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**PHASING OUT CFC-12 AT FANDEC C.A.  
MP/VEN/99/108  
EXTRUDED P.E. PRODUCTION: CONVERSION TO BUTANE**

Specifications of new extruder

Parties wishing to bid for the work detailed in this document are strongly encouraged, with prior consent of UNIDO, to visit the project site in order to familiarize themselves with the plant. The cost of such visits, however must be borne by the bidding party.

All companies accepting to quote must have in Venezuela a local subsidiary to assure maintenance of equipment, spare parts and trouble shooting. The name, address, contact phone and fax number, as well as the name of the manager of the office must be clearly indicated in the quotation. In the absence of such technical services, the offer will not be considerate.

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## **BACKGROUND**

### **1.1 General Background**

#### **Country data**

The Republic of Venezuela is a signatory of the Vienna Convention on the Protection of the Ozone Layer and of the Montreal Protocol on Ozone Depleting Substances. The Vienna Convention was ratified on 1 September 1988. The Montreal Protocol was signed on 15 September 1997 and approved by the Congress of the Republic through a Law issued on 24 August 1988 and it went into force on 7 May 1989. The Montreal Protocol London amendment was approved by the Congress of the Republic through a Law issued on 13 August 1992. The official communication of the ratification to the trustee was on 29 July 1993, and it went into force on 27 October 1993. Finally, the Copenhagen Amendment was introduced by the National Executive to the Congress of the Republic for its consideration and it is presently processing its approval.

Venezuela is a country that operates under Article 5, Paragraph 1 of the Montreal Protocol, because its ODS consumption per capita is less than 300 grams, measured by their ODP. Indeed, the value for 1994 was 146 grams per capita. Venezuela is committed to implement the regulations of the Montreal Protocol and to phase-out ODS production and consumption according to the terms and conditions established in the Protocol and to the decisions of the Parties.

### **1.2 Background Information of Fandec C.A.**

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 m<sup>2</sup> in size, and located in a total area of 20,000 m<sup>2</sup>. 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.

## 2. PROJECT OBJECTIVE

The objective of this project is the safe elimination of all CFC-12 from the process by substituting with Butane.

## 3. PROJECT DESCRIPTION

Fandec C.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.

In the course of the preparatory assistance given by UNIDO an analysis of the modifications to be introduced in the plant has been made.

### 3.1 Introduction

The company envisages the production of about 30 tons per month of polystyrene foam extruded by the **direct butane gassed extrusion foam process** on a proposed **NEW single-stage single screw extruder** and existing downstream. 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.

On site product storage would consist of the following projected quantities:

- (1) 3.5 Tons of Butane (1 tank of 9 cubic meters maximum)
- (2) 20 Tons of Virgin Polystyrene in bags.
- (3) 20 Tons of Butane extruded Polystyrene product.
- (4) 4 Tons of Reclaimable Extruded Polystyrene Foam Waste stored in a well-ventilated area in well-ventilated cages for on site densification and later usage on foam or other cast film extrusion lines which are not foamed.

On site electrical supply from the national system is available at:

440 Volts A.C.	
3 phase - 60 Hertz	<b><u>TO CONFIRM BY FANDEC</u></b>
Earth and Neutral	

Typical temperatures in Caracas are:

Maximum	+ 45 degrees Celsius	<b><u>TO CONFIRM BY FANDEC</u></b>
Minimum	+ 5 degrees Celsius	

The supplier must take the local weather conditions into account and must also advise the customer as to the most suitable equipment for the specific requirement as well as match it with any related equipment prescribed for the project.

Operating manuals and any related documentation must be supplied for installation as well as maintenance of the equipment. These documents should preferably be in Spanish and English since the commissioning engineer might not be fluent in Spanish.

