



# Clextrusion

## Summary

TECHNOLOGY

DEVELOPMENT  
AND PROCESS

REALIZATIONS

SERVICE AND  
MAINTENANCE

IN BRIEF

CLEXTRAL's sole aim is to bring you the most efficient, comprehensive and adaptable solutions to match your expectations.

CLEXTRUSION n°2 presents many innovations.

Incorporating technological improvements following our latest developments, we are introducing the EVOLUM 53 in the existing range of twin screw extruders, designed to optimize your production performance. The EVOLUM 53 will be available in different versions according to frame and torque requirements.

You will find more reasons to consider CLEXTRAL as a turnkey project supplier for your integrated projects as CLEXTRUSION introduces one of our top achievement in 1998 : a pet food line in ITALY.

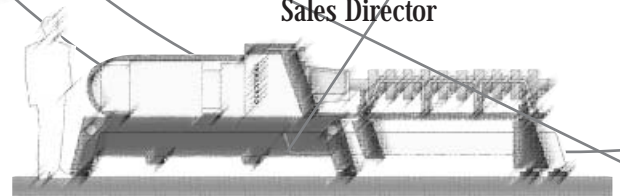
Trilobal barrel liners, described in this issue, are another good example of our internal development to increase the efficiency of your production lines and optimize your operation costs.

Patrice BREILLOT  
Sales Director

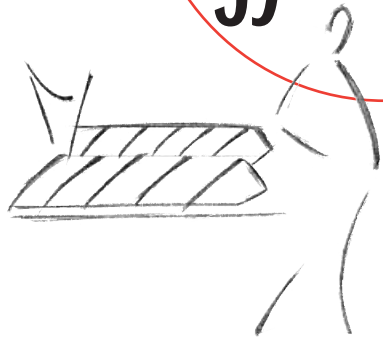
Numéro 2  
DECEMBRE 1998

CLEXTRAL

**FRAMATOME**  
EQUIPEMENTS INDUSTRIELS



# T echnology



## 10 MAJOR PERFORMANCE-

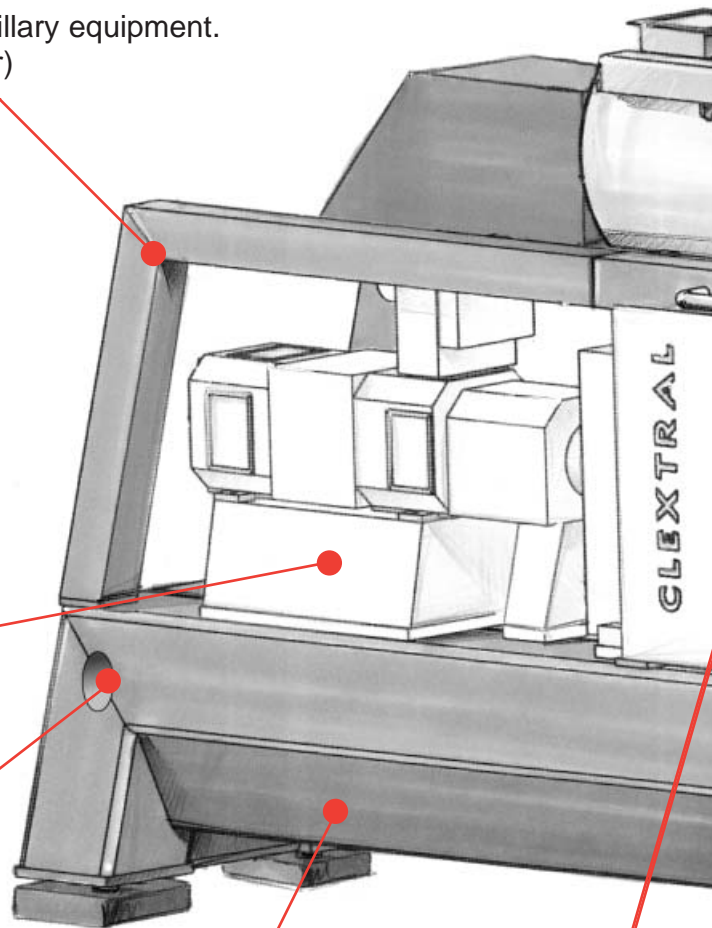
Holding platform for ancillary equipment.  
(e.g : one preconditioner)

Heightening system  
of motor for adaptation of power.

Holes to carry and handle  
the machine more easily.

Lower frame part  
standing back to  
help sanitation

Mobile board hiding  
the lub oil unit of the  
gear box



ALL WHAT YOU WANTED TO KNOW  
ON INNOVATION IN EXTRUSION  
IS NOW INTRODUCED TO YOU BY CLESTRAL WITH ...

