIONS/RECOMMENDATIONS:

No safety critical deviations have been observed.

It is recommended for the local company to maintain a training and information system for the employees in order to verify the proper information about the danger of Isocyanate (poisonous) and the necessary personal protection equipment during handling.

4 Distribution piping system

DESCRIPTION:

The distribution piping of Cyclopentane is made of a single wall welded and all 12 m flanged steel piping arranged aboveground from the tank to the factory building (length about 150 m).

The piping is suitable mechanical protected and is protected against direct sun rays by a metal shield above the pipeline.

After installation a pressure test (test pressure 7 bar; test time 24 hours) has been performed and documented by the commissioning personnel.

In the distribution piping there are two automatic safety valves, one at the tank area, one before the building entry installed (and tested).

REQUIREMENTS/DEVIATIONS/RECOMMENDATIONS:

No safety critical deviations have been observed.

5 Premix and dosing area

DESCRIPTION:

The premix and dosing area is located in the production building on a platform near the foaming safety box. There is one Ecomix EM 20P/S100 and one Ecodosing ED 2-50P DS unit and their electrical machine panels provided for the production.

The parts and devices involved with pure CP and with CP/Polyol blend are installed in artificial ventilated safety boxes. All these safety boxes are monitored by gas detectors and have leak detection switches at the collection basin.

Electrical equipment is, where necessary, explosion-proof (EEx d or EEx i type).

The tanks inside the boxes are suitable quality tested and certified by ISPESL, Italy. All CP containing tanks have an internal nitrogen inertization.

In the premix and dosing area there is also the chiller located (type: EUROCHILLER EF A12/ET24, 380 V, 37 A, CE-mark).

REQUIREMENTS/DEVIATIONS/RECOMMENDATIONS:

No safety critical deviations have been observed.

6 Foaming Areas refrigerator cabinet and door

DESCRIPTION:

Refrigerator Cabinet and door foaming area:

The foaming area for the refrigerator cabinets and doors is located inside the factory building in a combined safety box. There is one foaming head for the cabinets and one head for the doors.

The foaming jigs are non-preheated because of their small size. The jigs are transported manually on transport vehicles. The (larger) cabinet jigs are flushed with nitrogen prior to the pouring (max. time delay: N₂-inertization to pouring of 5 minutes); the nitrogen inertization is sufficient (oxygen concentration inside jig below the critical maximum limit) for the maximum allowed time delay. The position of the nitrogen nozzle is monitored by a safety switch to be inserted in the nozzle handle before flushing.

The foaming area is closed by a safety box and supplied with two artificial ventilation systems (air suction ducts at cabinet and door part of box) at the bottom of the safety box.

The electrical equipment inside the safety box (gas sensors, lights, flame detector) is explosion protected.

REQUIREMENTS/DEVIATIONS/RECOMMENDATIONS:

No safety critical deviations have been observed.

7 General clauses

7.1 Electrical installation

DESCRIPTION:

The electrical energy for the machine panels is supplied by a general low voltage distribution panel on the production platform.

As emergency supply a hot-standby 225 kVA diesel generator set with an automatic low voltage switch in the main supply panel and a manual started residual power supply with another diesel generator (as power supply for the whole company) is provided. The ability of the generator to start with load has been verified as far as possible by functional tests (at weekend, outside standard operation times).

Electrical equipment in classified endangered areas (EX-Zone 1 or 2) is certified and suitable for the intended purpose.

Nr.	Document Nr.	Document Title; Company
1	N1600.00.002	Layout General - Piping Lay-Out; QS-Group
2	N1600.00.003	Lay-Out Impiantistica; QS-Group
3	US 000 167	Schema di Flusso N16; QS-Group
4	US.000.146.P01	Box di aspirazione per Ecodosing; QS-Group
5	9056008 001 - 004	Lay-Out fire fighting system; QS-Group
6	-	Box Ecomix, Detail "A"; QS-Group
7	-	Calculation of Suction: Cabinet Foaming plant, Door Foaming Plant, Ecomix 20P/S100, Ecodosing 2-20, 2-50; QS-Group
8	-	Risk area classification: Cyclopentane Storage Area, Cabinet Foaming Plant, Door Foaming Plant; QS-Group
9	-	Hydraulic Calculations: Water system, CO ₂ -System; QS-Group
10	N16.01	Wiring diagram Ecomix EM-20-S100P + External Polyol Storage; QS-Group (23 sheets)
11	N16.02	Wiring diagram Ecodosing ED2-50P DS; QS-Group (30 sheets)
12	N16.20	Wiring diagram Monitoring Gas Pentane Safety System; QS-Group (33 sheets)
13	N16.35	Wiring Diagram Pentane Storage; QS-Group (8 sheets)
14	-	Ex-Certificates for Electrical Equipment in hazardous Areas; QS-Group
15	99/314861 M1	Tank certification and manufacturers documentation – 300 l, Nr. 815; ISPEL + Prandin & Cavallieri
16	99/314863 M1	Tank certification and manufacturers documentation – 300 l, Nr. 817; ISPEL + Prandin & Cavallieri
17	99/301388 P	Tank certification and manufacturers documentation – 5150-l, Nr. 809; ISPEL + CO.MET.
18	99/321174 M1	Tank certification and manufacturers documentation – 300 l, Nr. 837; ISPEL + Prandin & Cavallieri
19	-	Alarm list + safety matrix, 27.01.2005; QS-Group
20	-	Manufacturer declaration – Antisparking fans MB 253; Moro, 13.9.2000
21	4501	Certificate of qualified welder, Ministry of Labor, Iran
22	-	Test Report pressure test CP distribution piping; Sherkat Mohandes Mousa Bahar, 10.1.2005
23	-	Training declaration; Sherkat Mohandes Mousa Bahar, 26.1.2005
24	-	CP storage tank loading procedure; QS-Group