### **3.2 Project Modifications - General Description**

The LMP extruder currently in use is **not suitable** to convert to the safe extrusion of butane foamed polystyrene. The method of starve feeding, feed point being close to gas injection point, excessive oil leaks, condition of barrel oil cooling, oil cooling of static cooling section and barrel heater elements are not acceptable. **It is recommended that a NEW 44/1 L/D** (screw length to screw diameter) single-stage single screw extruder (or other type of extruder to be proposed by the contractor) be purchased. This extruder to be specified for butane direct gassed polystyrene extrusion up to an output of 240 kg/hr. Appropriate supplier guarantees must be obtained from the possible suppliers with regards to the output and the application for butane direct gassed polystyrene foam for sheet as well as foamed tubes.

The existing dies for the tubes as well as the flat sheet are acceptable for butane extrusion. The existing screen-changer must also be used. All downstream equipment to be used with the addition of safety equipment as specified later. The NEW extruder supplier must supply an adapter between the standard extruder flange and the existing screen-changer. The customer must supply the dimensions of the entry to the existing screen-changer in order to allow the extruder supplier to manufacture the adapter.

### **3.3 Equipment Specifications**

#### **A. NEW Extruder**

This extruder to include the following in order to safely extrude direct injected butane gassed foamed polystyrene flat sheet and pipe-insulation tubes.

##### **A.1 Up to 240 kg/hr nominal output.**

- A.2 Electrical control cabinet.
- A.3 44:1 L:D (screw Length to Diameter ratio) single 90 millimeter screw - single-stage.
- A.4 Pressure probe in compression zone with a Dynisco type instrument which could be set at a pre-set minimum pressure to stop the extruder in case of a loss in feed of material which could result in a situation where butane gas could escape towards the rear feed end and create an explosive situation. The signal to have a 5 second delay before activation in order to allow for the pressure re-establishment under normal running conditions. This signal to be equipped with an over-ride facility which must be held down by the operator during start-up or it must be equipped with an alarm which sounds during start-up.
- A.5 Material feed hopper to fit the existing hopper loader fed from separate material mixing station which is sufficient.
- A.6 Pressure probe at front end of barrel to be set at a high pressure to stop the extruder at high pressure. This pressure would also indicate screen filter or die blockage.
- A.7 All electrical elements to be to the appropriate standard for butane extrusion.
- A.8 Autoclave type valve at injection port.
- A.9 Drive motor ventilation to be connected to forced ventilation. Specify dimensions of motor cooling fan ducts well in advance. The extruder supplier to specify the fitted motor cooling fan dimensions and capacity in order to allow the Heating & Ventilation Engineers to design ducting which would be sufficient not to interfere with the extruder supplied motor ventilation cooling fans.
- A.10 Control cabinet to be force ventilated with filtered non-hazardous air in from the bottom and out at the top. The extruder supplier to specify well in advance the minimum electrical control cabinet ventilation (cfm for ambient temperatures) requirements and dimensions of vent holes in the control cabinet for ducting and fan supply.
- A.11 Material hopper level indicator to switch off the extruder in case of material run out. Only to stop the extruder after an audible alarm sounded allowing sufficient time for the operator to remove a possible blockage or fill the hopper.
- A.12 The extruder supplier to supply the high pressure piping from the high pressure pump to the injection point of the extruder. The detail of the connection point to the high pressure pump to be supplied by the customer who must also indicate the length required. The supply of the high pressure piping to the extruder must be 6 millimeter Autoclave (6 mm 44n2, MAWP 10 000 psi RJ) high integrity stainless steel with appropriately supplier specified matched fittings. The customer must install the pipe visible, well protected and well marked above ground (possibly 3 meters high) well supported and protected from any high lifting damaging traffic. Especially over the materials mixing and raw materials area.
- A.13 Adapter section between standard extruder barrel and inlet to existing screen changer, the inlet detail which must be specified by the customer to the extruder supplier.
- A.14 A Manual Emergency Stop.
- A.15 The NEW extruder supplier must ensure extruder stoppage facilities for the emergency signals. Interlocking Safety Systems as well as a signal to the Interlocking Safety Systems in case of an extruder shut-down.
- A.16 Specify dimensions of extruder and control cabinet in order to allow the customer to move the wall for longer extruder.