**E** VOLUM

**HT 53**

Last born in our existing range of extruders, EVOLUM is the result of many technological innovations. Its new design makes it more aesthetic and overall more ergonomic.

Technical improvements carefully keep into consideration mechanical engineering accuracy and production cost management as well as increasing your profitability.

Its name is EVOLUM, that may remember you some latin translations but is in fact a coded name gathering 3 main themes :

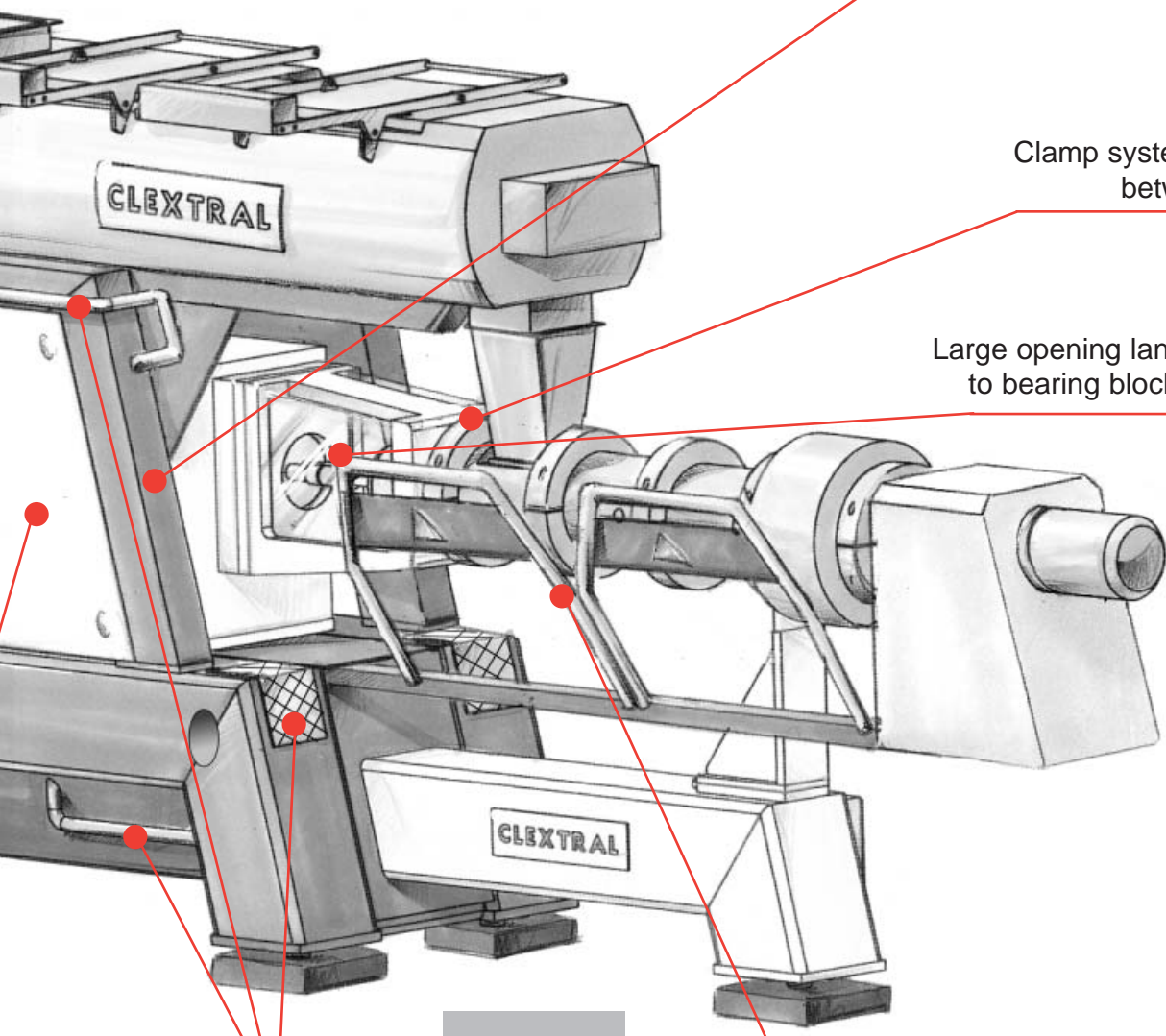
**EVOLUM** as for **EVOLUTION** for CLESTRAL dynamism and moves for the development of its products and services. (or leading to the development .....

