Information service offered to plastics & rubber technological companies by Maris SpA

N.04

JOURNAL MARIS

NEWS FROM THE COMPOUNDING WORLD

> **Minds are like parachutes:** they only function when open.
> (Quote)

INNOVATION AND CHANGE ARE CONTINUOUS PROCESSES. TRAIN YOURSELF TO "ELASTICITY"

...enjoy the reading.

SOMETIMES IT HAPPENS THAT, TRYING TO FIND THE SOLUTION OF A PROBLEM, WE ARE LOCKED IN OUR LOGICAL AND USUAL WAY OF THINKING..

...and we cannot "see" the solution just around the corner. Then, a flash of inspiration with great simplicity solves the matter. A kind of "lateral thinking", which allows you to find the solution, looking at the problem from unusual points of view.
This, for example, is the case of Dr. House (character of the famous TV series), with his brilliant insights, usually springing from inputs not strictly related to the problem to be solved.
Probably thanks to a surprising intuition, around the '30s, the idea to plasticize the PVC, lowering its Tg (glass-transition temperature) came into being.

In this way, a normally rigid material was made soft, expanding its field of application.
This was the "big-bang" of thermoplastic elastomers (TPE) universe. TPEs, as the vulcanizable elastomers, show significant deformation even under slight stress. Once removed the stress, the elastomers return to the original shape.
The elastic properties are due to the network between the polymer chains. While in the vulcanized rubbers the network is formed by chemical bonds, in the case of TPEs, physical bonds cross-link different polymers or different parts of a copolymer. From the origin of plasticized PVC, the continuous research and development led to the creation and improvement of different types of TPEs. For example, their use as "rubber replacement" finds application in different fields, such as the production of profiles, co-extruded and seals for the automotive, sports and medical sectors.

TPE Types

TPA	POLYAMIDES - TPE
TPC	COPOLYESTERS - TPE
TPS	STYRENE - TPE
TPU	URETANS - TPE
TPV	RETICULATE RUBBER - TPE
TPO	OLEFINE - TPE
TPZ	WEITERE - TPE

LET US DEEPEN TPE PROCESSES ASKING SOME QUESTIONS TO THE EXPERTS OF OUR TECHNOLOGICAL CENTER.

How does it happen the production of TPE by means of a co-rotating twin-screw extruder?

Given the wide range of materials (both from the formulations and the applications points of view), the process design is normally tailor-made and is characterized by the uniqueness of its layout. The starting point is to establish which is the elastomer used in order to find the correct process parameters to avoid its degradation while dispersing the thermoplastic part, avoiding the presence of gels in the finished product. You also need to know all the ingredients, their percentage in the formulation and, above all, their chemical and physical properties (to facilitate the oil absorption, for example). The next step is the preparation of the premix.

Does it mean that it is necessary to mix part of the ingredients in batch?

Yes, because in order to improve the dispersion and the material quality, it is necessary to let the rubber swell by the absorption of part of the oil. This step is normally carried out at higher temperatures than the room one. In such thermal conditions, the rubber tends to agglomerate; therefore, it must be cooled in order to avoid the clumping of blocks of material. These blocks reduce the free flowing of the rubber, which is necessary to obtain a constant quality of the final material. Furthermore, you can add to the premix other ingredients, such as fillers and/or polymers. Through the optimal mixing sequence and the choice of the feeding points for the fillers and the oil, the best results are achieved.

After the main feeding phase, in which other way is it possible to introduce such fillers and oils?

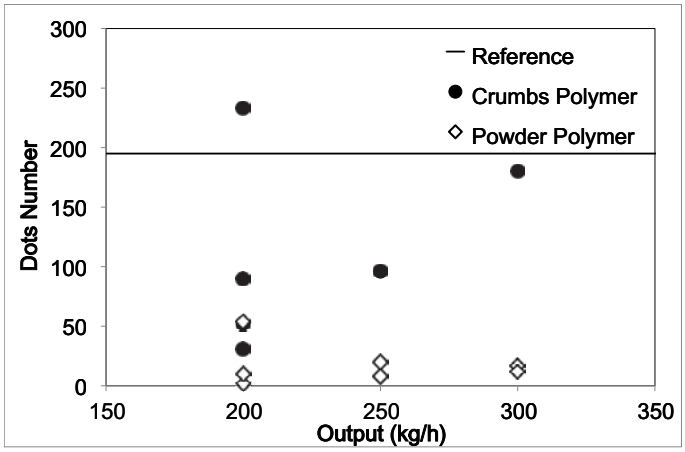
Such materials, which can be in powder or liquid forms, are introduced into the extruder by means of side feeders or injectors. In order to ensure a correct and constant feeding, a gravimetric feeding system is normally used and the use of free-flowing materials to support the continuity of the process is mandatory.

