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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

**Phasing out of CFC's at FANDEC C.A.
MP/VEN/99/108**

TERMS OF REFERENCE

for the Purchase of Equipment and Technical Services Required for the
Conversion of Polystyrene Foam blowing from CFC-12 to butane

These **Terms of reference** shall be used for the preparation of bids for the supply of equipment and technical services required for the conversion of the production process in order to phase out the use of CFC-12 in the production of polystyrene extruded foam at the above named factory. This document specifies the scope of supply of goods as well as the obligations and responsibilities of the supplier.

1. PROJECT OBJECTIVE

The objective of this project is the phasing out of CFCs in the production of extruded foamed polystyrene sheets used for food packaging, technical packaging and insulation purposes. The existing technology will be converted to non-ODS and CFC-12 will be substituted by butane as alternative blowing agent.

2. BACKGROUND INFORMATION

Name and address:

FANDEC C.A.
Sector Las Delicias, Guatire,
Estado de Miranda
Venezuela

Tel. ++ 58 36 - 440860 / 440716 / 442078

Fax ++58 36 - 442744

Fandec C.A. is a privately owned company (100% Venezuelan) located in zona industrial El Guatire, Estado de Miranda, in the outskirts of Caracas (Venezuela). The company was founded in 1960 and is employing 220 people. Fandec manufactures paper packing, aluminium packing and PSR foams. The factory is about 17,000 m² in size, and located in a total area of 20,000 m². It's sales in 1998 were US\$ 6,000.000 in three main product areas:

(a)	Paper packing	75% of sales
(b)	Aluminium packing	15% of Sales
(c)	PSR Foams	10% of Sales

Fandec business is split into 90% Food industry, 5% packing and 5% others.

Fandec is producing 375 Tonnes of PSR (average production -1998) per year on a LMP Model RC 40 capable of 240 kg/hr output releasing 45 Tonnes of CFC-12 (average consumption during 1996-1998) into the atmosphere. The plant is under-utilised having an annual capacity of 2,000 Tonnes. The extruded foam products are in the form of thin sheet of 1 mm to 6 mm, much of which is laminated in a subsequent thermoforming process. A small amount of material is recycled from start up scrap and damaged product in a rotating blade mixer unit. The majority of the extruded PSR sheets are processed in the company, producing various plates and trays for food packing.

Fandec C.A. is prepared to phase out ODS as soon as new technologies have been acquired, the necessary equipment installed and the technical staff trained.

Summary of Existing Equipment and Function

Storage Facilities

All chemicals are imported from a variety of suppliers including ICI, Bayer, BASF, Urequimicos and Agrip in drums of 250 kg.

CFCs are locally produced by PRODUVEN.

Extruding Equipment and process

Fandec C.A. operates one extrusion line, made by LMP, Italy, Torino:

RC 40 - extruder for production of foamed polystyrene, with installed capacity of ~~200~~²⁴⁰ kg/hour. Manufactured in 1973.

- type	- RC-40
- screw diameter	-Double
- screw length	-100 mm
- drive	- 3,000 mm and 2,700 mm
- cylinder heating	- 50 Hp
- die head	- no
- dosing of polymer	- 3 zones
- dosing of solid additives	- dosified by weight
- low and high pressure pump for CFCs	- mixed by mixer
- control board for temperature, torque and screw speed control	- 50 kg/cm ² and 250 kg/cm ²
- take-of with two rubber coated cylinders	- 12 zones
- winding unit	- 0 - 30 RPM
- take-of with two rubber coated cylinders	- ok
- winding unit	- ok

The majority of the extruded polystyrene sheets are processed in the company, producing various plates and trays for food packaging. Extruder operates in three 8 hour shifts a day working cycle.

3. PROJECT DESCRIPTION

Fandec S.A. is prepared to phase out ODS as soon as the new technology has been acquired, the necessary machinery and equipment installed and the technical staff trained.

The technology chosen is the use of butane as a blowing agent for the production line.

