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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

22093

cannon polyuretane technology	DOC N.	CR98/101
	Object	Phasing out of CFC's at SILTAL/EGYPT
	Contract	UNIDO N. 96/035

FINAL REPORT

RETROFITTING OF THE REFRIGERATOR CABINET AND DOOR FOAMING PLANTS FOR THE REPLACEMENT OF CFC WITH CYCLOPENTANE AS BLOWING AGENT

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C					
B					
A	11/12/98	FIRST ISSUE	M. BARALE		
Rev.	Date	Description	Prepared	Controll.	Approv.

1. INTRODUCTION

With the present document The Contractor wants to describe the works performed at the plant site for the conversion of the Islamic Company for Industrialization SILTAL to phase out the use of CFC11 in the production of Domestic Refrigerators and Freezers.

Here below it is briefly summarised the activities performed under the Contract step by step according to The terms of Reference

2. LAY OUT OF THE PLANT /REDISIGN OF EXISTING (STEP 1 OF THE TERMS OF REFERENCE)

After the award of the order the Contractor visited the Counterpart between May 24th and 30th 1996 in order to verify the conditions of the site and to identify the best engineering solutions for the conversion of the existing foaming lines.

During the visit, the Contractor discussed and checked with the Counterpart the following main subjects:

A - Technical details regarding the supply of the equipment; in particular The Contractor emphasised the Premix Units, the Polyol and Isocyanate Modules, Safeties of the plant (as i.e.: gas sensors, exhaust system with fan groups), cyclopentane storage tanks and relevant accessories .

B - The suitable site where the new equipment had to be installed and the required modification to the new layout.

Regarding the C5 storage tanks, The Contractor inspected and defined the area where it had to be positioned.

After the visit the Contractor prepared the first progress report including the preliminary lay-out and the Basic requirements and specifications for the site Preparation.

The first progress report covered all the subjects listed during the discussion and gave to the Counterpart, as much as detailed as possible at that phase of the project, a list of all the works and materials to be provided by them.

3 REDISIGN OF EXISTING EQUIPMENT/ AWARD OF SUBCONTRACT FOR MODIFICATION OF THE PLANT(STEP 2,3 OF THE TERMS OF REFERENCE)

In December 1996 the Contractor provided the Final Technical Documentation for the Conversion of the plant.

The above mentioned documentation included the following kind of detailed drawings and specifications:

- civil works for the storage tank and foaming lines
- grounding of the equipment
- piping arrangements and support details
- piping sketches
- box building construction
- ventilation construction
- cable run lay-out
- gas sensor positioning
- electrical drawings
- safety requirements

All the documentation was discussed with the Counterpart and some modifications have been agreed during the next period.

4. DELIVERY OF EQUIPMENT/INSTALLATION (STEP 4,5 OF THE TERMS OF REFERENCE)

In July 1997 all the new equipment have been shipped.

A team of engineers attended the training at Contractor site (abroad) in February 1997

The installation started in November 1997 , after the customs clearance of all the equipment.

The Contractor engineers followed the installation phase with the supervision of the job at Counterpart charge.

The Contractor's actions basically concerned the following zone of the modified plant:

- Cyclopentane storage tank area
- Wet area
- Process fluid connection piping between wet and dry area
- Cabinets /doors foaming area

The installation phase was completed in February 1998

5. COMMISSIONING. TRIAL PRODUCTION OF THE FIRST MODELS, TEST RUN OF PRODUCTION(STEP 5,6,7)

After the installation phase the Contractor performed the Commissioning phase of the modified plant in accordance with the contract.

On March 5th 1998 the commissioning phase has been completed and the Counterpart signed the Commissioning Acceptance of the project.

The training on the job activities has been carried out during the commissioning phase

The commissioning , trial production and test run phases mainly concerned the following operations:

- Pneumatic and Electric circuit check
- Grounding check
- Flushing of the tanks and the piping with nitrogen
- Pressure test
- Check of the operating sequences
- Operating test
- Service simulation test
- Setting start-up parameters
- Foaming quality check
- Performance test

The training on the job activities has been carried out during the commissioning phase.

6. SAFETY CERTIFICATION (STEP 8 OF THE TERMS OF REFERENCE)

The safety inspection has been performed in April and July 1998 by TUV ULM ; Enclosed please find the final commission report, the letter of the TUV inspectors and the confirmation of the last pending points by the Contractor and the Counterpart.

TUV will issue the safety certificate within January 1999

7. STARTING MASS PRODUCTION AND POST CONTRACT MONITORING(STEP 10,11 OF THE TERMS OF REFERENCE)

After the commissioning phase and during the next sixth month the Contractor visited the Counterpart to check and to monitor the performance of the plant.

