



$$\left(\frac{1}{h \cdot S}\right)_{\text{mat}} - \left(\frac{1}{h \cdot S}\right)_{\text{product}} + \left(\frac{e}{\lambda \cdot S}\right)_{\text{jacket}} + \left(\frac{e}{\lambda \cdot S}\right)_{\text{gap}} + \left(\frac{e}{\lambda \cdot S}\right)_{\text{barre}} + \left(\frac{1}{h \cdot S}\right)_{\text{cooling}}$$

FOURREAU

Echange Matière/Fourreau

$$\left(\frac{1}{h \cdot S}\right)_{\text{mat}} = \left(\frac{1}{h \cdot S}\right)_{\text{product}} + \left(\frac{e}{\lambda \cdot S}\right)_{\text{jacket}} + \left(\frac{e}{\lambda \cdot S}\right)_{\text{barre}}$$

Résistance de contact

COOLING FLUID

Echange Fluide/Fourreau

CHEMISE

Clextrusion

$$h_{\text{Matière}} (e; \lambda) (e; \lambda)_{\text{gap}} (e; \lambda)_b h_{\text{froid}}$$

$$Pr = (h \cdot S)_{\text{eq}} (T_{\text{product}} - T_{\text{cooling}})$$

$$\left(\frac{1}{h \cdot S}\right)_{\text{eq}} = \left(\frac{1}{h \cdot S}\right)_{\text{product}} + \left(\frac{e}{\lambda \cdot S}\right)_{\text{jacket}} + \left(\frac{e}{\lambda \cdot S}\right)_{\text{gap}} + \left(\frac{e}{\lambda \cdot S}\right)_{\text{barre}} + \left(\frac{1}{h \cdot S}\right)_{\text{cooling}}$$

$$\left(\frac{1}{h \cdot S}\right)_{\text{eq}} = \left(\frac{1}{h \cdot S}\right)_{\text{product}} + \left(\frac{e}{\lambda \cdot S}\right)_{\text{jacket}} + \left(\frac{e}{\lambda \cdot S}\right)_{\text{gap}} + \left(\frac{e}{\lambda \cdot S}\right)_{\text{barre}} + \left(\frac{1}{h \cdot S}\right)_{\text{cooling}}$$

Summary

TECHNOLOGY

Evolum : The target is reached !