The following assistance will be provided through the project:

- a) Retrofitting, renewal, modification, or replacing of certain parts of existing extrusion lines;
- b) Replacement of existing CFC-12 storage, pumping and metering system with the system designed for butane;
- c) Construction works for adaptation of the newly entitled production area in the already existing old building in order to renew the building so that the modified lines could be installed in accordance with safety standards. Construction of the technological storage facility for "fresh" products, before transferring to a storage place.
- d) Installation of fire fighting, safety and alarm systems in the production area, butane storage area, butane pumping room and the technological storage facility to mitigate fire and explosion hazard from the use of butane;
- e) Transfer of technology and training of the plant operators in the production techniques, technological control of the process, quality management, etc.
- f) Training on safety operations in accordance with international and local rules and regulations related to the use of butane as blowing agent.
- g) Safety certification of converted plant by TÜV Germany.

4. SCOPE OF CONTRACTOR'S SUPPLY AND TECHNICAL SERVICES

4.1 Retrofitting of extruder

Modifications to the extruder are aimed to maintaining the current capacity and ability to produce the marketable foam grades that fulfil standard quality demands with the new blowing agent, and to comply with the stringent safety requirements.

To adapt the production process at Fandec C.A. on use of butane as auxiliary blowing agent, it is proposed to retrofit the following parts of the extruders.

4.1.1) Screws: Necessary change in the design and extension, or replacement, based on the calculations or already existing technical data providing evidence about the same level of homogeneity of the foam, like in case of the use CFC-12. The reduced dosage of the blowing agent must not interfere with the properties of polystyrene foams for insulation and food packaging purposes. Perfectly even distribution of small amounts (up to 2%) of liquid additives, liquefied blowing agent, as well as solid additives must be ensured.

4.1.2) Barrel: Extension, or replacement. Equivalent to the change of screws. Renewal of cooling and heating elements. Heating elements and cooling fans must be explosion proof.

4.1.3) Extrusion head: Replacement of the annular, automatic self adjusting die head is necessary for the production of all grades of polystyrene foams. The head must be equipped with a conditioning unit.

4.1.4) Homogenizer (static mixer): Appropriate homogenizer, with thermo conditioning, adjusted to the capacity of the extruder must be an organic part of the extruder.

4.1.5) Explosion proof electric devices: Explosion proof main driving motor, as well as motors for metering and dosing units, loaders from daily containers, die head motor, take-up mandrel motor and ionized air blowers. Existing motors must be replaced. The electric control cabinet must be explosion proof.

4.2 Foaming agent supply system

The following components of the foaming agent supply system must be subject of the contract:

- a) Low pressure system, including tank accessories.
- b) ~~Two~~ ^{OME} butane storage tanks each of ~~2~~ ⁵ m³ capacity. Tank~~s~~ must be designed and installed in accordance with international and local safety and security regulations.
- c) High pressure butane pumping system. The installation of the pumps and related accessories must be carried out in adherence to the international and local safety and security rules.
- d) Deodorizing system, based on separation of mercaptan molecules from butane, while flowing through molecular sieves cartridges.

4.2.1 Butane storage tank will be specially designed for storage of butane, according to the physical and chemical properties of butane. The tank should be designed for under ground installation outside of the factory building. It should be double-wall, made of carbon steel with anti-corrosion coating on the outside surface.

The supply should also include all required flanges, butane delivery pumps (at least one operating and one stand-by) designed for explosive liquids and gas mixtures, explosion proof level gauges and controls (including current level control), saturator, safety valves, to avoid overfilling and over-pressure, remote operated valves, connections for filling from the delivery trucks, all flanges valves and piping for introduction and maintaining N₂ (or other) blanket between the walls, N₂ or liquid sensors between the walls, butane sensors, cables, alarm and control system and panels.

Along with the tank and related systems, the Contractor should provide a complete set of engineering drawings, instructions, calculation data, etc. Special attention should be given to the scope of the civil works to be carried out by the end-user in connection with the underground placement of the tank.

4.2.2. The underground explosion proof piping system from the butane tanks to the high pressure system should be made of jacketed steel pipe modules, connected with special flanges, equipped with pressure gauges for nitrogen and leakage sensors.

An appointed certification body (TÜV Germany) should be involved in the process of Foaming Agent Supply System design and installation from the very beginning. The necessary drawings and relevant documentation, like Technological Production Scheme; Butane Flow Diagram; layout of the shop floor, with detailed allocation of extrusion lines and other production accessories; schematic drawing indicating allocation of butane storage tanks, low pressure system, high pressure pumping system, production area and pipeline connections; must be authorized by the certification body.