TÜV
ANLAGEN UND UMWELT

Niederlassung Ulm

Benzstraße 17
89079 Ulm

Telefon (07 31) 49 15-2 28
Telefax (07 31) 49 15-2 60

Ulm, 1998-11-16
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UL-AW/BT-E / RI-Ma
File No. SILTAL-EG/01/98
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Final Commission-List

on Technical Plant Inspections and Evaluations

SILTAL10th of Ramadan City / EGYPT

Plant Location:	**SILTAL** **Islamic Co. For Industrialisation** **10th of Ramadan City** **EGYPT**
Responsible / Experts:	**Dipl. Ing. Richardt, TÜV-AW** **Dipl. Ing. (FH) Mack, TÜV-BT-E** **Companygroup TÜV Süddeutschland**
Project	**UNIDO Contract No. 96 / 035 with Cannon Afros** **Order No.: 98 023 2143-1** **Order No.: 98 024 3220-4**
Dates:	**17th and 19th April 1998** **- Plant inspections and evaluations on location** **23 July 1998 - Final plant inspection** **April 1998 - Preparation of commission list** **- Meeting on Bono Sistemi** **October 1998 - Preparation of Final Commissions list**
Participants on location:	**- Mrs. Barale - Bono Sistemi** **- Mr. Garois - Cannon France** **- Mr. Hosny - Siltal** **- Responsible Persons of Siltal**

	Responsible		
	CAN	SILT	Remark (July 1998)
1. Unloading station / pentane storage tank			
1.1 Unloading station			
1.1.1 Basin			
The place where the drums will be unloaded must be constructed as follows:		X	has been done but the installed pipe must be removed otherwise the basin us useless
a) The place must be designed as a basin with a capacity of min 0.2 m^3.	-	-	has been done
b) The floor must be tight against pentane (concrete), cracks must be less than 0,1 mm wide.	-	-	has been done
c) Remark Drain trays for rain water are not existing inside the basin.	-	-	
1.1.2 Filling Pump			
a) The existing pump is not suitable for the requested pressure and will be changed.	-	-	a pneumatic pump will be used
b) The pump must be included in the switch-off-system of max. and supermax level	X		must be realised
c) The clamp for earthing the drums is still missing.	-	-	has been done

	Responsible		
	CAN	SILT	Remark (July 1998)
1.2 Pentane storage tanks			
1.2.1 Basin			
a) The drain tray in the basin must be removed		X	must be done
b) The breakthrough of the walls must be removed and the holes must be tight		X	must be done
c) The cables of the earthing system must be fixed finally.		X	
1.2.2. Tank			
a) The tank must be fixed on the floor	-	x	has been done
1.2.3 Pipe			
a) The pipe was designed as a high pressure pipe. The relief valve in the feeding line is only suitable for max 10 bar. It must be changed against a high pressure valve	-	-	has been done
b) The valve (automatic fire safe valve) in the pipe before the building is a return spring valve. The second pressure air connection is to remove. It must be fail safe.	-	-	has been done
- The valve should be protected against high temperature of sunshine		X	must be done
- For a final evaluation concerning leakage proof the specification is necessary	-	-	is available
c) The valves in the filling and in the return line must be both open or closed in the same time. A mechanical connection between the both valves must be installed.	-	-	has been done

	Responsible		
	CAN	SILT	Remark (July 1998)
1.2.4 Roof The sharp border of the roof must be protected	-	-	has been done
1.2.5 Labels: All electrical and mechanical devices must be labeled according the drawing.	-	-	has been done
1.2.6 Control panel			
a) The corrant supply for the control panel should come from the alarm panel, otherwise a over-voltage protection for this panel is necessary.	X	-	must be installed
b) The electrical devices must be identified in accordance with the plans.	-	-	has been done
c) The hand-/ automatic-switches of the pneumatic valves must be secured against unauthorized handling. The switch must be covered additional and a following label is necessary: „Attention, safety equipment. Changes are only allowed by authorized persons.	X		the switches will be covered
d) The signal lamp of the power supply is not recognizabel because of the sun-light. A protection is necessary.	-	-	now acceptable
e) Lamp test	X		it was not possible to test the lamps
1.2.7 Emergency switch The emergency switch must be installed inside the C-5 area.	X		must be installed