**EVOLUM** as for **VOLUME**, our extruders producing large product volumes of various product varieties.

**EVOLUM** as for **MOVEMENT**, our extruders being modular, evolutive fitting your production goals.

In the next CLESTRUSION issue, you will find the complete technical information and specifications of this machine. It will be available early 1999, but you may get more information right now with your present correspondants at CLESTRAL.

**ENHANCING INNOVATIONS**



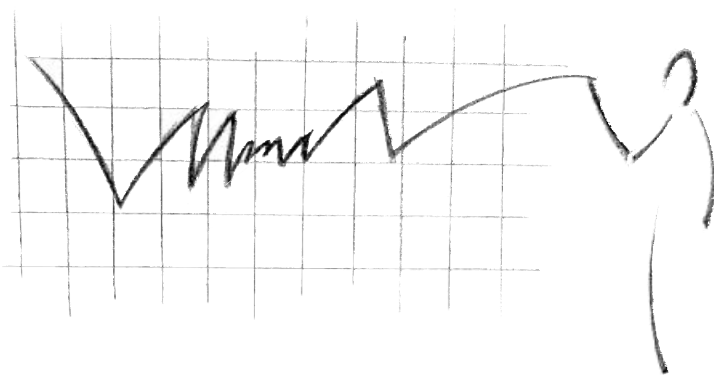
Holding frame for electrical cabinet and PLC.

Clamp system for easy dismantling between lantern and barrel

Large opening lantern to ease access to bearing block and shaft coupling

Well studied ergonomy including one step, a handrail, antisliding stainless steel safeties to climb on the machine.

Mobile stainless steel protecting unit for machine operators instead of a hard cover.



# MELTING OF THE POLYP

# D

## evelopp

### AIMS

Extrusion technology is commonly used for plastic processing.

Within the extruder barrel, conveying of the raw materials has been widely covered in scientific papers but melting still needed to be observed.

During her Master of Science at CEMEF (the Ecole Nationale Supérieure des Mines de Paris), Miss Marie-Laure DELACOUR, under the sponsorship of CLEXTRAL, carefully observed those melting mechanisms according to a strict experimental methodology and set up on this basis a theoretical model. This study enables us to deepen our knowledge of the melting phenomenon. The data will be added to the software LUDOVIC, created by CEMEF, on the energies liberated during the melting of polymers in an extruder.

Understanding the melting of polypropylene in an extruder is important in determining the screw profile and the geometry of the screw elements, on the length of the barrel and on different production parameters (for example screw speed, extruder throughput...)

### EXPERIMENTAL STUDY

Trials were carried out on three types of CLEXTRAL extruders (BC21, BC45, BC72), changing the feed rate, screw speed and profile.

The extruder was stopped, full of product ; cooled down ; samples were collected in various zones in the profile, but only in the C chambers of reverse screw elements or kneading discs.

Sample observation enabled us to differentiate four steps in the melting phenomenon:

- \* Accumulation and conglomeration of plastics granules before the reverse screw element
- \* Cohesion of pellets layers in a film at the edge of the barrel and internal densification
- \* Deformation of pellets and development of a liquid phase among plastic pellets
- \* Melting on-going and suspension of solid bodies in the liquid phase

### RESULTS

From the remaining solid phase observed along the screw elements, we can deduce the influence of the various experimental parameters on the melting phenomenon velocity. Pressure and material temperature measurements are important for those experiments as they were never done before. Temperature rises when experimental parameters are modified and increased (screw speed, machine throughput, length of reverse screw elements in the profile) increasing shearing to create viscous dissipation. Pressure rises with the variation of parameters, increasing the filling rate (throughput increment, decrease of screw speed, length and angular arrangements of the kneading discs.)

The influence on melting, due to the change of granulometries of the plastic pellets and of the change in the sizes of the machines is confirmed and the four steps previously described as well.

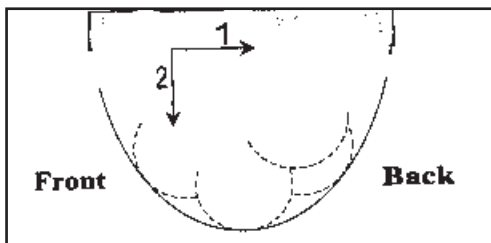
The results of those numerous experiments and the analyses of all parameters interaction will help building up a database to set up a model.



## Development & Process



1/ (Barrel opening : 5%)  
Accumulation of solid pellets in the right handed element.



2/ ( First samples : 5% )  
The melting begins close to the barrel  
Cohesion of pellet layers in the right handed element.



3/ ( Cutting and polishing : 5% )  
Deformation of pellets, liquid between pellets; sample density increases.