4.3 Safety system and safety related modifications

The following are the basic elements of the safety system to be supplied:

- a) Ventilation system in the production area, butane storage and technological storage facilities;
- b) Ionized and compressed air supply system to air ring after the die head and crossover.
- c) Necessary, safety related civil construction works;
- d) Electrical system adaptation, including ex-proofing of relevant elements; electrical control cabinets replacement; emergency back-up electric source and grounding of entire plant;
- e) Butane detection and alarm system.

A fire protection system should be designed and installed, in accordance with TÜV recommendations, as an integral part of the safety system at the plant, and consist of the following:

- automatic neutralization system (based on CO₂ or N₂), allocated over the die heads of the extruders;
- flame/heat detectors and automatic fire extinguishing system for the production area, technological storage (cure area), and butane storage areas.

4.3.1 General requirements

The contractor should follow the best available industrial safety practices. The equipment and technology in the converted area should be inherently safe to avoid any explosion, fire or other hazards during its use (operation, service) in line with the written instruction and training provided by the Contractor. For this reason, at least the following measures should be taken by the contractor, which should be described in the proposal in full detail:

- * All equipment which may get into contact with butane or its mixture must be provided with well designed reliable earth connections;
- * All electrical contactors, relays, switches, motors, solenoid valves and other electrical parts of such an equipment operating in the environment affected by butane should be provided and/or replaced with explosion proof types;
- * All areas, where butane or its mixture is present or where these can be set free, should be provided with reliable and well positioned butane detectors of sufficient quantity incorporated into the safety system(s), which in case of reaching a 15% of lower explosion limit (LEL) is/are automatically interfering the operation, first by doubling the exhaust level, and then, at 30% of LEL, by cutting the butane supply, switching off the electrical supply of selected devices, including the butane supply pump and/or in any other appropriate ways. The system(s) should also give audio and visual warning signals to the operators;
- * All hazardous areas in the converted plant should be encapsulated, or where it is not practical, escape/accumulation of butane should be prevented by other appropriate measures;
- * All equipment, tubes and devices, which might contain butane or its mixture, should be equipped with reliable seals to prevent leakage of hazardous materials;
- * All hazardous areas in the converted plant should be equipped with a reliable ventilation system, including anti-spark double speed fans, allocated as follows:

- extruder line	2 fans for each line
- gas house	2 fans
- technological storage/cure area	4 fans

The fans must be of proper extraction capacity. The capacity should be computed in accordance with the production capacity of the extruder, with regard to the production profile (density of the foam) and related butane release, respecting the relevant properties of butane, like lower and upper flammability limits in the air; flash point; temperature of autoignition; density of vapour; vapour pressure at normal and higher (up to 60 °C) temperatures etc.

Hoods and suction grills, as well as airflow gauges sensors and other controls, must be properly designed and positioned .

- * The safety ventilation systems, butane sensors and the safety control and alarm systems, must be connected to an automatic emergency back-up power supply.
- * Electrical connections to the hazardous areas should be made of fireproof cables.

4.3.2 Safety related responsibilities of the Contractor

All equipment and the complete technological/production process, proposed by the Contractor, must be designed, manufactured and commissioned, according to the requirements of TÜV Germany. The Contractor should set-up a working arrangement with TÜV at the early stage of the contract execution, and before installation and start up of the new technology, in order to obtain from TÜV their safety certificates for the converted areas of the plant as a complete unit.

Please note, that the safety certificates will cover only equipment and services provided by the Contractor.

4.3.2.1 Safety certification

In accordance with the common practice of safety certification of similar industrial plants, TÜV Germany should be involved in all stages of contract execution including:

- Certification of technical specification of the equipment; process control and safety instrumentation; ventilation; and expendable materials, to be delivered by the Contractor;
- Certification of relevant electrical, mechanical and civil engineering drawings, as well as of operational, maintenance, safety and training manuals, as an integral part of the Contractor's services;
- Supervision of equipment installation and commissioning (to be decided by TÜV);
- Safety inspection of the converted production premises and issuance of safety certificate for the whole plant.