DEVELOPMENT & PROCESS

The futur is in the plate

REALIZATIONS

La pampa cereals

SERVICE & MAINTENANCE

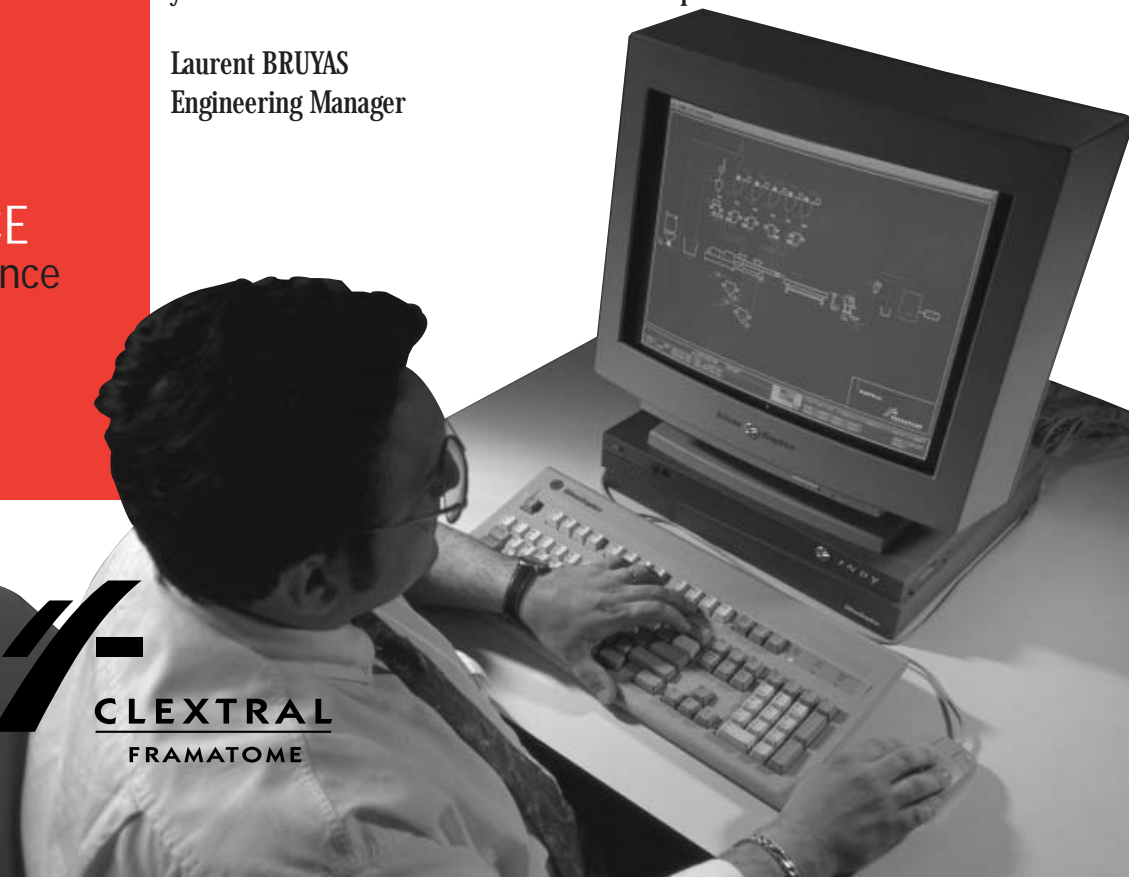
preventive maintenance and formation

IN BRIEF

Clextrusion, in its two previous issues has presented to you some of our realisations in term of extrusion processing lines. These examples are representative of our tenacious and constant work in the field of Process and Engineering development. We are convinced that the performance of a complete production line is directly related to those of the twin-screw extruder. So, all of the Clextral Team (from the marketing to the manufacturing departments), have been mobilised these last few years, to define and develop a new generation of twin-screw extruders. This way, Clextral, the one and only manufacturer in the world active in three fields of applications (food and feed, plastic and chemical, cellulose pulp) reinforces its flexibility and its adaptability. This new generation will allow us to propose you optimized solutions, thus responding to your specific needs on an economical and technical standpoint.

You will find in this issue the technical specifications of this new extruder, which you will be able to observe in our French test plant in Chazeau.

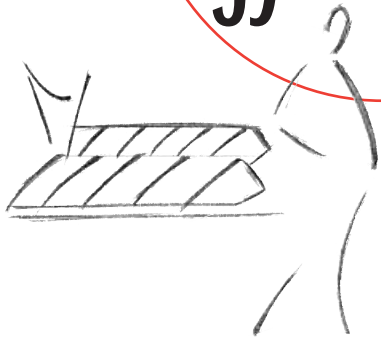
Laurent BRUYAS
Engineering Manager



Number 3
APRIL 1999

CLEXTRAL
FRAMATOME

T echnology



performances

optimized cooling circuit of the barrel modules, leading to increased performance for temperature regulation

