



**TOGETHER**  
*for a sustainable future*

## OCCASION

This publication has been made available to the public on the occasion of the 50<sup>th</sup> 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

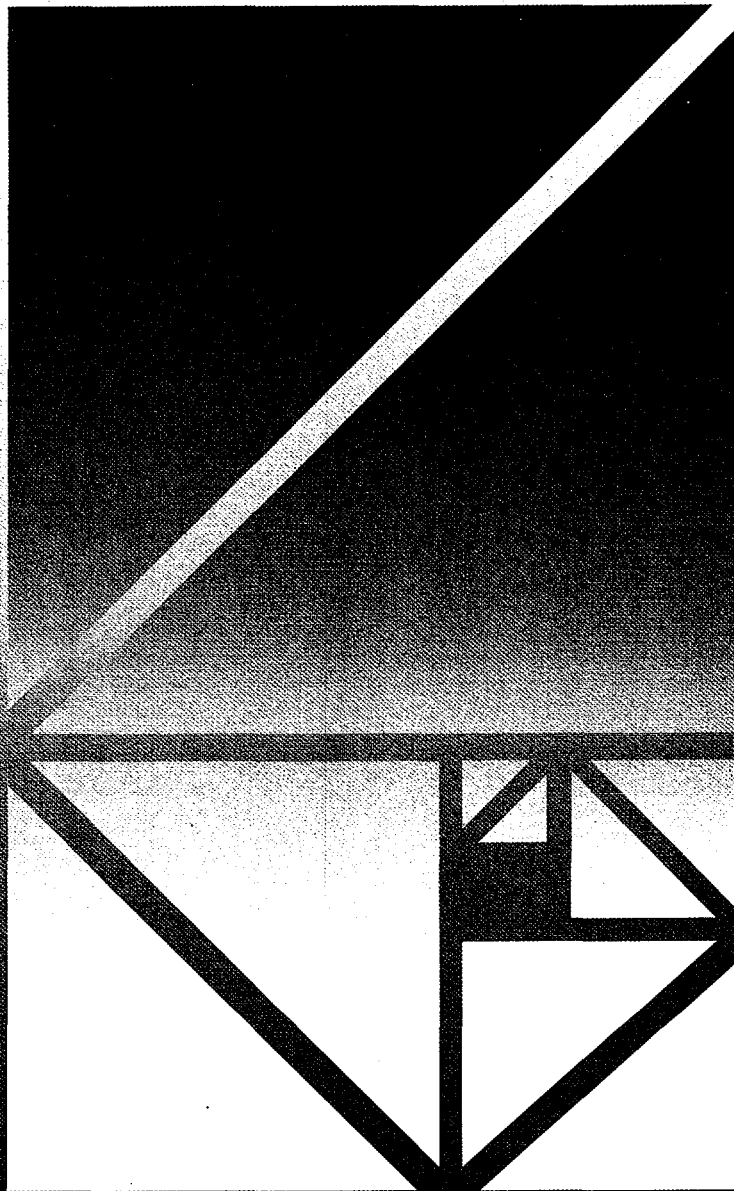
Please contact [publications@unido.org](mailto:publications@unido.org) for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at [www.unido.org](http://www.unido.org)

22201

# **PERROS**

## **INDUSTRIALE**



**PROGRESS  
THROUGH  
ECOLOGY**

**UNIDO PROJECT NUMBER MP/IRA/96/041  
CONTRACT NO. 96/115**

**PHASING-OUT ODS AT THE REFRIGERATOR PLANT OF  
LORESTAN REFRIGERATOR MANUFACTURING Co.,  
TEHRAN, IRAN**

**FINAL REPORT**

**Report covering all activities as per steps 11 through 13**

**of**

**Terms of Reference**


**including the safety statement of the equipment made by TUV Germany**

## INTRODUCTION

This final report include the following document:

- "CERTIFICATE OF ACCEPTANCE" signed up by the representative of LORESTAN REFRIGERATION MANUFACTURING INDUSTRIES and Perros People after starting up the mass production of refrigerators made from 7<sup>th</sup> April to 9<sup>th</sup> May 1999.
- Here attached is also the safety statement of the equipment made by TUV Germany.