In view of the above, and based on UNIDO experience in this area, the bidder is requested to:

- Attach to the proposal a **written confirmation of TÜV Germany** to participate in the contract execution under conditions indicated above in the paragraph 4.3.2;

- Confirm that in case the TÜV requirements are not met, the Contractor shall perform and provide all additional safety related work, equipment, instrumentations and materials etc. in relation to the equipment delivered and services supplied **without additional cost to UNIDO;**
- Indicate and specify the equipment, instrumentation, materials, civil works and engineering services, not included in the cost of proposal and to be provided by the counterpart, in accordance with the TÜV safety requirements.

4.4 SUMMARY OF EQUIPMENT, RETROFITTING, MODIFICATIONS AND ADAPTATION WORKS AND SERVICES

It is expected that the Contractor, based on its experience in this field, shall provide the optimal scope of equipment and services listed below:

	ITEM	Unit	Qty
	Extruder retrofitting		
1	Explosion-proof main motor	each	1
2	Explosion-proof driving motor for metering and dosing unit (polymer pellets, solid additives)	each	1
3	Explosion-proof motor for loader from daily container	each	3
4	Extrusion screw	set	1
5	Barrel with heating and cooling elements renewal and extension	set	1
6	Extrusion head with adjustable gap	each	1
7	Homogenizer	each	1
8	Gas injector into extruder	each	1
9	Die head conditioning unit	each	1
10	Pressure transducer with connection and display (Dynisco)	each	1
11	Changing of cooling air fans of heaters	set	1
12	Metering and dosing unit for nucleant.	each	1
13	Mixer to prepare powder additives	each	1
14	Explosion-proof die motor	each	1
15	Explosion-proof cutter and take-up mandrel motor	each	2
16	Ionized air blowers	each	2
17	Electric control cabinet	each	1
	Foaming agent supply		
18	Butane tank, 5 m3	set	1
19	Low pressure system including tank accessories	set	1
20	Molecular sieve system	each	1

21	High pressure system	set	1
22	Piping (LP and HP)	set	1
	Safety-related modification/retrofitting		
23	Civil construction for adaptation of old building	each	1
24	Water sprinklers for technological storage facility	set	1
25	Portable fire extinguisher	set	2
26	Emergency water supply: 2 water tanks (40 m3 each), pumps and other hydraulic components	set	1
27	Stand-by electric power generator for ventilation, alarm and water supply system: 100kW	each	1
28	Automatic CO2 system over die	set	1
29	Gas detection system with associated wiring and electronics	each	1
30	Electric control cabinet	each	1
31	Ex-proof ventilation fans (2 for gas house containing high pressure pump, 4 for extruder line, 4 for storage/cure area)	each	6
32	Ventilation ducting, including hoods and sucks around and above the extruder. (Drawings and critical components are from MF)	set	1
33	Audio/visual alarm system	set	1
34	Emergency lighting	each	6
35	Portable gas detectors	each	1
36	Electrical grounding for the entire building	set	1
37	Antistatic paint, clothing, shoes, etc	set	1
	Certification according to international and local standards	each	1
	General consulting services and training, incl. safety training	w/m	3

5. REQUIREMENTS AND CONDITIONS FOR THE TENDER DOCUMENTS

- a) The detailed technical specifications of the new equipment to be tentatively purchased, as well as detailed information and civil and mechanical/electrical engineering drawings of the existing systems and equipment to be modified are not provided in this Terms of Reference assuming that a *bidder*, prior to the submission of his offer to UNIDO, *will pay a visit to the project site*, to get acquainted with the actual situation and to collect information and data required for the preparation of his offer. The cost of the visit will be absorbed by the bidder.
- b) The technical part of the bid should include a *complete scope* of supply and services, as requested in the TOR. *No partial provision* of equipment and services will be accepted.
- c) The country of origin of the main equipment, like extruder, conditioning unit, metering and dosing unit, electric control system (transducers, electronic processors, detectors, sensors, cabinets), butane storage facilities (tanks), high pressure system for butane dosage etc., should

be provided, and an indication of the model numbers. A written evidence from the manufacturers of the equipment, confirming the supply, should be attached to the proposal for those relevant items.

d) Specification/brief description of proposed engineering, consultancy and training should be provided, including warranty and post-warranty services.