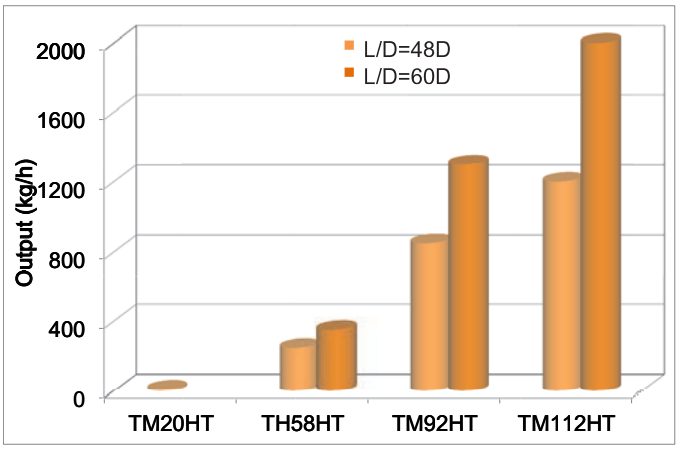
In which way the physical form of the materials can influence the quality of the final product?

From our experience, for example, if the rubber is in crumbs, it is more difficult to achieve optimal quality due to the presence of gels. In this case, using material in powder form, a good quality product can be obtained, keeping the MFR of final polymer at the same level of the original product.

In terms of line configuration, which are the proposed technical solutions?

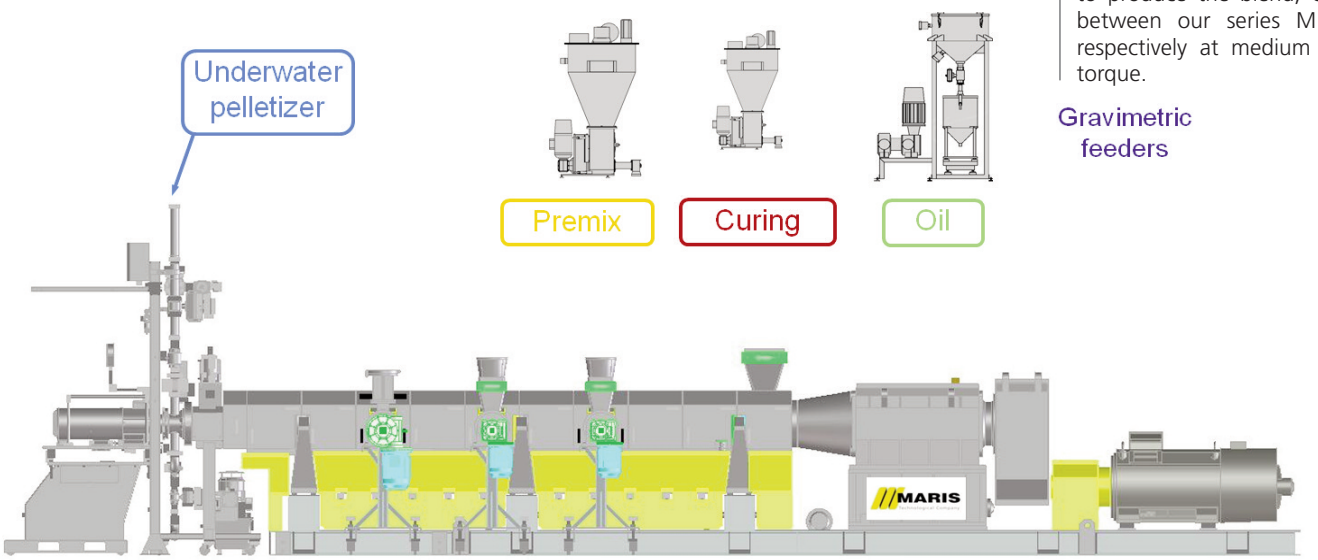
As already stated, the line configuration and the related process parameters, deeply contribute to determine the quality of the final product. For example, according to our experience with the TPV's, we have ascertained that a machine longer than 48D (which is the usual standard for the production of TPE) preserves the quality (or even, in some cases, improves it) and increases the output. A longer machine improves the entire management of the process parameters as the screw profile, the thermal profile and the screw r.p.m., achieving the optimal dispersion and crosslinking.





Among the extruders produced by Maris, which are the models that best suit the production of TPEs?

To homogenize in an optimal way this type of blends, containing elastomeric and thermoplastic materials, our experience leads us to consider the machines with D / d = 1.55, i.e. high-shear-rate, are the most suitable. Moreover, depending on the viscosity of the material, it is necessary to evaluate the required torque necessary to produce the blend, choosing between our series M or HT, respectively at medium or high torque.