REQUIREMENTS/DEVIATIONS/RECOMMENDATIONS:

Final documentation shall include the final changes, layout and electrical drawings as well as certificates and shall represent the actual status of the plant. Some drawings have slightly changed during installation and commissioning.

Recommended action:

Issue of final documentation and supply to the recipient company

QS-Group

REQUIREMENTS/DEVIATIONS/RECOMMENDATIONS:

- a) There are some ratings of the fuses for the electrical panels higher than the allowed limits for the used cables and the nominal current of the electrical panels:
Safety Panel Fuse rating: 63 A (should be reduced to max. 25 A)
Ecomix Panel Fuse rating: 63 A (should be reduced to max. 25 A)
- The cross-section of the cable for the chiller has to increased:
Existing cable 4 x 4 mm² (63A fuse); necessary cable 4 x 16 mm² (63A) or 4 x 10 mm² (50A)

Corrective action:

Sherkat Mohandes Mousa Bahar

Change the fuses and cables as mentioned above.

7.2 Documentation

DESCRIPTION:

All documentation for the safety inspection has been supplied by the manufacturer of the foaming equipment – QS-Group.

The on-site documentation of QS-Group has been collected in the following files and documents:

Nr.	Book-Nr.	File or Document Title, Company
1	827	CP storage tank 5000 l, N16.35-99; QS-Group
2	823	Ecomix, N16.01-99; QS-Group
3	824	Ecodosing, N16.02-99; QS-Group
4	828	Polyol storage tank, N16.37-99; QS-Group
5	825	Monitoring unit, N16.20-99; QS-Group
6	826	Fire fighting system, N16.32-99; QS-Group
7	-	Nitrogen installation; ALUP compressors

List of (preinspected and on-site inspected) documents (next page):

8 Safety requirements during operation of the plant

8.1 Safety Instructions

Adequate training and instruction of the personal working with Cyclopentane and Isocyanate is an integral part of the plant safety. In a production process using flammable and poisonous liquids the following instructions for handling and training are a minimum safety requirement:

- Instructions for handling and storage of Cyclopentane and Isocyanate
- Instruction for the filling and periodic supervision of the CP storage tank
- Working and safety instruction for the foaming process of the doors and cabinets
- Specification documents for the execution of periodic tests for safety relevant devices and functions and the calibration of the gas monitoring system. A test register has to be kept and stored for inspection visits.
- A fire alarm and emergency plan

8.2 Periodic Surveillance

An initial safety inspection covers the principal safety of the plant and the installation at the time of inspection (commissioning). To secure a safe operation for a lifetime period of the plant, the execution of periodic surveillance either internal or preferably external by an independent expert (third party) is an essential part of the safety concept.

The interval of the external surveillance is preferably one year. If the time between two surveillance inspections exceeds one year, the functional tests of safety systems and components have to be executed internal at least annual and must be properly documented.

The periodic surveillance inspections shall include all relevant systems, e.g.:

- a check of the test register,
- the test of relevant safety functions and alarms,
- function tests of safety relevant components,
- the calibration of the gas monitoring system (all 3 months),
- a visual inspection of the properly condition and maintenance of the installation and equipment,
- a leakage (pressure) test for the CP distribution piping

In addition to the annually (external) surveillance the company shall execute a periodic internal surveillance of the storage area and the CP-piping (weekly) making a visual inspection and a leakage test of flanged joints either by a portable gas detector system or a leak detector spray.

8.3 Preventive Maintenance

The minimum requirements for the preventive maintenance of the foaming units are the requirements defined by the supplier or within the provided technical documentation of the equipment.

For locally supplied parts of the plant an internal guide including the necessary inspections and maintenance should be prepared by the company.

It is recommended to document all maintenance works and inspections in a register.

9 Conclusions

The aim of the safety inspection visits of the refrigerator plant of Sherkat Mohandes Mousa Bahar (Zagross II) in Teheran, Iran, was the execution of all necessary checks and tests in order to prepare a safety report for the plant. The safety inspection report, generally based on international standards, should guarantee the safe design and function of the converted plant.

At the time of the inspection visits the commissioning of the foaming equipment has been generally finalized by the supplying company, QS-Group s.p.a.