accessibility and cleaning

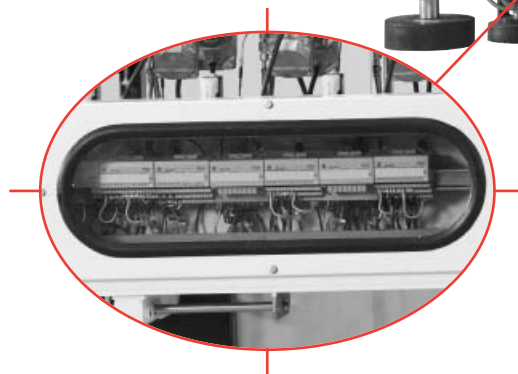
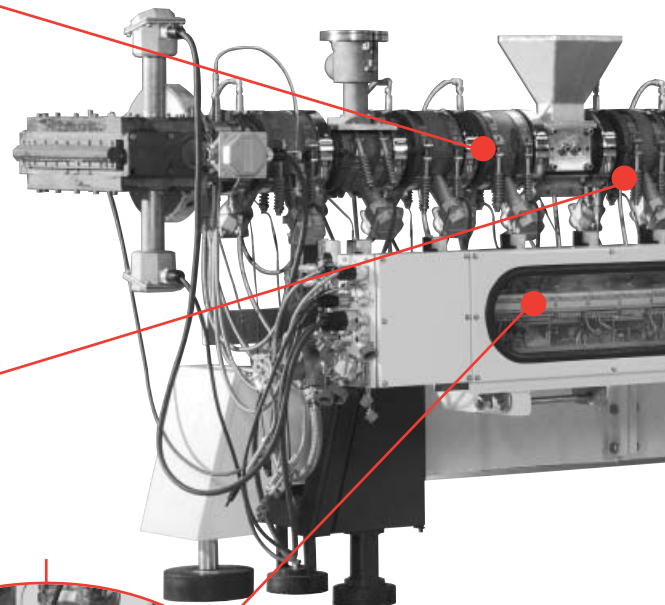
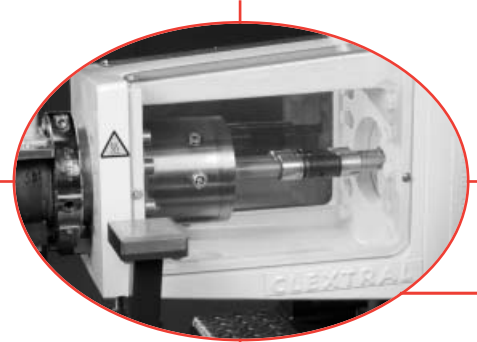
- *disassembling of the lantern bearing blocks through the lantern*
- *possibility of dismounting the mechanical torque limiter without removing the main motor or the gearbox*

screw and barrel assemblies

*total barrel length :
from 3 to 12 modules
equivalent to 12D to 48D*

simplified wiring

All signal wires are connected to remote I/O modules located on the frame side, leading to limited number of cables and simple wiring operation during extruder installation on site (available on PLC control only)