EXTRUSION LINES: MACHINERY OR PARTLY COMPLETED MACHINERY?

In our first article, we dealt with the difference between a machine and a partly completed machine.
In our second article, we summarized the procedure the machinery user should follow to declare that the partly completed machine conforms to the Machinery Directive and affix the CE marking.
In this article, we go further into the description of the Essential Health and Safety Requirements (EHSRs) and the Technical File.
A detailed description of EHSRs can be found in Annex 1 of the Machinery Directive.
The manufacturer of the individual machinery (or the person assembling the line) should check the assembled machinery to ensure it meets the EHSRs and record the information in a Technical File, along with risk assessments, drawings, calculations and any other information to ensure that the machinery is safe.
In case of individual machinery, the Technical File as per Annex VII of the Machinery Directive is property of the manufacturer. The Technical File may not be available in a hard-copy form. All the information "must be made available to the competent authorities of the Member States for at least 10 years following the date of manufacture of the machinery. It must be capable of being assembled and made available within a period of time commensurate with its complexity by the person designated in the EC declaration of conformity". In this case, the End user has no right to ask the manufacturer to supply a copy of the Technical File, as affixing the CE marking and issuing the EC declaration of conformity are the proof that the manufacturer comply with the Machinery Directive.
When machines are linked together to create a production line or complex assembly, the person assembling the line has the responsibility for the CE marking, and should create a Technical File, address the EHSRs, carry out risk assessments and ensure that the machines, and the interfaces between machines, are safe and compliant.
There are many things to be considered: for example, how safety functions are connected on a number of machines, how the emergency stop system works, how interlocks work, and how to ensure that the complex assembly is safe to use. This requires discussions and design reviews with users, designers and integrators to develop a functional safety specification.
The person assembling the line should check the relevant European Normative (EN) standards to ensure that the functional safety of the equipment is assessed correctly and then validated. At the end of this process, a report should be issued as part of the Technical File. The end user has the responsibility to make the Technical File available to the competent authorities of the Member States for at least 10 years following the date of final assembling of the line.
End users should also be considering items such as consistency of control and cable colours. For example, the preferred colour for a "start" control is white, while the preferred colour for "stop" is black. Many machines come with green "start" and red "stop", which is acceptable within the standard; however, where there is a complex assembly of machines, consistency should be applied across the system. End users also need to ensure that machinery across their sites have consistent colours, especially where operators often use different machines. Consideration should also be given to makes of components for maintenance consistency, types of guard fixings, to ensure operators are not provided with tools that allow them to dismantle parts of the machinery they should not have access to.

In addition to the above items, the end user should consider all the risks involved during maintenance operations, which will be discussed in our next article.

...to be continued.

The Machinery Directive 2006/42/EC can be downloaded from: http://ec.europa.eu/enterprise/sectors/mechanical/documents /legislation / machinery/index_en.htm

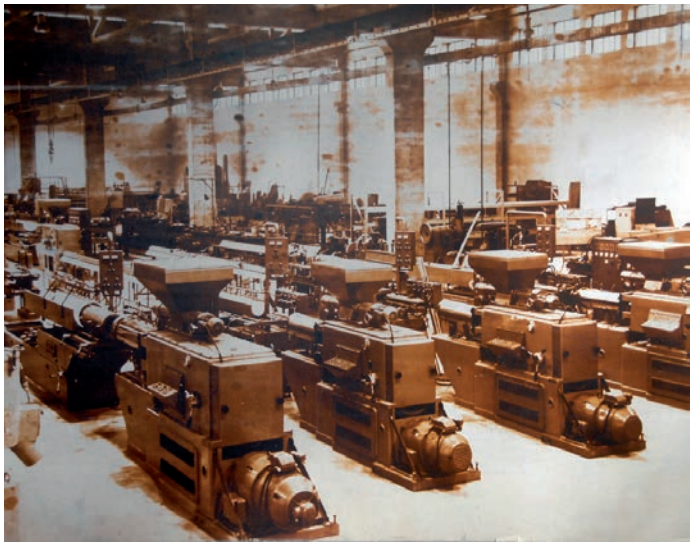
The Guide to application of Directive 2006/42/EC can be downloaded from: http://ec.europa.eu/enterprise/sectors/mechanical/documents /guidance/ machinery/index_en.html

MANUFACTURING OF ALL MAIN COMPONENTS:
SUPPORT AT ANY TIME
AND LONG LIFE MACHINERIES
ARE ENSURED.

Since the beginning of its foundation, the company's philosophy has been independency from third parties for the production of core components of the extruders. The result is that Maris owns 100% of its technology and handles directly every phase of the production of its extruders.