- B. The customer (Fandec C.A.) must construct a mobile extraction fan on wheels (fitted with an explosion proof motor ) with diameter of 400 millimeters connected to a 300 millimeter diameter flexible pipe with a length of 3 meters and a funnel shaped front end on the hose to be placed underneath the die before start-up and to remain there until the bubble is finally pulled over the cooling can and stabilized with the air-ring blower. The exhaust of this fan must then be directed towards the natural low ventilation louvers or open door.**

- C. The customer (Fandec C.A.) must ensure that the die cooling oil is pumped with an explosion proof electrical motor - alternatively the pump and motor must be lifted at least one meter from the floor level and be removed three meters from the die. In the latter case the oil hoses must be at least 3 meters long with the heat exchanger removed 3 meters from the die. The oil supply must not be in a trench in the floor.**
- D. The customer (Fandec C.A.) must ensure also that the air cooling fan supplying the air-ring around the cooling cart is of an explosion proof type.**

No scrap should be stored in the vicinity of the extrusion equipment and if stored in the extrusion hall then in well ventilated cages which are placed in such a manner that they do not interfere with the normal ventilation which "sweeps" the floor from one side of the building to the other side. If stored in this room then it must be in an area close to the 300 kg portable dry powder or foam fire extinguisher.

#### **4. SCOPE OF SUPPLY**

The scope of supply includes:

- Design services for modifications associated with the supply of the new extruder as indicated in Point 3.2.
- Supply of equipment DDU Zona Industrial el Guatire, Caracas (Venezuela) of goods described in Point 3.3.
- Assistance to assembling.
- Commissioning.
- Trial tests.
- Training of on site personnel.

Prices will be submitted split in following items (indicating m/m foreseen in pts. 1, 3 and 4):

1. Design services.
2. Equipment.
3. Commissioning and trial tests.
4. Training.

All companies accepting to quote must have in Venezuela a local subsidiary to assure maintenance of equipment, spare parts and trouble shooting. The name, address, contact phone and fax number, as well as the name of the manager of the office must be clearly indicated in the quotation. In the absence of such technical services the offer will not be considered.

#### **5. REFERENCES**

All companies accepting to quote must include a reference list of working (or in use) extruders using Butane for P.E. foaming production. In the absence of such list the offer will



note be considered.

## **6. TERMS OF GUARANTEES**

The supplier should apply the best practice in CFC phase-out technology in extruded polystyrene foam equipment manufacturing. Its mechanical, electrical and performance guarantee for the equipment, as well as the technologies transferred, should be in accordance with international practice and standards.

The supplier guarantees the quality of all his works specified in para 3.3 above. He guarantees that engineering designs, specifications, technical documentation and other documents which serve as a basis for the conversion of Fandec C.A. plant will be adapted to the purpose they are determined for.

The supplier guarantees that the machines and equipment he supplies will be new machines, of recent conception, without any defectiveness or incorrect operating, and that the time for the technical guarantee is 12 months after delivery.

- (a) The supplier guarantees that the equipment to be supplied is suitable for butane direct gassed polystyrene foam sheet as well as foamed tubes production.
- (b) The supplier guarantees that the capacity of the extruder is per an output of 100 kg/hr minimum.

The supplier's responsibilities are valid up to the expiring of the guarantee period and he is required to intervene and to rectify each operating defect, defectiveness or irregularity which are due to fault of original manufacturing or imported material.

The supplier has to inform UNIDO as well as the counterpart, if equipment, works, components and material supplied under the responsibility of Fandec C.A. do not fulfil the safety standards or if the training of the staff did not reach the standards necessary for a safe operation of the P.E. lines.