e) *A written confirmation from TÜV, Germany to participate in the Contract execution under conditions stipulated in part 3 g), 4.2., 4.3.2. and 4.3.2.1. of the TOR should be attached to the proposal.*

f) In case the TÜV requirements are not met, *confirmation* that all additional safety related work, equipment, instrumentations and materials etc. in relation to the equipment delivered and services supplied will be performed and supplied by the Contractor *without additional cost to UNIDO.*

g) The bidders should add to the technical part of their tender, as separate Annex, a list and detailed technical specification of individual items of equipment including the main elements of systems and installations. Relevant catalogues, technical leaflets, etc. should also be attached.

h) The contractor should confirm that the cost of expandable materials, like pipes, flexible hoses, valves, flanges, fittings, connections, wires, normal and special control and power electrical cables and other electrical or mechanical accessories required for installation and commissioning of all equipment delivered in the frame of contract, is included in the costs of individual items of equipment and assemblies, as specified above.

In accordance with the UNIDO rules and regulations, offers which do not meet the above-mentioned requirements might not be considered and can be rejected.

6. CONTRACTOR'S GENERAL RESPONSIBILITY

- * The contractor assumes overall responsibility for the correct conceptual design and practical implementation of the conversion process, which enables continuous, safe and proper operation of the plant with a capacity not lower than the current one, and with the product quality not inferior to that before conversion.
- * The contractor is responsible for applying the internationally best available industrial practice in CFC phase-out from extruded polyethylene and polystyrene foam manufacturing.
- * All engineering designs, specifications, technical documentation and other documents used/supplied/recommended by the Contractor for the conversion of the plant should be adapted to the purpose and the site they are destined for.

- * The contractor will ensure that all machines and equipment, supplied through the contract, are new machines of recent design, free of defects and operational failures.
- * The contractor is responsible for the control of all works, services and suppliers which are executed by its subcontractor(s) and will supervise the work, services and supplies provided by the counterpart or its subcontractor(s), with regard to the implementation of the conversion process. If the above work/service/ supplies/ are not satisfactory and/or do not correspond to the agreed requirements, terms, schedules and/or safety standards, or if the training of the staff does not reach the standards necessary for a safe operation of the converted production lines, the Contractor is obliged to intervene and to request fulfilment of such provisions, work, services and supplies, and to timely inform UNIDO accordingly.
- * The contractor should obtain relevant TÜV certificates and issue a Safety Statements to certify that the operation of the converted production lines and related supporting and safety systems are safe, as long as the end user follows the rules and regulations for operation and maintenance, established by Contractor, and the rules for regular control and training of the staff.

7. TERMS OF GUARANTEE

- The Contractor should guarantee the quality and completeness of all his work, supplies and services specified in Chapter 4 above.
- Mechanical, electrical, performance and safety guarantee for the equipment supplied, and processes/technologies transferred should be quoted for 12 months after obtaining the acceptance certificate for installed and commissioned equipment.
- The Contractor guarantees that the proposed scope of supply and services are sufficient to convert the current production programme, using non-CFC technologies, to maintain the current production profile and capacity in accordance with safety requirements, stipulated by TÜV.

8. PROVISIONAL TIME SCHEDULE

A schedule similar to that outlined below is envisaged to be furnished by the Contractor for engineering, fabrication, purchase/subcontract delivery, installation, conversion and commissioning of the plant and training of plant personnel.

To ensure a harmonious and coherent conversion process and to coordinate all work and activities to be performed by the Contractor and the counterpart, the main activities and responsibilities of both parties are specified below.

Major deviations from this proposed schedule should be indicated and discussed in the Contractor's tender.

Note: the schedule should be attached as a separate annex to the offer.