**PERROS INDUSTRIALE S.p.A.**

  
-----

**G. BOSSI**  
Project Engineer

## CERTIFICATE OF FINAL ACCEPTANCE TEST

Customer : UNIDO  
P.O. Box 300  
A-1400 Wien  
Austria

Consignee : LORESTAN REFRIGERATOR MANUFACTURING INDUSTRIES  
N° 12 Azady Alley  
Parsa St., Motahari Ave.  
Tehran 15447 - IRAN

Supply : High pressure foaming machine and equipment for the use of Cyclopentane

Contract : UNIDO n° 96/115/ML

Perros reference : L33

From 07/04/99 to 09/25/99 c/o LORESTAN REFRIGERATOR MANUFACTURING INDUSTRIES, our technicians Mr. Casadei and Mr Romanini have finished the commissioning and have effected the final test of the following plants:

1. Ecodosing 2-50 DS-P
2. Ecomix 20P-100
3. Cyclopentane storage
4. Polyol storage
5. Safety systems

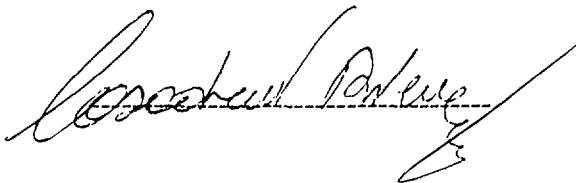
Starting from 03/05/99..... the plants have successfully started to produce with the components and raw materials that were in the factory.

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.

Perros confirms its availability for supporting LORESTAN REFRIGERATOR MANUFACTURING INDUSTRIES to solve the pending problems mentioned on the attached minutes of commissioning (see additional notes/remarks below).

PERROS INDUSTRIALE SPA

LORESTAN REFR. MANUF. INDUSTRIES



A-DARVISH  
Date 09/25/99

Notes/remarks

تاریخ تحویل نهایی  
کارخانه  
تاسیس ۱۳۵۷

**TÜV**

ANLAGEN UND UMWELT

TÜV Anlagen- und Umwelttechnik GmbH · Benzstraße 17 · D-89079 Ulm  
 Unternehmensgruppe TÜV Süddeutschland

PERROS INDUSTRIALE SPA  
 Mr. Brianzoni  
 Technical Manager  
 Strada per Cassinetta, 6

I - 20081 Abbiategrasso (Milano)

Niederlassung Ulm

Benzstraße 17  
 89079 Ulm

Telefon (07 31) 49 15-2 08  
 Telefax (07 31) 49 15-2 60

Seite 1 von 5

Ihre Zeichen/Nachricht vom

Unsere Zeichen

Tel.-Durchwahl

Fax-Durchwahl

Datum

AW/ka

0731/4915-208

0731/4915-260

26. Oktober 1998

Richardt

K:\AW\RICHARDT\98\_DATE\PERROS\BF2\_BRIANZONI.DOC

Dear Mr. Brianzoni,

according to your request I enjoy to confirm following:

### 1. Background

TÜV-Süddeutschland  
 Branch Ulm  
 (following referred as TÜV)

has gained experience with safety engineering and certification for refrigerator and foam industries in many countries of the world. In conjunction with the progressive change-over to combustible blowing agents (Pentane, Pentane-Butane-blend) the experts of the Ulm branch of TÜV have used existing standards and developed together with experts of the PU field from engineering companies, plant producers, refrigerator producer and international organisation a safety strategy.

One part of the safety strategy is a safety evaluation of components of the PU plants and of all safety related parts of the plant.