All necessary tests to verify the proper function of safety measurements and technical installations have been executed with an overall positive result.

There is one formal critical deviation, which is to be eliminated before start of production.

The safety requirements during operation of the plant seem to be handled pretty well. There is general quality and maintenance guidance provided by the supplier which can lead to the expectation of a proper future operation of the foaming plant.

As final conclusion the inspection visit in January 2005 resulted in a basically positive result and, under the condition, that the deviations stated in this report are eliminated before official start of production, there are no objections against the operation of the refrigerator production plant of Sherkat Mohandes Mousa Bahar (Zagross II) in Teheran, Iran.

10 Standard List (international, European and national)

This list must not be complete but shall provide the reader of this report sufficiently detailed information of the applicable regulations for the safety assessment.

In case there is no adequate international standard existing for the review of a detailed requirement a basic risk assessment has been performed in order to achieve a practical solution.

- ⇒ IEC 60079-14 Electrical apparatus for explosive gas atmospheres - Part 14:
Electrical installations in hazardous areas (other than mines)
- ⇒ IEC 60079-10 Electrical apparatus for explosive gas atmospheres - Part 10:
Classification of hazardous areas
- ⇒ EN 50014 Electrical apparatus for potentially explosive atmospheres -
General requirements
- ⇒ EN 50018 Electrical apparatus for potentially explosive atmospheres -
Flameproof enclosures "d"
- ⇒ EN 50019 Electrical apparatus for potentially explosive atmospheres -
Increased safety "e"
- ⇒ EN 50020 Electrical apparatus for potentially explosive atmospheres -
Intrinsic safety "i"
- ⇒ EN 50021 Electrical apparatus for potentially explosive atmospheres -
Type of protection "n"
- ⇒ EN 50039 Electrical apparatus for potentially explosive atmospheres -
Intrinsic safety "i" Systems
- ⇒ IEC 61024-1 Protection of structures against lightning - Part 1: General principles
- ⇒ IEC/EN 60204-1 Safety of machinery - Electrical equipment of machines
Part 1: General requirements
- ⇒ TRbF 20 Stores
- ⇒ TRbF 30 Filling stations
- ⇒ TRbF 40 Petrol stations
- ⇒ TRbF 50 Pipelines
- ⇒ EN 61779 series Electrical apparatus for the detection and measurement of
flammable gases
- ⇒ BGR 104 Guidelines for the avoidance of dangers by explosive atmosphere including
collection of examples - guidelines on protection against explosion (EX-RL)
- ⇒ BGR 132 Guidelines for avoiding the dangers of ignition due to electrostatic charges;
guidelines "Static Electricity"
- ⇒ VDMA 24169-1 Air handling units; design-related explosion protection measures for fans;
specifications for fans used to handle flammable gases, vapors or mist-
containing atmospheres
- ⇒ ÖNORM EN 12599 Ventilation for buildings – Test procedures and measuring methods for
handing over-installed ventilation and air conditioning systems

11 Annex

11.1 Measurement and functional test protocol (11 pages)

See enclosed separate measurement and function test protocol!

TUV Austria
Division Electrical Engineering

Division Manager:



Friedrich Bittermann

Safety Expert:



Thomas Burger

This report may only be reproduced in its entirety and without any change.
A publication of its parts is permitted only with written authorization of TÜV Austria.

MEASURING and FUNCTIONAL TEST PROTOCOL

Customer:	Sherkat Mohandes Mousa Bahar
Factory:	Zagross II
Manufacturer:	QS-Group (Milano, Italy)
Date(s):	27.1.-28.1.2005
TUV experts:	Th. Burger

1 Artificial Ventilation Systems

1.1 Measurement of air-streams

The efficiency of the artificial ventilation systems in the safety boxes has been checked by means of an anemometer to measure the air-stream in the exhaust air channels and compare it to the calculated values to establish a sufficient air exchange rate in endangered areas.

In some areas an additional plausibility check by measurement of the air-stream at the suction points inside the safety boxes to verify the power loss through the ventilation duct system has been made (see table below, <location; suction>).

The measurement procedure as used is described in the standard EN 12599:2000, Annex E; the measurement results are the mean values of a measurement in two rectangular directions, 5 points in each direction (Trivial-nm-procedure).

The measured air temperature has been about 15-20 °C therefore no recalculation for the standardized value at 20 °C has been necessary.

Location: Measurement point	Fan speed	Mean Air-velocity [m/s]	Resulting air-stream [m ³ /h]	Nominal air-stream [m ³ /h]	Calc. limit (QS-Group) [m ³ /h]	Result [not Ok/Ok]
Ecomix	Single	8,04	1158	2250	418	Ok
Ecomix	Double	11,22	1616	3500	418	Ok
Ecodosing	Single	6,96	1002	2250	1023	(Still) Ok *)
Ecodosing	Double	9,82	1414	2700	1023	Ok
Foaming Area Doors	Single	8,4	2371	2700	936	Ok
Foaming Area Doors	Double	12,34	3482	5000	936	Ok
Foaming Area Cabinets	Single	8,2	2314	2700	1196	Ok
Foaming Area Cabinets	Double	12,26	3460	5000	1196	Ok

*) The calculated minimum for the air-stream in the Ecodosing area made by QS-Group mentioned a specific weight of air of 1024 g/m^3 . At $20 \text{ }^\circ\text{C}$ and normal pressure the air has a higher specific weight, which reduces the result of the calculation below $1000 \text{ m}^3/\text{h}$!