Step	Completion time (month)	Activities	Responsibility
I.		Preparatory engineering work	
1.1.	0.5	Visit of the contractor's team leader to the project site to participate in the : - discussion and adjustment of the detailed scope of supply and services to be provided by the counterpart; - preparation of a detailed and coordinated work plan and schedule of contract activities to be performed by all parties concerned (major part of total work plan of project implementation).	Contractor
1.2.	1 - 2	The counterpart will provide the contractor with: - the layout of existing lines in the extruded PE & PS foam production section; - the ground plan drawing and construction design of the new appointed building where converted technology will be placed with existing electrical/engineering facilities like electrical wiring, positions of electrical switches, lights, sockets or other electrical equipment and installations, channels and trunks in the ground, in which butane could be collected and accumulated; - if available the construction design and specification of the existing equipment; - report about current technology and quality problems of both extrusion foaming and thermoforming sections; - technological data, chemical, physical and mechanical properties of extruded PE&PS foams, relevant for the conversion to the CFC free foam.	Counterpart
1.3.	2	Review and evaluation of the technical documents provided by the counterpart enterprise.	Contractor
1.4.	2	Elaboration of the final conversion concepts and Terms of Reference for the subcontractors and sub-suppliers including the local ones, if possible.	Contractor
1.5.	2	Detailed list and technical specification of equipment to be designed, fabricated or purchased.	Contractor
1.6.	2	Review of local regulations and safe operation requirements for the PE&PS extruded foam production.	Contractor
1.7.	2	Proposal for a new layout of the plant, the basic requirements and specifications for the site preparation for the conversion related to construction work, civil work for the exhaust and ventilation systems, the butane storage, production and technological storage as well as feeding and piping.	Contractor
1.8.	2	Progress Report No. 1 about the completion of the preparatory engineering works for the project implementation.	Contractor
1.9.	2 - 3	Approval of the final layout of the plant, the conversion concept and Terms of Reference with the specification of equipment and services by the counterpart enterprise, UNIDO and the Contractor.	UNIDO, Counterpart, Contractor

2.		Engineering works and subcontracts' order placement	
2.1.	3	Engineering works including design with necessary drawings and technical specification for the civil works and site preparation for the conversion, construction works, utilities, exhaust and ventilation, butane storage, feeding and pipes etc.	Contractor TÜV
2.2.	3 - 4	Placing of sub-orders and sob-contracts for the purchase of equipment and related services for: - extrusion section - butane storage and supply system - technological storage(curing) - exhaust and ventilation system - industrial safety works and equipment like gas detecting system, fire protection and fire fighting system	Contractor
2.3.	4	Provision of a set of standard sample of documentation related to the technical and legal rules and regulations including necessary certifications of equipment to be supplied, training modules for the operational personnel, safe operation rules and control concept etc. to allow the counterpart enterprise to apply to the local authorities for permission to use butane in the production.	Contractor
2.4.	4	Progress Report No. 2 about the completion of the engineering works and subcontracts' order placement	Contractor
2.5.	5 - 6	Application to the local authorities for the operation permission of using butane in the production. If requested, translation of the technical documentation and certifications on his account to the Romanian language.	Counterpart
2.6.	6 - 7	On request, supply of further technical documentation, certifications etc. to gain the operation permission for the butane blowing PE&PS extrusion technology.	Contractor
3.		Project site preparation for conversion	
3.1.	7 - 8	Provision of services and work for site preparation by the counterpart according to the specifications provided by the contractor.	Counterpart
3.2.	8 - 11	Training of selected and qualified staff of the counterpart enterprise in the PE&PS extruded foam production while using butane as a blowing agent including industrial safety training.	Contractor
3.3.	11	Contractor's control, supervision and inspection of the site preparatory works to be performed by the counterpart enterprise and/or local subcontractors.	Contractor
3.4.	11	Progress Report No. 3 about the supervision and inspection of the site preparatory work and training of the selected staff of the counterpart	Contractor
4.		Delivery of equipment specified in the contract	
4.1.	11	Delivery of equipment.	Contractor
4.2.		Progress Report No. 4 upon delivery of equipment	Contractor
4.3.	7 - 11	Provision of necessary transport for local transportation of delivered equipment to the project site.	Counterpart Contractor

4.4.	7 - 11	Inspection and provisional acceptance of equipment; statement to be signed by the counterpart and to be returned to the contractor.	Counterpart Contractor
4.5.	7 - 11	Adequate care, storage and insurance of equipment during transportation within the country and subsequently at the project site during the period of erection.	Counterpart
5.		Installation, commissioning, test-run and start up to be executed by the counterpart personnel under supervision of the contractor and/or his subcontractors	
5.1.	11 - 13	Supervision and control of the installation, commissioning and test-runs.	Contractor
5.2.	13 - 14	Check up, testing, certification of equipment and systems related to industrial safety, ensure permission of local authorities.	Counterpart Contractor TÜV
5.3.	13 - 14	On-the-job training of the counterpart's staff in following subjects: - the operation of the PE&PS foam extrusion lines; - the maintenance and service of these converted lines and equipment; - the safe operation parameters, their control and measurements with regard to the relevant rules and regulations; - quality control	Contractor
5.4.	13 - 14	Contract execution control and preparation of a Certificate of Acceptance.	UNIDO Counterpart
5.5.	14	Commissioning report with Certificate of Acceptance after completion of installation, commissioning and test-runs; safety certification.	Contractor TÜV
5.6.	14	Final report	Contractor
5.7.		Preparation of after sales services and post-contracts monitoring visits by contractor's personnel.	Contractor