	Responsible		
	CAN	SILT	Remark (July 1998)
1.3 Fire fighting system			
a) The pressure vessel of the sprinkler system must be marked. (Producer, max pressure, construction year, volume)		X	The used paper is not readable, a metal sheet should be used
b) The pump of the sprinkler system will be tested each week.		X	Instruction must be prepared
c) The pressure vessel including the pump and the valves in the pipes will get an enclosure (cabin or room). The valves in the pipes can not be closed by unauthorised people.	-	-	has been done
1.4. Organisation			
a) The operator instruction of the unloading process is missing		X	must be installed
b) The warning signs(Ex-area, no smoking, inflammable liquid, c-5-safety datasheet)		X	
c) The operator instructions of the handling for the empty drums is missing.		X	
1.5 Grounding system The cables of the earthing system must be fixed finally.	-	X	This must be done/ controlled regularly

	Responsible		
	CAN	SILT	Remark (July 1998)
2 Wet-part for door and cabinet			
2.1 Equipment			
a) Supermax The supermax sensor can be evaluated after the documentation is available	X	-	a modul is available the documentation will be transmitted by Mr. Corti
b) High pressure pump Following proof according to high pressure is necessary: How much is the max. pressure of the pump? The pump hasn't inside a overflow valve to limit the pressure?	-	-	The pressure gauge is only adjustable till 300 bar, a stop-page has been installed.
Remark: The pressure gauge after the high pressure pump is adjustable till 400 bar. The system is designed for max 300 bar.	X		A label with the setpoint will be installed
c) Pipe The c-Pentane pipe before the Easyfroth must be fixed before the enclosure.	-	-	has been done
d) Control panel The wires and clamps of the EEx-i electric circuits concerning relays N 970 and 971 are not installed separately from the other wires.	-	-	has been done
The thermostat of the tank-heater must get a safety label.			

	Responsible		
	CAN	SILT	Remark (July 1998)
2.2 Enclosure b) The electrostatic transparent plastic material can get a too high electrostatic charge (plain window: 350KV/m; ripped window: >1000 KV/m) Suggest: On the inner side of the windows should be mounted a grounded metal screen. c) Remark High of enclosure The upper parts of the devices are bad accessible to maintenance and regularly checks.		X	must be done
2.3 Lamp above the wet part The installation of the lamps must be in a professional condition.		X	must be done
2.4 Pentan emergency push button In the wet part area should be installed a pentane emergency push button.	-	-	has been done
2.5 On the junction box outside the enclosure the number according to the drawing is missing.	X		must be done
2.6 In case of N_2-min contact no function works.	X		The new delivered unit does not work
2.7 The thermostat of the tank-heater must get a safety label.	X	-	setpoint must be marked

	Responsible		
	CAN	SILT	Remark (July 1998)
3. Dry Part			
3.1 General			
a) Electrical resistance of the floor The electrical resistance for the derivation of the electrostatic charge is to high (>10^8 Ohm has to be measured).	-	-	has been changed
b) Enclosure The transparent plastic material can get a too high electrostatic charge (plain window: 350KV/m; ripped window: >1000 KV/m) Suggest: On the inner side of the windows should be mounted a grounded metal screen	-	-	has been done
c) Junction boxes On the junction boxes the numbers according the drawing are missing.	X	-	must be done

	Responsible		
	CAN	SILT	Remark (July 1998)
3.2 Door plant			
a) The electrical heating system for the moulds isn't finished.		X	
b) The transformer (380/110 V) for the mould heating system must be connected with the technical heating system.		X	siltal will give a solution
c) The power of the electrical heater must be disconnected before and during the pouring.		X	
d) The plastic film in the moulds can get a high electrostatic charge and is not suitable for pentane process.	-	-	paper will be used
e) The cable channel to the control panel outside the enclosure must be gas tight on the entrance of the enclosure.	-	-	made by glas wool
f) The leakage monitoring system did not cause any function.	-	-	has been done
3.3 Cabinet plant			
It the switch is in the position „manuell open" during the foam rise time the function „open the moulds" must be blocked. An electrical bolt is necessary.	X		must be confirmed

	Responsible		
	CAN	SILT	Remark (July 1998)
4. Safety panel			
a) Type plate The typplate of the panel maker is missing		X	must be fasten
b) Overvoltage No overvoltage protection has been provided.	-	-	has been done
c) 1st-alarm-level The function of the 30% gasalarm is not running direct via the safety relays The relays between the circuits are not safety relays.	-	-	has been done
d) Battery The capacity of the battery is calculated approximately for 10 min. This is only possible when the normal power supply for the safety panel is interrupt and in this case the backup generator starts automatically.	-	X	The backup generator works
Presently the generator starts only in case of interrupt of the main power supply.		X	The generator must also deliver the safety panel in case of an interrupt of power for Control panel
The type plate of the battery is missing. (Capacity, data of first charging, type) The battery charging device presently isn't in function.	-	-	has been done
e) The electrical drawing must be brought up to date.	X		
f) Transformer T 40 and 24-DC The minus-wire of the secondary circuit is not grounded.	X		must be done
g) Gasmonitoring The centre of the gas alarm system has not been marked concerning the sensor position.	-	-	has been done