1.2 Measurement of gas concentration during operation

During some operation cycles a concentration measurement with a portable gas detection system (Draeger Multiwarn II) has been performed in order to verify the correct efficiency of the ventilation in connection with the released amount of CP-vapours. The results showed no significantly higher concentration in the foaming area and around the cabinet jig (in a distance above 20 cm) and led to an overall positive result.

2 Efficiency of Inertization System

The foaming head (model 50) for the jigs in the cabinet production of the refrigerator production is equipped with a nitrogen inertization system. The volume of the jigs is filled with nitrogen shortly before pouring

(pouring has to be done after a maximum time delay of 5 min.).

The nominal nitrogen pressure is 6 bar, the time slot for inertization is 3 seconds. There is a safety key to be inserted in the handle of the N_2 -nozzle to secure the correct position during inertization.

To verify the function of the explosion protection by the primary measurement inertization, the oxygen amount inside the jig volume has been measured with a portable oxygen detection system (see clause 1.2).

The limit value for the inertization with nitrogen is max. 11,6 % O_2 !

Location; measurement point	Time after inertization [min.]	Measured concentration [Vol% O_2]	Result [not Ok/Ok]
Cabinet jig (inside)	0,5	3,1	Ok
"	1	3,1	Ok
"	2	3,2	Ok
"	3	3,3	Ok
"	4	3,4	Ok
"	5	4,5	Ok
"	6	4,7	Ok

The measured oxygen concentration shows a good efficiency of the inertization over the evaluated period of six minutes (five minutes after the nitrogen inertization the clearing for the pouring is cancelled).

3 Efficiency of Grounding System

3.1 Specific resistance of earth

The specific resistance results from the measurement according to the Wenner-method as

$$\rho [\Omega\text{m}] = R_a \cdot 2\pi \cdot a$$

a [m]	R _a [Ω]	ρ [Ωm]
0,8	37	185
1,6	12,7	127
3,2	3,2	64

Medium specific resistance $\rho_m = 120 \Omega\text{m}$

Maximum allowed grounding resistance $R_{st\text{ zul.}} = 15,5 \Omega$ 7,7 Ω (EX)

3.2 Grounding/earthing system and equipotential bonding

Location	measured value	satisfactory
Storage tank CP	0,28 Ω	Yes
Equipotential bonding CP tank area	<< 1 Ω	Yes
Grounding system for CP piping, measure point No. 1	0,28 Ω	Yes
Grounding system for CP piping, measure point No. 2	0,28 Ω	Yes
Grounding system for CP piping, measure point No. 3	0,28 Ω	Yes
Grounding system for CP piping, measure point No. 4	0,28 Ω	Yes
Grounding system for CP piping, measure point No. 5	0,28 Ω	Yes
Grounding system for CP piping, measure point No. 6	0,28 Ω	Yes
Internal Equipotential connections (Foaming Area and foaming machine constructions)	<< 1 Ω	Yes
Grounding connection to factory grounding	<< 1 Ω	Yes

5.3 Inspection of adjustment of overload switches (for fan motors, pumps) inside the safety panel and the machine panels

Circuit	Adjustment [A]	Safety Panel	
		Result [NOK/OK]	Remarks
3Q1	1,4	Ok	Ecomix fan 2speed
3Q3	0,95	Ok	Ecomix fan 1speed
3Q4	1,4	Ok	Ecodosing fan 2speed
3Q6	0,95	Ok	Ecodosing fan 1speed
3Q8	4,7	Ok	Door foaming fan 2speed
3Q10	2,1	Ok	Door foaming fan 1speed
4Q1	4,7	Ok	Cabinet foaming fan 2speed
4Q3	2,1	Ok	Cabinet foaming fan 1speed
Ecomix			
4Q2	6,9	Ok	Ecomix pump Polyol
4Q5	3,6	Ok	Ecomix pump CP
Ecodosing			
6Q4	30,4	Ok	Ecodosing pump Polyol
6Q8	32,7	Ok	Ecodosing pump Iso
4Q5	15	Ok	hydraulic pump
4Q2	2,0	Ok	stirrer
Safety panel CP tank			
2Q1	1,6	Ok	CP pump

6 Gas Monitoring System

6.1 Test of Gas Sensor function – Test description

The tests have been performed by simulating a 15% and a 30% alarm at the sensor card and additionally activating a 30% alarm with test gas (butane) on the sensor.

At the level 2 alarm (15 %; warning, yellow light) the fans of the safety boxes are switched to the second speed and the electric power of the machine is cut-off as in a machine ESD, at the level 3 alarm (30 %; alarm, red light) the power of the safety box panels is switched off (immediately).