9. COUNTERPART RESPONSIBILITIES

The counterpart's contribution to the project implementation should be oriented to the preparatory civil engineering works (buildings adaptation and reconstruction) and works related to the foaming agent supply (butane storage facilities and butane supply) and some safety related works (ventilation, fire fighting, stand-by electric source, emergency water supply etc).

TENTATIVE SCOPE OF SUPPLY AND SERVICES TO BE PROVIDED BY FANDEC C.A.:

- 9.1 All necessary civil engineering work related to the conversion process (work to be specified with the assistance of the contractor immediately after the contract award).
- 9.2 All required utilities and supporting systems (to be specified with the assistance of the contractor)

- 9.3 All construction work related to the adaptation and renewal of the building(s). (to be specified with the assistance of the contractor).
- 9.4 Provision of all necessary sets of legal documents (in both local and English languages) and certificates permitting full operation of the converted lines using butane.
- 9.5 A written statement that the building(s) and all utilities will meet the contractor's requirements within the specified time agreed with UNIDO and the contractor.
- 9.6 Provision of necessary transportation (if not responsibility of the contractor) of equipment within the country from the harbour or airport to the project site.
- 9.7 Adequate care, storage and insurance of equipment during transportation within the country and when subsequently at the project site during the period of erection (if not responsibility of the contractor).
- 9.8 Provision of full operational testing facilities before the start of commissioning of the equipment.
- 9.9 Supply the necessary components, parts and elements as well as material and chemicals to permit trial runs and prototyping during commissioning and further plant operation.
- 9.10 In case of necessity to interrupt production, which might be needed for rebuilding or replacement of some of the manufacturing equipment, installation and tests of supporting and safety systems, commissioning and test-run of the converted plant, the financial losses occurring will be absorbed by the counterpart.

10. SPARE PARTS

The contractor should confirm that all equipment, systems and instrumentation specified above will be delivered with standard set of spare parts and expandable materials, tools for maintenance and service of the relevant items of equipment *sufficient for 12 months operation* of the equipment.

11. DOCUMENTATION

The following documents are required for the project conclusion:

- a) TÜV safety certification of the whole converted plant, in accordance with conditions stipulated in chapter 4.3.2 above.

The liabilities of the certificates will be limited by the scope of supply and services provided by the Contractor in the frame of the contract responsibilities only.

- b) Catalogues of the equipment, including technical specifications, list of spare parts, assembling instructions, operation manual etc. in English or Romanian language.
- c) Certificate of Acceptance, duly signed by the counterpart enterprise (end user).

12. REPORTING MODALITIES

Reports

Progress reports will be submitted to UNIDO in accordance with the Provisional Time Schedule as follows:

Progress Report No.1	Upon completion of step 1.8 (completion of preparatory engineering work).
Progress Report No.2	Upon completion of step 2.4 (completion of engineering work and sub-contracts' order placement).
Progress Report No.3	Upon completion of step 3.4 (supervision and inspection of the site preparatory work and training of the selected staff of the counterpart).
Progress Report No.4	Upon completion of step 4.2 (delivery of equipment systems, assemblies, accessories, etc.).
Commissioning Report	Upon completion of step 5.5 (completion of installation, commissioning, test runs and safety certification by TÜV).

Final Report

Content, format, number of copies, submission, approval and other matters related to the Progress, Draft Final and Final Reports should be in line with UNIDO's general reporting requirements, rules and procedures.

Potential suppliers:

1. LMP Impianti srl, Italy
2. Gloenco-Battenfeld , Gloucester, UK
3. Myung-II Machinery Co, South Korea
4. AGE Srl, Italy
5. Milacron Inc., Cincinnati, USA