Thanks to the use of advanced production processes, Maris manufactures, entirely inside the company, gearboxes, barrels, screws and screw-shafts that are the core of the machine. Special attention is given to the research of new construction materials, to be used in order to improve the performance of its extruders. Acquisition and development of the most appropriate technologies, constant evolution, extensive know-how and strong expertise, have brought the company to produce a wide range of co-rotating twin screw extruders; besides, even by the customization of the lines, it is definitely possible to meet all the current process requirements in the market…
An important benefit that comes from the in-house production of all main components is the supply of spare parts for very old or even out of production models. In fact, the equipment used for their construction and the relevant drawings are still available and held by Maris.

In this way, it is possible to satisfy the demand of spare parts also for extruders produced in the last 40-50 years, without the need of external suppliers that, likely after decades, could be no longer active. Maris can also refurbish very old extruders in compliance with the latest and most updated regulations.
On all spare parts production the newest material-processing-technologies and treatments are applied in order to make them even more performant than the original ones.
Some examples of how we reach these goals follow.
Gearbox repair: a 120 mm size machine has been working since year 1985 for the production of crosslinkable materials. The shafts have been damaged because of a wrong modification of power, made by third party; despite this, we manufactured new shafts and made the complete overhaul of the gearbox, restoring it to the original conditions.



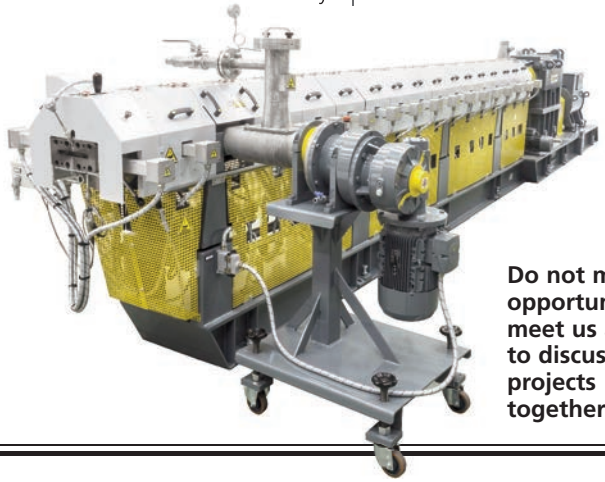
Screws and barrels refurbishing: On an extruder (125 mm size) originally manufactured in 1987 for the production of filled compounds, all the process components have been recently replaced. After so many years of production, screws and barrels were still the original ones and, after a survey of our technician, it was realized it was time to replace them. New parts have been produced and, during a scheduled shutdown of the line, screws and barrels have been totally replaced.
In the same way, on a 70 mm extruder of 70's for the production of PVC rolling shutters, still in use in the production line, a complete overhaul has been performed, bringing the extruder close to original and definitely optimal process conditions.

WELCOME TO K 2016!

The World's No. 1
Trade Fair for Plastics and Rubber "K 2016" is ready to open its doors in Düsseldorf from 19th to 26th October, 2016

For this event, Maris has been assigned a booth of 170 sq. in the Hall 16, stand number 16B59. Our commercial and technical staff is eager to welcome you at our booth, where a highly impacting machine, part of our production range is shown. It is an extruder model TM112HT/64D, having a length of almost 13 meters!

This extruder offers complete versatility and, depending on the final configuration, it is suitable for a number of different applications. In this specific case, the extruder is configured for a new and innovative process of vulcanized rubber recycling, producing a plastic material that could be re-entered in the productive process of new products. Our staff is glad to have the possibility to show you its potentialities and its advantages.



Do not miss the opportunity to meet us and to discuss new projects together!

EXHIBITIONS, CONGRESSES AND CONFERENCES IN 2016

PLASTIMAGEN 2016
Mexico City / Mexico on March 8th to 11th, 2016

IRANPLAST 2016
Tehran / Iran on April 13th to 17th, 2016

CHINAPLAS 2016
Shanghai / China on April 25th to 28th, 2016

12TH CHINA INTERNATIONAL BATTERY FAIR
Shenzhen / China on May 24th to 26th, 2016

ARGENPLAS 2016
Buenos Aires / Argentina on June 13th to 16th, 2016

IX CONGRESS FOR RUBBER INDUSTRY IN POLAND
Warsaw / Poland on June 23rd, 2016

FEICA CONFERENCE 2016
Vienna / Austria on September 7th to 9th, 2016

K 2016
Düsseldorf / Germany on October 19th to 26th, 2016

INNOVATIONS IN PLASTIC DESIGN
London / UK on December 7th and 8th, 2016

… to the next!

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