4 Resistance surface–earth of floors in production areas

The measurement has been done with a Ø50 mm electrode on several places in the production area (in the safety zones). The isolation resistance between the floor surface and the factory earth has been measured. For an antistatic behaviour the resistance should be smaller than 1 MΩ!

Location	Number of measurements	R _{surface-earth} [kΩ]	result [not Ok / Ok]
Cabinet foaming area	10	10 – 70	Ok
Door foaming area	10	20 - 100	Ok

5 Electrical Safety

5.1 Electrical loop resistance

Object	Distribution panel	Ext. I _{>prot.} [A]	Int. I _{>prot.} [A]	R _{loop L-PE} [Ω]	result [not Ok/Ok]
Factory building	Main panel, Ecodosing	100	-	0,13	Ok
"	Main Panel, Ecomix	63 (25)	-	0,16	Ok
"	Main Panel, Safety Panel	63 (25)	-	0,38	Ok
"	CP storage tank panel	20	-	1,22	Ok
"	Main panel, Chiller	63	40	0,24	Ok
Supply room	Main Panel, N ₂ -Generator	25	-	0,33	Ok

5.2 Function of RCD's (Residual Current Devices)

There are no RCD's used in the refrigerator plant.

6.2 Results of the gas monitoring system tests – Safety Panel

Sensor No.	Position	Level 2 Warning	Level 3 Alarm	Sensor Failure	Remark(s)
1	Ecomix	Ok	Ok	Ok	No valid sensor calibration!
2	Ecodosing	Ok	Ok	Ok	No valid sensor calibration!
3	Door Foaming	Ok	Ok	Ok	No valid sensor calibration!
4	Cabinet Foaming	Ok	Ok	Ok	No valid sensor calibration!
5	CP storage tank	Ok	Ok	Ok	No valid sensor calibration!

7 Functional Tests

7.1 Tests according to safety matrix (QS-Group)

7.1.1 Ecomix EM 20PIS100

Test description	Reaction	Result
Failure gas sensor (wire-cut)	Level 1 (trouble)	Ok
15% gas alarm	Level 2 (warning)	Ok
30% gas alarm	Level 3(alarm)	Ok
Ecomix tank max. level	Level 4 (alarm, 3 seconds delay)	Ok
Leakage basement	Level 4 (alarm, 3 seconds delay)	Ok
Min. pressure nitrogen in tank	Level 4 (alarm, 3 seconds delay)	Ok
Failure fan flow switch	Level 4 (alarm, 3 seconds delay)	Ok
Door monitoring Ecomix safety box	Electrical power off after 2 hours	Ok
Fire alarm (thermal detector)	Electrical power off; stop fan; CO ₂ -injection Fire alarm (optical and acoustical)	Ok

7.1.2 Ecodosing ED 2-50P DS

Test description	Reaction	Result
Failure gas sensor (wire-cut)	Level 1 (trouble)	Ok
15% gas alarm	Level 2 (warning)	Ok
30% gas alarm	Level 3(alarm)	Ok
Ecomix tank max. level	Level 4 (alarm, 3 seconds delay)	Ok
Leakage basement	Level 4 (alarm, 3 seconds delay)	Ok
Min. pressure nitrogen in tank	Level 4 (alarm, 3 seconds delay)	Ok
Failure fan flow switch	Level 4 (alarm, 3 seconds delay)	Ok
Door monitoring Ecomix safety box	Electrical power off after 2 hours	Ok
Fire alarm (thermal detector)	Electrical power off; stop fan; CO ₂ -injection Fire alarm (optical and acoustical)	Ok
Failure of thermal detector (wire-cut)	Alarm on fire detection unit	Ok
Temperature alarm heat exchanger	Stop electrical heating	Ok

7.1.3 Foaming Area

Test description	Reaction	Result
Failure gas sensor (wire-cut) doors	Level 1 (trouble)	Ok
15% gas alarm doors	Level 2 (warning)	Ok
30% gas alarm doors	Level 3(alarm)	Ok
Failure gas sensor (wire-cut) cabinet	Level 1 (trouble)	Ok
15% gas alarm cabinet	Level 2 (warning)	Ok
30% gas alarm cabinet	Level 3(alarm)	Ok
Failure fan flow switch doors	Level 4 (alarm, 3 seconds delay)	Ok
Failure fan flow switch cabinet	Level 4 (alarm, 3 seconds delay)	Ok
Fire alarm (flame detector)	Electrical power off Ecodosing; stop fan; Fire alarm (optical and acoustical)	Ok
Grounding clamp (door, cabinet)	Stop (no start of) foaming (Ecodosing)	Ok

7.1.4 Tank area

Test description	Reaction	Result
Failure gas sensor (wire-cut)	Level 1 (trouble)	Ok
15% gas alarm	Level 2 (warning)	Ok
30% gas alarm	Level 3(alarm)	Ok
Leakage CP pump basement	Level 4 (alarm)	Ok
Min./max. nitrogen pressure CP tank	Level 4 (alarm)	Ok
Min./max. nitrogen pressure tank jacket	Level 4 (alarm)	Ok
Min. pressure nitrogen CP pipeline	Level 4 (alarm)	Ok
Max. level CP tank	(1x) stop machine emergency; yellow lamp	Ok
Failure (no power) max. level card	(1x) stop machine emergency; yellow lamp	Ok
Fire alarm (flame detector)	Electrical power off; Fire alarm (optical and acoustical)	Ok
Grounding clamp	Stop (No start of) filling pump	Ok

7.2 Power Failure Test

The test should verify the function and the sufficient power resources of the Emergency Power Generator located in the energy supply area of the factory.