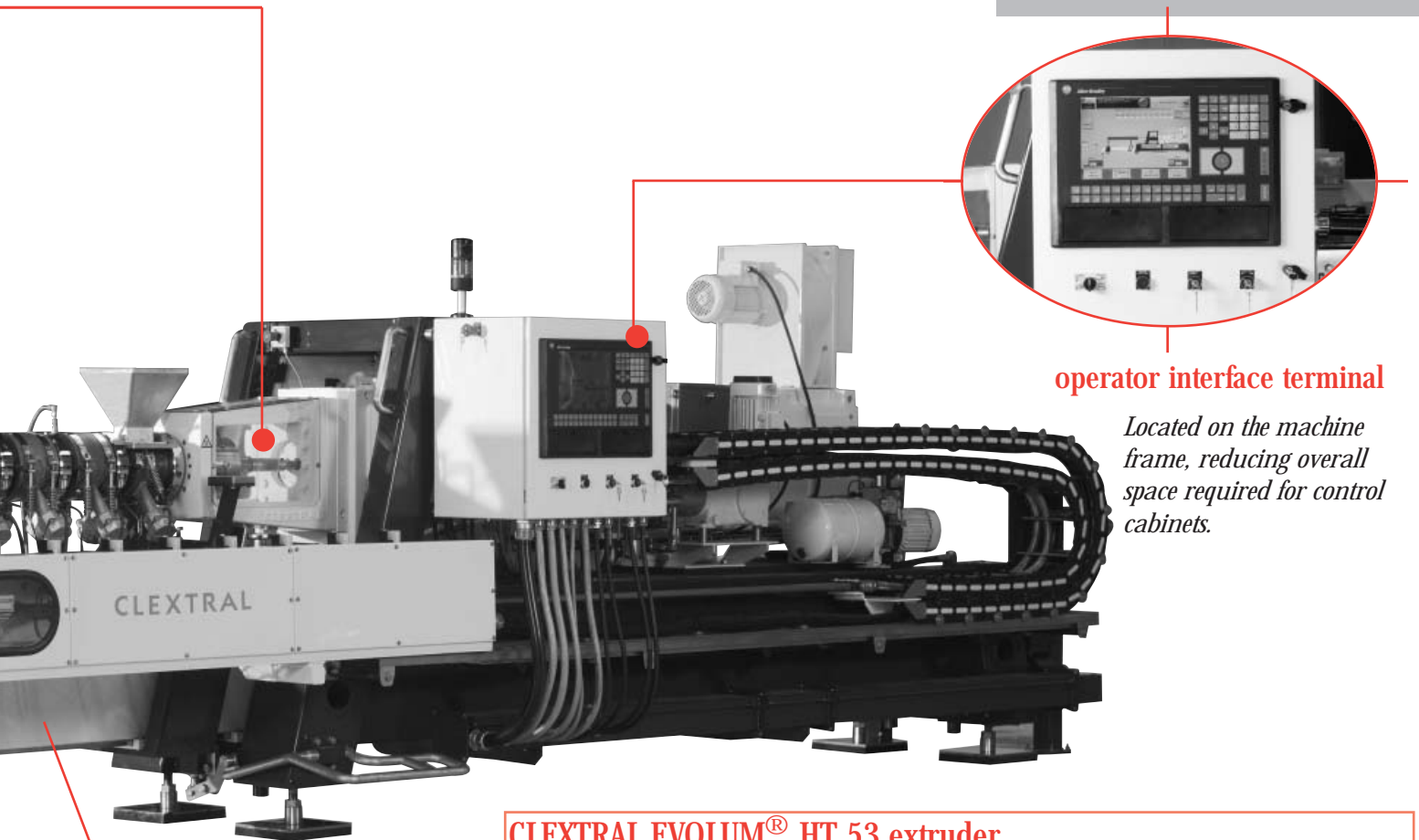


CLESTRAL EVOLUM® HT 53 EXTRUDEUR : The target is reached !

Introduced in our December Clextusion, the **EVOLUM HT 53** has become a reality in our pilot plant in Firminy. Here are conclusions of the validation trials and the complete technical specifications. **EVOLUM HT 53** with its high available torque and high screw speed level proves to offer performance which greatly exceed equivalent machines. The process performances ratings reckoning shows that the capacities are from to up to four times higher than the current same size machine. And the economical indexes points out the superiority of this new extruder. The global result of the potential of this extruder in term of throughput and final product sets a new standard of extrusion.

EVOLUM

HT 53



frame - barrel opening

Two different types of frame :

- with hydraulic slide : allowing quick opening of the extruder barrel and direct access to the screws (H. series)
- with fixed beam : screws on shafts can be withdrawn from barrel by pulling them from the extruder front.

operator interface terminal

Located on the machine frame, reducing overall space required for control cabinets.

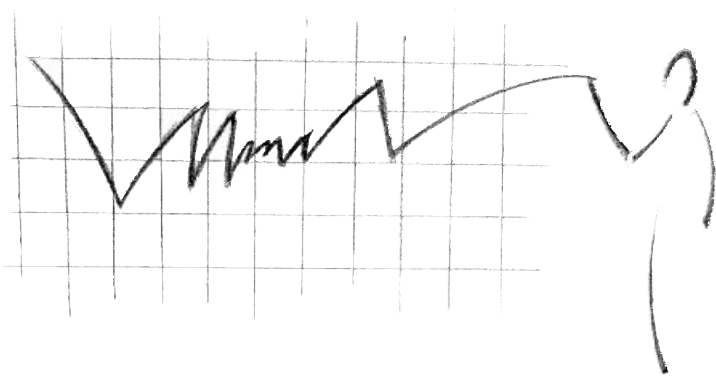
CLESTRAL EVOLUM® HT 53 extruder

is available with a variety of features and varying performance levels to meet each customer's specific requirement.