4/ ( Principal step : 85% )  
Suspension of solid entities in the liquid; solid size decreases.

### MODELIZATION

The assumed model enables us to follow up the temperatures of a solid pellet and of the liquid phase, study the change in radius of the pellet and the pressure along the screw profile.

The barrel is assimilated as a mobile plan, both screws are fixed, the geometry of the screw flight is a "parallelepiped", plastic pellets are non deformable spheres and the energy dispersal in the mix of solid spheres and the liquid phase cannot vary and remains global.

This model follows the sequence of direct pitch followed by reverse pitch screw elements whose geometry may vary and the starting point of melting.

Data and results from calculations are correlating those of experiments as far as residence time, pressure measurements, liquid phase temperature in the reverse pitch and solid phase remaining after the pitch obstacle are concerned.

There is a good correlation between model and experiments despite some irrelevant results and missing data for kneading discs.

### OUTLOOKS

The results of Miss Marie-Laure DELACOUR enabled the construction of a strong database and complemented the works of Miss Isabelle NOE in 1992 ("Study of melted polymer flows in a twin screw extruder"), done on a CLEXTRAL extruder as well. Simulation of this model needs to be developed after the study of remaining samples, complete data analyses (residence time, melt temperature after the restricting screw element...) and validated on other screw profiles, especially the kneading discs in order to be used for any screw profile in a twin screw extruder.



CLEXTRAL



In 1998, CLEXTRAL confirmed its role as a turnkey project supplier ; beyond the extruder and its ancillary equipment, CLEXTRAL offered a wide range of services including process formulations, and machine operator training to support our customers. Our top 1998 achievement is in Napoli, ITALY, not for italian pasta but for pet food.

among the pet food producers, RUSSO MANGIMI Spa wanted to distinguish itself from large volumes manufacturers of classical and standard shapes. Selecting a CLEXTRAL twin-screw extrusion processing line was a natural decision.



RUSSO MANGIMI Spa is a leading animal feed supplier in Italy; with this new project, they expect to change their status from pet food repacker gearing up to produce, pack and market their own products. In order to grab a significant market share

The deal and finalization of the contract were dealt briskly with CLEXTRAL's sales department within few weeks. CLEXTRAL selected leading suppliers of technologies in the field of animal feed, to complete the process line, all validated by the customer.

# HA CONVINTO I CANI E I GATTI NAPOLITANI\*

*(\*Cleextral succeeded in convincing Napolitan dogs and cats)*

## Realizations...

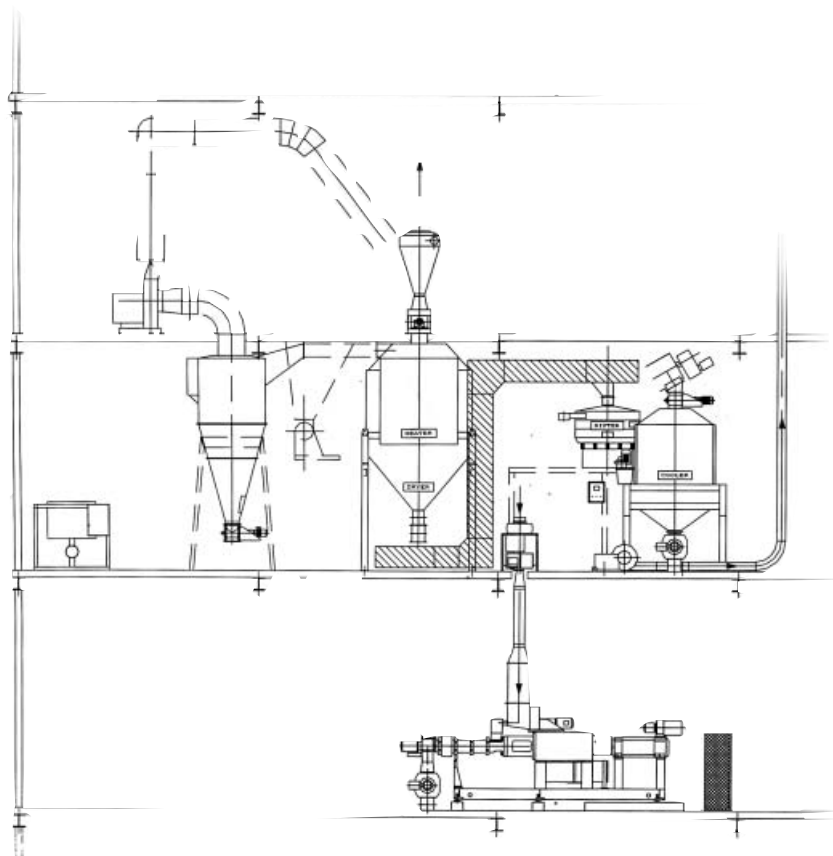
Beyond our CLEXTRAL supply, CLEXTRAL's engineering department confirmed their expertise overseeing the whole project and managing that all equipment fit together : GEELLEN for the dryer and the cooler, SOPAC for final coating with a screw system, SAFELINE for metal detection primarily in the raw materials.