All safety evaluations by the TÜV experts are based on International, European, German and particular national standards. The experience gathered with plant inspections and through evaluation of solutions based on measurements and the investigation of accidents since the start of plant conversion in 1992.

A special safety strategy was developed for fire and explosions hazards.

## 2. Safety evaluation

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

- Coordinate 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
- Per example following components of the safety system must be suitable, according to the rules and in good relation to each other:
  - Unloading station (plant specific) with filling pumps etc
  - Storage area (plant specific) with tank and equipment for different solutions
  - Grounding system
  - Wetpart (Components of Perros: Ecomix, Ecodosing, Ecokit), flexible pipes, Mixing head (often plant specific)
  - Drypart (Fixtures, Moulds, Heating system conveyer belts, needs always special solutions)
  - Building (fire proof walls, resistance of floor, Electrostatic, Lightning system, emergency exits, emergency light)
  - Safety panel (give signals and produce reactions together with parts of the equipment in case of failures in different levels)
  - Gas alarm system (depend often on the factory)
  - Ventilation system (depend on the particular situation)
  - Electrical data processing equipment (depend on particular situation)
  - Inertisation (depend on the design of fixtures and moulds)
  - Pentane emergency button (location depend on the particular situation)

- Back up Generator depend on the safety system at all (Ventilation, availability of Batteries for safety relevant systems)
- Marking of components
- Remote panel
- Documentation
- Measurements and protocols
- Safety related organisation

### 3. Exemplary documents used as a basis for plant evaluation

Technical regulations:

These plant evaluation is based on international, European and national regulations - in that order - as far as these are available and applicable.

These include the following essential regulations:

- permits and requirements of public authorities
- international standards (ISO, IEC)
- Ordinance Regulation Facilities for Storing, Racking and Transporting Combustible Liquids - Germany: VbF
- Decree over electrical components in explosion proof areas. (In Germany ExeV)
- Pressure Vessel Decree (Germany DruckbehV)
- Law about the environment (Germany Immissionsschutzgesetz: BImSchG)
- Law for protection against water-polution (Germany: Wasserhaushaltsgesetz WHG)
- Electrotechnic 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 DIN-V 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





ANLAGEN UND UMWELT

Seite 4 von 5

- 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 molding 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
- IEC 79-XX in general

#### 4. Investigation of Perros components

TÜV has inspected in the past some refrigerator plants installed by Perros.

In the meantime the components like

- Storage tank
- Eco-mix
- Eco-kit
- Eco-Dosing

has been revised by Perros. The last revision of these components has been checked end of September 1998.

If Perros produce the above mentioned new components in the same way they will meet the TÜV requirements.

The safety of a PU plant at all can only be judged after all components are valuated and the construction and safety relevant functions between all parts is according to the rules and the particular safety strategy.

## 5. Conclusion

Each refrigerator factory which used Pentane as blowing agent needs a safety concept which includes the parts mentioned in chapter 2.

Some of the parts can be standardised but a lot of installations and regulations are very particular for each factory.

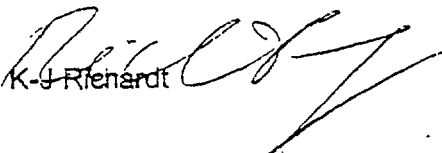
After we worked together with Perros we are able to state that the in chapter 4 mentioned parts of Perros can be included in a safety concept of a PU plant at all.

The parts like Ecokit, Ecodosing and Exomix in the last version met our safety requirements. The investigated Perros equipment together with a safe design, installation and organisation of the whole safety system are able to convert a refrigerator factory to a safe factory which can use Pentane as blowing agent.

TÜV Süddeutschland

Branch Ulm

The expert

  
K-J Richardt

PERROS INDUSTRIALE s.p.a.  
20081 Abbiategrasso (Mi) Italy  
Strada per Cassinetta, 6  
tel. +39.029421121 / 029420622  
fax +39.029420678  
e-mail: sales@perros.it  
web site: <http://www.perros.it>