TECHNICAL SPECIFICATIONS

- Screw diameter (D) : 53 mm (48 mm for some applications)
- Barrel module length (L) : 212 mm (4 x 53)
- Barrel module length is a function of the screw diameter :
module length = 4 x screw diameter
- Torque available (per shafts) : 53 HT = 1033 N.m
- Maximum operating pressure : 275 bars
- Maximum drive power at maximum screw speed : 260 kW
- 3 types of control are available :

1. Electro-mechanical manual control board
2. PLC + panel view : FITSYS
3. PLC + Industrial computer using Intouch software = FITSYS "PLUS"



THE FUTURE IS em **D**evelopment

A new food concept

Although widely recognised for its efficiency in replacing traditional food processing techniques, twin screw extrusion is proving to be a powerful tool in creating new food concepts. Key to these new developments is the extruder's HTST (High Temperature Short Time) thermomechanical capabilities for the cooking of starch and proteins. High Moisture Extrusion Cooking (HMEC) is one area that shows particular promise. Developed in the early 80s, High Moisture Extrusion Cooking is an innovative technology, which Clextal has applied to the fibrillation of proteins in collaboration with PROTIAL, a Research and Development laboratory in Angers (France). The process is designed for the manufacture of products for human foodstuffs and for the petfood industry under highly competitive industrial and economic conditions. Very much part of the present-day trend of "convenience food", this process now has major potential for the development of new "meat type" products. It also helps to add value to by-products of the meat and fish industries. Clextal has developed 3 production lines, in particular, based on 3 formulae, which illustrate the sheer diversity of extruded products that may be obtained with High Moisture Extrusion Cooking :

A meatless formula designed to create vegetarian "beef" steaks.

A chicken formula : for flaked chicken.

A tuna formula : for "prime cuts" type petfood. Many other products have already been manufactured and have instant industrialisation possibilities. Clextal now offers the industry's own turnkey process : production line and skills for a production capacity of 200 Kg/h. In addition to the above,



PROTIAL can, on demand, come up with specific product developments, as well as limited series-produced items for market test purposes. The ingredients : The protein base may be of animal and/or vegetable origin. The protein content of the formulation must be somewhere between 50 and 90% of the dry weight. The vegetable protein base is generally obtained from soy or wheat, while the animal protein base comprises the white meat of chicken, rabbit, beef or pork, meal or fish pulp. Egg white, rich in protein, is also used for its powerful binding properties. Each type of protein will produce a particular type of fibrillation. In addition to the protein base, other ingredients, each playing a specific role, add to the formulation. These include corn starch, soy fibre, blood protein, dairy protein or other vegetable protein, fat, vitamins and minerals, salt, colouring and flavouring agents, anti-oxidants and preservatives.

The manufacturing process

This is an original process, which implements a twin-screw extruder and a cooled long die. **Pre-processing operations** make it possible to obtain a smooth blend of vegetable or animal protein bases. This mixture is then introduced into the twin-screw extruder before proceeding with the **extrusion cooking process**. The powder and emulsion are then blended and melted together by thermomechanical action inside the extruder and the proteins are texturised by means of a die specific to the High Moisture Extrusion Cooking process.

The job performed by the extruder comprises 3 elements : Feeding and compression, which take place along the first third of the screw, followed by plastification half

S IN THE PLATE :

enhancement, transformation, creation...

ment & Process

way along the screw and finally the feeding of the die. The die used in High Moisture Extrusion Cooking is an innovative and highly specific invention, being long and cooled. This is where the proteinic melt in fibres is texturised. Cooling is an essential element of the process, as the quality of the fibrillation depends on the changes in temperature between the product and the die.