	Responsible		
	CAN	SILT	Remark (July 1998)
h) Pilz safety relays On the clamp with the ground sign has no ground wire connected. (Final evaluation after documentation is available)	-	-	DC is used
i) Timer relays The setpoints of the relays of alarm level increasing must be documented and marked.	X		must be done
j) Alarm definition The colour and the sound of the different alarm levels have to be defined and marked on a board near the safety panel.		X	hase been transmitted by Bono but was not installed
k) For some connections clamps the numbers according the drawing are missing.	-	-	has been done
l) In front of the panel a lamp which is supplied of the back up generators is necessary.	-	-	The generator is audible
m) For the acoustic alarm signal (sirene, horn) should have a possibility for reset.	-	-	has been done

	Responsible		
	CAN	SILT	Remark (July 1998)
5. Ventilation			
a) Flow sensor The different pressure for all flow switches must be measured. According to the result the right spring must be installed and the system has to be adjusted. The result must be documented. All flow switches must be marked according the electrical diagram.	X		The suitable pipes were not available
b) Earthing The ducts must get a ground connections to the metal construction of the building near the roof (lightning protection).		-	has been done
c) 1st alarm lead In 1st alarm lead the ventilation did not in crease automatically in the high speed. The assign of the wetpart and drypart are confused.	-	-	has been done
d) Effectiveness of fan The effectiveness of the ventilation in the area of the jigs must be improved.	-	-	is efficient
e) Fixing The channels of the ventilation system must be fixed finally.	-	X	must be done
f) Compensators The compensators between the ducts must be bridged with wires.	-	-	has been done
g) The flow switches must get a number according the drawing.	-	-	must be done

	Responsible		
	CAN	SILT	Remark (July 1998)
6 Inertisation			
a) Remark: The Nitrogen generator is missing. Presently N2-bottles will be used.	-	-	is available
b) The valve near the tank in the entrance pipe can be closed without causing any function. That valve is not necessary and must be removed.			the inertisation system was well installed but the new flowmeter was not installed.
c) The vessel must be fixed on the floor.		X	The function could not be tested.
d) The function of the flow meter is not clear.	X		
e) How to get the right amount of N2 is not clear. A fixed relation between the size of the cabinet and the N2 amount should be realised within the PLC-program.	X		A Confirmation from Cannon is necessary.
f) Presently it is possible to pour the form without N2 before. That function should be only possible by using a code for the PLC.			
g) After the system is finished the O2-concentration should be measured inside the cabinets.			
h) The position control sensor has not been installed.			
i) According to our measurements inside the cabinet the amount of N2 had been to less. (O2 about 16%)	X		
j) In case of wire interruption in the flow switch circuit the fault function is missing.	X		
k) The system must be calibrated regularly. For that reason suitable plastic bags must be available.		X	Must be done

	Responsible		
	CAN	SILT	Remark (July 1998)
7. General			
7.1 Pentane emergency push buttons			
a) The housing of the pushbuttons should not be red (according to the international standards this colour will be used for fire alarm push buttons) Housings in yellow colour and additional marking „Pentane Emergency" is recommended.	-	-	has been done
7.2 EEx-i cables	X		must be done
a) Cables of EEx-i and not EEx-i-circuits are used with blue colour. A differentiation is therefore not possible. Following solutions can be recommended: - Using of blue cables only for EEx-i circuits - Using of normal cabels inside a particular cable tray. This cable tray must be marked (EEx-i) along the whole way.			CANNON will confirm the discussed solution
7.3 Back up-generator			
a) The generator is not availabel. The TÜV inspection of this part will be done during the final inspection.	-	-	is in function
b) A signal of a defect of the generator plant must be transmitted to the security room.		X	A signal will be transmitted when the generator is running
7.4 N2-Generator The Generator wasn't available The check will be done during the final inspection.	-	-	is available including pressure vessel 1000 l / 11 bar

	Responsible		
	CAN	SILT	Remark (July 1998)
7.5 Fire fighting system			
In the areas of the wetpart and drypart automatic smoke sensors will be installed.	-	X	not connected temperature sensors will be installed
7.6 Marking / Covering			
a) Pipes The pipes must be marked according to the materials which are inside (Colour, flow direction)		X	must be done
b) Pressure Ganges The min and max setpoints must be marked	X		must be done
c) Timer relays The setpoint must be marked.	X		must be done
d) Pressure air valve The manual switch to charge the position must be covered and marked.	X		must be done
e) Relays Relays with N0 and N0-switches need a safety label	X		must be done
f) Thermostat The setpoint must be marked and the covering secured by a seal.	X		must be done