Commissioning was handled by the customer. Our engineering department had also to face another subtlety of the Italians : how to squeeze a complete line in a small space and that spanned four floor levels.

Commissioning was completed within nine weeks as the customer was not in a hurry to start the line but wanted to carefully follow the start up. There were no real problem apart from some interconnections between existing equipment.

This pet food line for RUSSO now produces 1500Kg/h from three formulas in several new product shapes, achieved by CLEXTRAL's process department. The acceptance test was then signed by RUSSO MANGIMI Spa on May 1998.

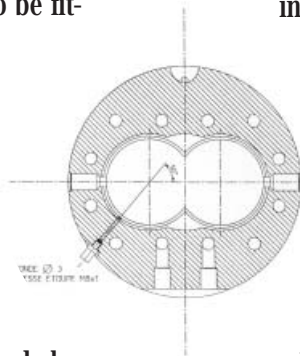
CLEXTRAL, with this new successful commissioning of a complete pet food line, once again confirms its ability to gather all its Services to fulfill such an integrated project (Process, Engineering, Industrial Realizations, Sales, CLEXTRAL Services) with comprehensive methodology, a better internal organization and the capitalization of previous successful commissioning of industrial references.



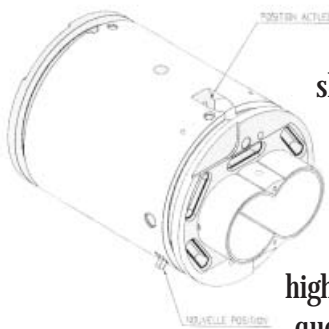
# S Service & Maintenance

## CLEXTRAL's solution to reduce wear cost on worn out barrel modules : the trilob barrel liner

Aiming to help our customers control their wear costs, CLEXTRAL Services now proposes the trilobal barrel liner. This new liner offers a cost-effective alternative to replacing worn barrel modules; it is designed to be fitted in a worn out barrel module, and is installed after barrel element refurbishing. Manufacturing is done in our workshops in FIRMINY /FRANCE.



For very corrosive and abrasive applications, CLEXTRAL Services previously offered liners made in three parts, but the fixing slide has shown limitations; the trilobal liner has a new design in three parts but cast in one piece with higher resistance to torque increase, or rough materials specifications.



This solution represents a considerable saving of 30 to 40% compared to the cost of a new standard barrel module.

The customer ships his worn barrel module to CLEXTRAL in FRANCE. Once received, we check its ability to be transformed into a liner holder by conducting a dimensional check of the internal bores and of the internal cooling circuit capacity. Once approved the worn barrel module is machined into a liner holder to fit the liner. To save time, the trilobal liner may be fitted or replaced by the user on site at their plant.

Another major improvement was implemented following recommendations by the R&D and Engineering Department : the relocation of the temperature gauge. It is now placed directly in the liner rather than in the metallic part of the module, to improve reading and utilization of this parameter. Moreover the air gap between the liner and the barrel liner holder is almost insignificant to avoid any thermal barrier effect.

This new device has been well accepted by many customers in pet food and those extruding difficult cereal mixtures on our machines.

In brief...

In 1998, CLEXTRAL Services has confirmed the increased demand for old machines screws and barrels, adaptation to new safety standards, with new electrical cabinets; then whenever it is possible, we optimize the driving unit (motor, extrusion group) of the extruder.

Big success in replacing old mecosys by new PLC systems (ALLEN BRADLEY, TELEMECANIC, SIEMENS...).

A new service engineer at Clextral Inc. In order to meet increasing customers' demands for maintenance, training, technical assistance) on Latin American markets, Mr Pedro RIVERA joined our Customer Service Department on 1st September 98 managed by Mike RHINEHART.

Jérôme MOTTAZ graduated from IUSTI in Marseille after getting his DEA in Mechanics and his PhD in Energy Mechanics joined CLEXTRAL as thermal Engineer since July 98 .

CLEXTRAL will be exhibiting on the booth # 1A10 of the next INTERPACK, May 6 to 12, 1999, in Düsseldorf, GERMANY.

The CLEXTRAL web site is forecast to be on line early 1999.



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