There is one hot-standby diesel generator with automatic switching device in the main supply panel and one manual switched backup generator available.

Hot-standby Emergency Power Generator:

Type Caterpillar CAT 3406, generator data: 225 kVA, 180 kW, 324 A at 400 V 3phase

The emergency generator provides energy to the main panel in the refrigerator plant area after a time delay of 10 seconds; there has been no overload of the generator (test at weekend, no standard production).

The gas monitoring system and the fire alarm system are supplied by an uninterruptible power supply by a battery-pack in the Safety panel (2xSonnenschein A512/10S; 24 V, 10 Ah).

Test results:

No safety critical reaction after power failure, if the load situation of the generator during normal production is sufficient, Ok

7.3 Test of ESD push buttons and general alarm push buttons

At all machines and safety boxes, the function of the ESD push buttons (and the switching safety relays) has been tested. Furthermore the general alarm push buttons in the different plant areas have been tested.

The intended reaction (at the safety panels) of an general emergency shut down is an alarm, the power cut off and the switching of the ventilator fan motors to the second speed. At the Ecomix and the Ecodosing machine panels, the Isocyanate skid and at the foaming heads there are machine Emergency push buttons, which stop only the machine or the pouring cycle. Activating the general alarm causes an energy switch-off an all electrical panels and an acoustical alarm.

Nr.	Location and Type of Push button	Reaction	Result
1	ESD – CP Storage Tank Panel	Energy control circuits off	Ok
2	General Alarm – CP Tank Area	General Power Off	Ok
3	ESD general – Ecodosing	Power Off Ecodosing	Ok
4	ESD machine – Ecodosing	machine stop function	Ok
5	ESD general – Ecomix	Power Off Ecomix	Ok
6	ESD machine – Ecomix	machine stop function	Ok
7	ESD machine – Isocyanate Skid	machine stop function	Ok
8	ESD foaming head – Cabinet	stop-function pouring	Ok
9	ESD foaming head – Doors	stop function pouring	Ok
10	General Alarm – Machine Platform	General Power Off	Ok
11	General Alarm – Safety box foaming	General Power Off	Ok

Test results:

All functional tests of the push buttons led to a positive result (Ok).

7.4 Test of fire alarm and fire fighting system

The fire alarm and fire fighting system of the machines consist of a fire detection central unit, type: Notifier AM-6000 and thermal and infrared fire alarm sensors. The sensors are located in the endangered areas and have been tested within the functional test procedure of each area (see detailed test results of each area).

The intended reaction of a fire alarm is an acoustic alarm; the employees should be trained to leave the building coordinated through the emergency doors to designated points outside the building.

Test results:

The functional tests of the fire alarm sensors caused acoustical alarms; (Ok).

7.5 Test of fire safety valve (located in CP-piping at building entry)

The fire safety valve closes in case of an alarm (ESD, General alarm, max. level tank Ecomix, leakage etc.), Ok

7.6 Test of fire extinguishing equipment

The water supply for fire fighting purposes in the whole factory is provided by a fire water line and hydrants. The water is pumped out of a water basin (app. Size: 8m x 6m x 4,5m \approx 200 m³) by a manually started pressure pump (type Rosenbauer with diesel-engine) to the hydrants. The general fire water supply is working with a pressure of about 3 - 4 bar (acc. to company information, no manometer on pump); this is sufficient for fire fighting in a distance of more than 10 meters.

The performed test concerned the function and the efficiency of the fire hydrants (general fire water line) and the pressure pump. Generally it can be mentioned, that the fixed fire fighting system is working sufficiently for the intended purpose, Ok.

Additionally there are fire extinguishers located close to the endangered areas (for details see report).

In the factory close to the foaming area there is a manually opened fire fighting water line with minimum pressure detection. The minimum pressure alarm causes a general alarm of the foaming equipment (power off), Ok.

Table of Used Measurement Equipment:

Product Name	Type of Equipment	Inventory
NORMA Unilap 100	Electrical Safety Meter	E-W/SC41
NORMA GEO X	Earthing Meter	E-W/ER20
Testotherm Testo 452	Climatic measurement	E-W/KP03
Draeger Multiwarn II BEP	Portable gas detection	E-W/GA04

All equipment used for measurement during the inspection visit had a valid calibration certificate either referenced to a calibration standard or being calibrated before use (gas detection equipment).