	Responsible		
	CAN	SILT	Remark (July 1998)
7.7 Storage for pentane drums			
A new storage room has been build.		X	The room was not finshed
Following request are necessary:			
a) To close all walls to the next room.			
b) Build a basin for about 10 % but min for the volume of one drum.		X	
c) Installation of a technical ventilation.		X	
d) The transport of the pentane must be safe and operator instruction are necessary.		X	
e) The Polyol but especially the Isocyanate must be storaged separately.		X	
f) Installation of signs for references and danger.		X	
g) Operator instruction for - transport - work with waste pentane - general storage - work during an emergency situation are necessary		X	
h) Installation of smoke sensors will be done. The signal will be transmitted to the safety guard room.		X	
7.8 Remate panel in security room			
a) The plan about the actions in case of an alarm must be made.		X	must be made
b) The signal lamp of the power supply is not recognisable because of the sun-light. A protection is necessary.	-	-	is efficient

	Responsible		
	CAN	SILT	Remark (July 1998)
7.9 Signs on the plant			
Following signs should be available: – Emergency exit – Fire- and Explosions danger – Safety data sheets of the Pentan, Polyol and Isocyanate must be available on the plant.		X	must be completed
7.10 Refrigerator			
The refrigerator must be signed an the back with „pentane“.		X	will be done
7.11 Earthing system			
Connections with large metal structures (e.g. gas lines, water lines, building structures) are required for a good potential equalisation it's recommended to use bars to the connection of these cables.	-	-	has been done

	Responsible		
	CAN	SILT	Remark (July 1998)
8. Documentation			
8.1 Storage area			
a) The documentation of the level control- /super max system has to be submitted.	-	-	
8.2 Wetpart			
a) The documentation of the level control and super max system has to be submitted.	X		TÜV has model The documentation will be submitted by Cannon
8.3 Inertisation			
a) The certificate about the safety relief valve on the vessel is missing.	-	-	is available
b) The specification of the position control system of the mixing head ((maker : Elobau) has to be available.	X		will be transmitted
8.4 Gasalarmsystem			
a) Calibration report for the gas sensors has to be submitted	-	X	is available must be done regularly
8.5 Measurements and Protocols			
a) Test and measuring reports for the electrical equipment in accordance with IEC 204-1	X		must be confirmed CANNON (electrical control board) SILTAL (Field Electric connection)

	Responsible		
	CAN	SILT	Remark (July 1998)
8.6 Safety-related organisation			
a) The operators and the personnel responsible for maintenance must be well trained in the plant technology of Bono Sistemi, proof of regular training must be provided.	X	X	must be done
b) An instruction manual must be provided for the operator and the maintenance personnel; maintenance equipment (e.g. antistatic clothes, tools, personal safety equipment) must be suitable for pentane.	X	X	must be done
c) A safety function matrix must be prepared; all safety-relevant functions must be tested and documented by well and regularly trained personnel (at least once a year) in accordance with this checklist.	X	X	must be done
d) A coordination between the company and the official authorities (fire brigade, civil defense) is necessary; the results must be documented.	-	-	no special demands are required
e) For emergencies, an alarm plan must exist which has been coordinated with the fire brigade and the civil defense authority.		X	must be done
Function matrix of all safety-related functions and report showing that all functional tests have been performed			

		Responsible		
		CAN	SILT	Remark (July 1998)
9	**General**			
	a) The following documents must still be finalised: Flow diagrams of the facilities Wiring diagrams	X		must be done during start up
10	**Conclusion**			
	The facilities for pentane operation had not yet been completed at the time of the TÜV audits. Overall, the safety concept agrees with the TÜV safety strategy. A complete audit of all safety-related aspects (such as inerting, ventilation after completion of the enclosures) was not yet possible.			The most important safety equipment has been installed and tested. All demands in this report must be fullfilled till start up. After start up the completion of all demands of this report has to be confirmed by Bono and Siltal in a written letter to TÜV .
	In the opinion of the TÜV experts, it would be safe to start trial operation with pentane after completion of the various measures stipulated in this Commission List and all work still to be completed on the facilities.			After the confirmation a certificate will be issued. A further inspection is not necessary at this time.
	Pentane trial operation means that in the 1st phase the plant may only be operated under the supervision of experts and that in the 2nd phase operation must be constantly monitored by specially trained personnel.			

The TÜV experts

K. J. Richardt

E. Mack