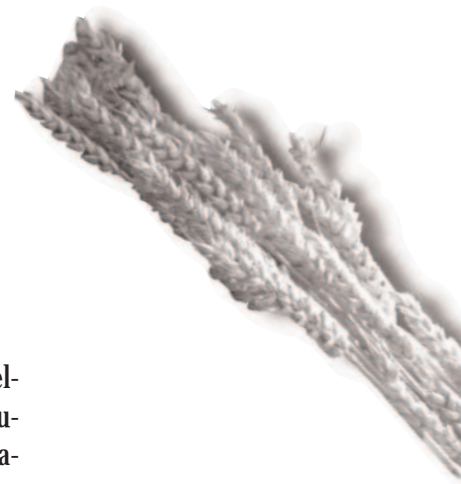
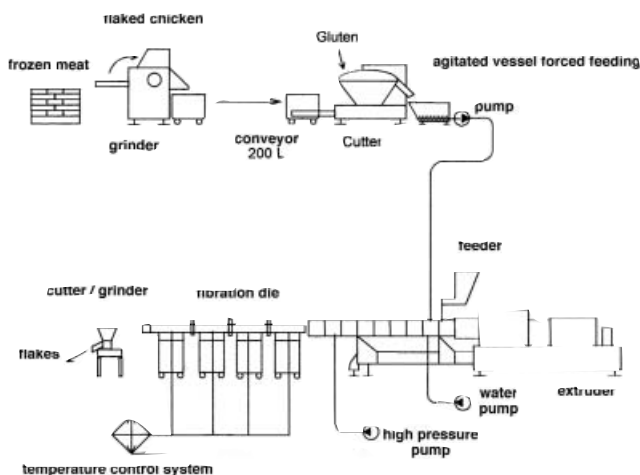
The process integrates post-processing operations: cutting and brine-cooling the product. The product emerges from the die as a strip. Different types of cutting operations are then implemented to obtain cubes or flakes using a twin-dimensional cutter equipped with special blades. Shapes can also be produced with a stamp. After being cooled in brine for 10 to 30 minutes, the product is then lightened, having absorbed the additives (salt, colouring, flavouring, vitamins or minerals) and having been rehydrated by 1 to 6% water. Offcuts may be reintroduced into the extruder: these will melt and become properly texturised.

For new food habit

The physical and tactile characteristics of the product obtained are defined

in terms of its fibrillation: non fibrous (unmelted, gel-like) or fibrous (in sheets, longitudinal in form), in terms of its surface appearance (smooth, rough, shiny, matt, even, marbled), in terms of its colour (light or dark), its texture (consistent, firm, supple, elastic), and finally its taste. The High Moisture Extrusion Cooking process guarantees product hygiene: the microbiological quality of the product is maintained throughout the manufacturing process. The process is designed for the manufacture of products destined both for human foodstuffs and for the petfood industry under highly competitive industrial and economic conditions. Clextal now offers the industry's own turnkey process: production line and skills for a production capacity of 200 Kg/h. Very much part of the present-day trend of "convenience food", this process now has major potential for the development of new "meat type" products. It also helps to valorise by-products of the meat and fish industries. In addition to the above, PROTIAL can, on demand, come up with specific product developments, as well as limited series-produced items for market test purposes.

Production line with HMEC process (200 kg/h)



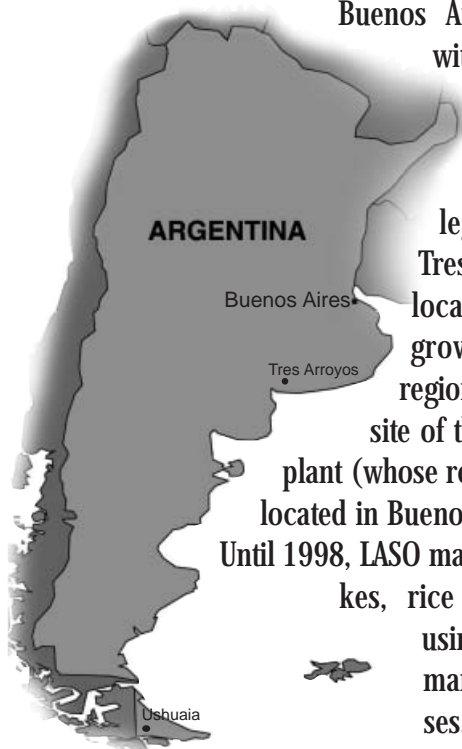


Our tour of the world continues with our achievements in Argentina, 500 Km from Buenos Aires, a capital city with all the trappings

of the "Old Continent", and 2,700 Km from the legendary Ushuaia.

Tres Arroyos, a small locality in the cereal-growing agricultural region of Argentina, is the site of the LASO production plant (whose registered offices are located in Buenos Aires).

Until 1998, LASO manufactured corn flakes, rice and puffed wheat using traditional batch manufacturing processes.



It was in May 97, at the close of a scientific seminar organised in Buenos Aires by Clextal and its Argentine representative, SOFRAR, on the fundamental concepts of twin-screw extrusion and generic processes, that contact was first made with the company. LASO, hosting the event and particularly interested in this technology, immediately realised its potential for the company's development. LASO representatives compiled a list of the different products it hoped to be able to produce by extrusion.