The accepted measurement tolerances are kept within the documented limits of the products.

Issued by:

Thomas Burger

Date:

02. February 2005

CERTIFICATE OF FINAL ACCEPTANCE TEST

Customer : **UNIDO**
P.O. Box 300
A-1400 Vienna – Austria

Purchaser : **SHERKAT MOHANDES MOUSA BAHAR (ZAGROSS 2)**
16TH KM KARAJ SPECIAL ROAD
TEHRAN IRAN

Supply : **Phasing-out CFC-11 in the Production of refrigerators**
and freezers at ZAGROSS II COMPANY

Contracts : **Subject: MP/ IRA/97/197 –**
Contract No. 98/016

QS-GROUP/Plastic : **N 16**
Division reference

From 05-01-05 to 28-01-05 c/o **ZAGROSS II**, our technicians
TROMBINI FABIO / FRANCHINO ROCCO have finished
the commissioning and have effected the final test of the following plants:

Starting from 25-01-05 the plants have successfully started to produce with the components and raw materials that were in the factory.

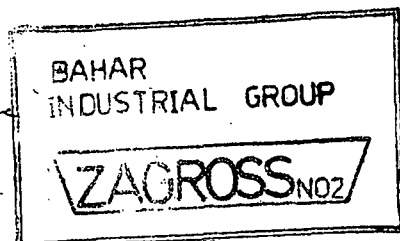
During the assembly and the final start-up of the plants, the necessary training for operators, maintenance people and safety team was done by Perros specialist H. GHIAIB, Mr. RAZI, M.S. UAYERI.

QS-GROUP/ Plastic Division

Franco Fabiani
Fabio Trombini
Rocco Franchino

ZAGROSS II COMPANY

Homer Ghiaib
Abbas Razi



شماره ۱۹۱۷۳۵ سری /



رستم خدادادی، مترجم رسمی زبان انگلیسی، دادگستری جمهوری اسلامی ایران

تهران، خیابان انقلاب، نیش فروردین، پلاک ۱۴۴۸، طبقه دوم

دارالترجمه رسمی پارسا (شماره ۱۳۱) : تلفن: ۶۹۵۲۸۱۱ - ۱۲

R. KHODADADI, Eng. Lang. Translator to the Ministry of Justice of I.R.I.,
No.: 1448-2nd fl., Enghelab Ave., Corner of 12th Farvardind st., Tehran, Tel.: 6952811-12

شماره دفتر مترجم

جمهوری اسلامی ایران
وزارت دادگستری



OFFICIAL TRANSLATION FROM PERSIAN

EMBLEM
ISLAMIC REPUBLIC OF IRAN
MINISTRY OF LABOR AND SOCIAL AFFAIRS
STATE ORGANIZATION OF TECHNICAL & VOCATIONAL EDUCATION

CERTIFICATE OF TECHNICAL & VOCATIONAL SKILL

Certificate No.: 4501
Issued on Jan. 25, 1994
Standard No.: 8-71/2
Examination date: Oct. 7, 1993

Photo of holder affixed & sealed

This is to certify that **Mr. Mohammad Hossein Baghchi**, s/o Gholamhossein, ID Card No. 3 issued at Karaj, born in 1958, participated in and succeed to pass examination according to 2nd grade standard in the field of **Gas Piping**.

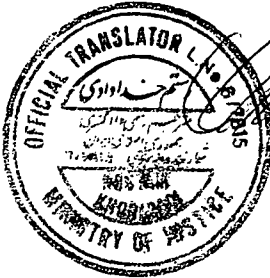
For: Ahmad Ali Mokhtari
Director - General of Technical & Vocational Education of Karaj District : Signed .

For: Ahmad Lahoutian
Director, Office of Examination, Supervision, Follow up & Evaluation: Signed & sealed

True translation certified.

Tehran, Jan. 25, 2005

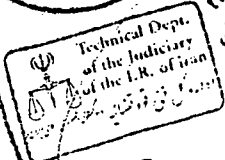
SZ/H/Govahi



Khodadadi

(X)

The authenticity of
the seal & signature
of the official translator
marked (X) is certified
without any consideration
of the contents



2





جمهوری اسلامی ایران

وزارت کار و امور اجتماعی

سازمان آموزش فنی و حرفه‌ای کشور

شماره گواهینامه ۷۰۹۰۹

تاریخ صدور ۷۲/۷/۸۰

شماره استاندارد ۸-۷۶/۲

تاریخ آزمون ۷۲/۷/۱۰

گواهینامه مهارت فنی و حرفه‌ای

گواهی می‌شود آقای محمد حسین باغچس فرزند غلامحسین

شماره شناسنامه ۳ صادره از ۱۳۳۷ متولد سال ۱۳۳۷

طبق استاندارد درجه دو رشته سوله کشی گسار در آزمون شرکت

و موفقیت حاصل نموده است.