Confident of the Clextal teams' ability to help them in the manufacture of these products, they soon decided to install an extruded cereal production line.

The first feasibility studies were carried out after the signing of the contract, a mark of confidence in itself, at the Clextal Inc. test base in Florida. The tests were highly successful and, LASO's visit to the Tampa site marked the start of a genuine partnership between the two companies.



Clextal assisted LASO in its technological leap forward, determined to stand out from its local competitors on the breakfast cereal market.

The production line, installed in January 1998, comprises a BC45 extruder, a conveyor belt, a pinching cutter and a filling tank. All the equipment is driven by an Allen Bradley automatic control system.

The system is deceptively simple in relation to the scope of the project.

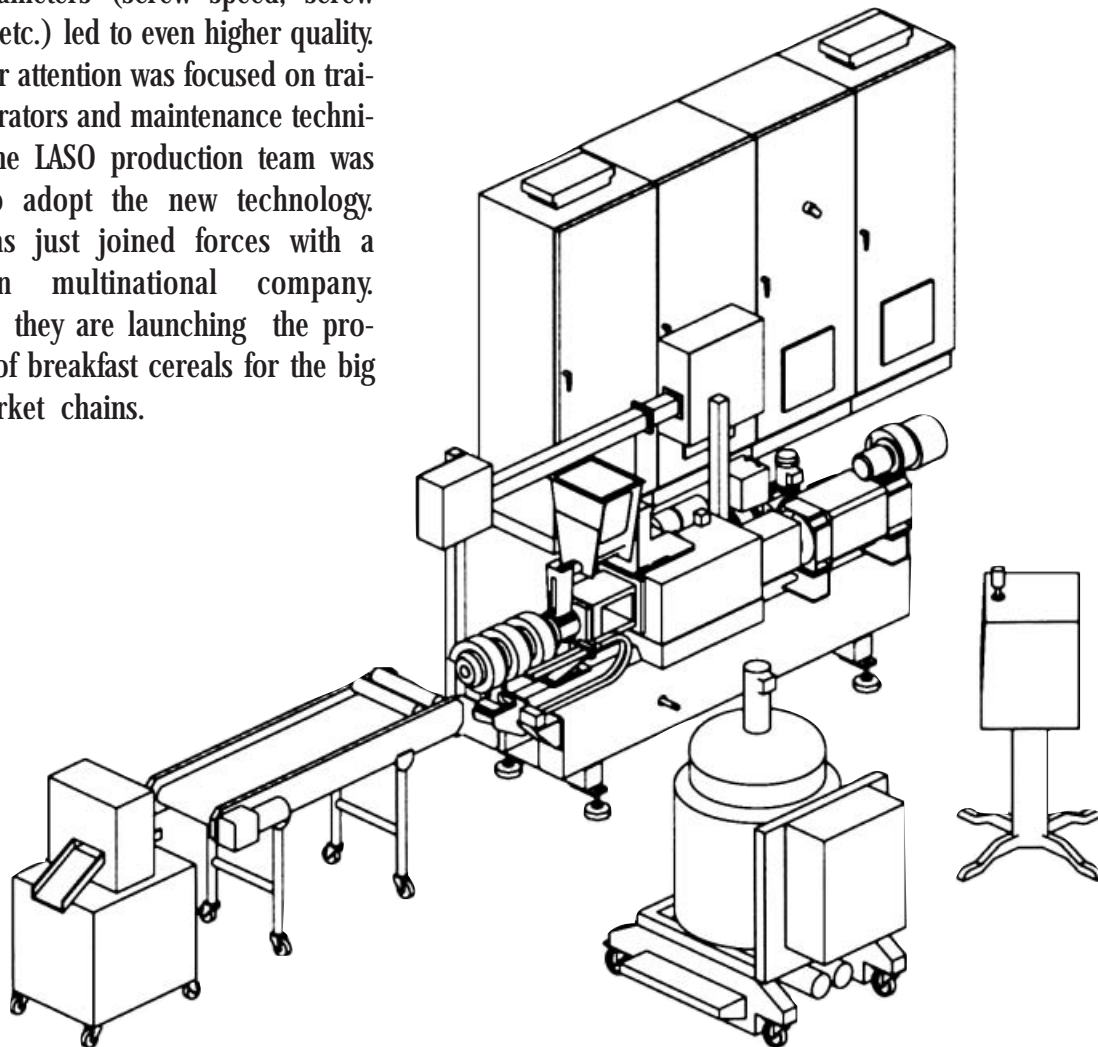
DE LA PAMPA...*

(**La Pampa cereals...*)

alizations

In fact, the purpose of Clextral's new machine in Argentina is to manufacture 7 different products: filled pillows, corn balls, rings, rice balls, health food cereals, flakes for cereal bars, 3D model animals and other items (dolphins, anchors, etc.), with an output varying between 100 Kg/h and 200 Kg/h depending on the item. Last September, at LASO's request, some of these products were given specific backing. Improvements made to certain production parameters (screw speed, screw profiles, etc.) led to even higher quality. Particular attention was focused on training operators and maintenance technicians. The LASO production team was quick to adopt the new technology. LASO has just joined forces with a European multinational company. Together, they are launching the production of breakfast cereals for the big supermarket chains.

The recent agreement enables LASO to branch out further, and improve the quality and variety of the products they offer. This success story illustrates how Clextral's twin screw extrusion expertise helps companies of all sizes to create, produce and quickly bring products to market that satisfy the needs of the consumer and the client. The LASO line currently operates 5 days a week with all the grace and fluidity of the finest Argentine tango...



Service & Maintenance

Increase the performance of your extrusion equipment with **preventive maintenance** and the **development of personnel skills**



Since 1995, experts at Clextral have been carrying out technical audits on the clients' premises.

This regular technical update, recommended once a year, provides full mechanical and electrical servicing. The service may be extended to include reports on the wear on screws and machine barrels.

A whole day is devoted to each machine, at the end of which a technical report is compiled on the client's premises. The report details the condition of the machinery and outlines recommendations and the proposed preventive action.

Available around the world, this activity has witnessed a surge in popularity, especially in Europe and America.

Apart from ensuring the machinery is kept in perfect working order, these audits represent an efficient means of training and exchanging information with maintenance personnel.

Clextral has also set up a Training Department.

Training may be carried out on the user's premises or on Clextral premises. Clextral runs courses on twin-screw processes, lasting 2 to 3 days on average.

The typical course covers a presentation of twin-screw extrusion, its technology and the assembly, operation and maintenance of the Clextral extruder.

We also offer special, scientific style training aimed at R&D personnel. Organised on demand, this type of training focuses on food products and covers:

Generic extrusion processes, raw materials used in extrusion cooking, an analysis of the extrusion process and residence time distribution, thermomechanical developments in the structure of the extruded materials, methods instrumental in the evaluation of extruded materials and extrusion process extrapolation.



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In brief...

Fairs 99 : Clextral programm

INTERPACK 99 : 6-12 May 1999
Düsseldorf-Germany

stand 1A10-15th international trade fair-packaging machinery-packaging-confectionery machinery

EUROPLAST 99 : 31 May- 4 June 1999
Parc des expositions de Paris Villepinte-France

Stand 4E19-11th international fair for plastics, rubber and composite materials.

FISPAL 99 : 8 - 11 June 1999

Sao-Paulo-Brasil

International fair for food and food equipments`

IFT 99 : 24 -28 July 1999

Chicago-IL-USA

Stand 3342-Fair for food technologies

INTERPLAS 99 : 3 - 7 October 1999

Birmingham- United Kingdom

Stand 4480

AACC "Table Top" - (American Association of Cereal Chemists) :

31 October - 2 November 1999

Seattle-WA-USA

Clextral new representatives for food & feed applications :

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The visual identity of the Framatome Group is changing, and so is the Clextral logo. The

new logo melds our two previous logos into one cohesive graphic, providing an immediate recognition that Clextral is an important member of the Framatome corporate family. The new visual identity, simplified, consists in three elements :

- The Framatome logo, "federating" symbol

- The name of the individual company

- Its belonging to Framatome