امضاء و مهر سازمان

مدیر دفتر آزمون، نظارت، پذیرش و ارزشیابی

احمد علی حسینی

مدیر آموزش فنی و حرفه‌ای منطقه کرج

Document of non destructive testing (Pneumatic testing) of cyclopentane pipe.

This is to Declare that the cyclopentane pipe consisting of approximately 150 meter of 0.75 inch pipe of 2.5 mm thickness pipe located in Zagross company connecting the cyclopentane storage tank to Ecomix box, has been tested with Nitrogen gas at pressure of 8 bar for the period of 24 hours, there was no decrease in pressure at the end of test period

H.Ghiaie

10.01.2005

Hous. Ghiaie

Mr. Riazi

Abbas Riazi

From : Zagross

To:QS group

We the undersigned declare that we have had the training limited by the time span for the cyclopentane foam injection plant from 21.01.2005 to 26.01.2005.

Mr. Riazi

Abbas Riazi

Mr.Ghiaie

Homer Ghiaie

Ms.Nayeri

M.N

RAPPORTO INTERVENTO / INTERVENTION REPORT

(Per assistenza tecnica)

Mod. 4UP

CLIENTE ED INDIRIZZO/Customer and address:

N: 16

ZAFROS

(IRAN)

NS. COMMESSA/Work order

N 16

INTERVENTO N/Service n

DEL/Of

3-1-05

TECNICO/Engineer:

NOMINATIVO/Name:

FABIO
TROMBINI

INTERVENTO RICHIESTO DA
Job required by

NOMINATIVO/Name:

IMPIANTO/Plant

DESCRIZIONE/Description:

DATA/Date

MATTINO/A.M.

INIZIO
From

FINE
To

POMERIGGIO/P.M.

INIZIO
From

FINE
To

ORE/Hours

LAVORO
Working

VIAGGIO
Travel

KM AUTO
Mileage

SPESE VIAGGIO
Journey/expenses

	DATA/Date	MATTINO/A.M.		POMERIGGIO/P.M.		ORE/Hours		KM AUTO Mileage	SPESE VIAGGIO Journey/expenses
		INIZIO From	FINE To	INIZIO From	FINE To	LAVORO Working	VIAGGIO Travel		
M	04-1-05			18.30	4.30		10		
M	05-1-05			12.00	20.00	8			
Q	06-1-05	07.00	12.30	13.00	19.00	11 1/2			
U	07-1-05	07.00	12.30	13.00	19.00	11 1/2			
S	08-1-05	08.00	12.30	13.00	18.00	9 1/2			
D	09-1-05	08.00	12.30	13.00	18.00	9 1/2			
L	10-1-05	07.00	12.30	13.00	19.00	11 1/2			

DESCRIZIONE LAVORO / Job executed:

START UP FOAMING PLANT - OK
TEST FOAMING - OK
FINAL TESTS OF THE PLANT - OK
TO SUPPLY THE TUV CERTIFICATIONS - OK

PENDING POINTS ARE AS FOLLOWS:

- 1 - COMPLETED AS BUILT PLANT'S FLOW DIAGRAM
- 2 - COMPLETED AS BUILT PLANT'S ELECTRICAL, ELECTRONIC & CONTROL DIAG.
- 3 - SPARE PART USED DURING THE COMMISSIONING (0-10 BAR ISO GAUGE)

IL RICHIEDENTE DICHIARA CHE IL LAVORO È STATO ESEGUITO A PERFETTA OPERA D'ARTE E CONFORMEMENTE ALLE DICHIARAZIONI DATE AL TECNICO
The undersigned (customer) certifies that the job has been carried out positively, in conformity with the contract

SEGUE FATTURA/Invoice:

Y

N

LAVORO FINITO / Job completed

LAVORO NON FINITO / Job not completed

DESTINATARIO DEL SERVIZIO SIG.

Customer

Honar, Ghiaie
MR. ABGHIAIE

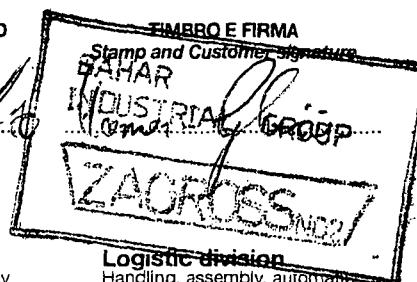
RESPONSABILE INTERVENTO

Engineer

Fabio Trombini

TIMBRO E FIRMA

Stamp and Customer signature



DATA E FIRMA

Date & signature

28-01-05

Metal sheet division

Metal sheet processing technology
Factory: Cerreto d'Esi (AN)
Tel. +39 0732 67081
metalsheet@qs-group.com

Plastic division

Plastic processing technology
Factory: Abbiategrosso (MI)
Tel. +39 02 9401821
plastic@qs-group.com

Logistic division

Handling, assembly, automatic
warehouse, AGV
Factory: Pavia (PV)
Tel. +39 0382 575601
logistic@qs-group.com

Electronic division

Test devices, industrial software
applications
Factory: Cerreto d'Esi (AN)
Tel. +39 0732 67181
electronic@qs-group.com