

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



N.03

JOURNAL

# MARIS

NEWS FROM THE COMPOUNDING WORLD

Coming together is a beginning; keeping together is progress; working together is success.

(Henry Ford)

**TOGETHER WE STICK THE WORLD**  
..enjoy the reading.

Our Company is glad to introduce the third edition of our "Maris Journal". In line with the previous ones, we wish to discuss some technical issues related to specific processes and applications and to share with you the new technologies we have developed during our activities ...to be continued.

**CREATIVE PEOPLE ARE ABLE TO COMBINE IDEAS, VALUES, ENERGY AND TO TURN THESE INTO SOMETHING INGENIOUS AND CONCRETE.**

**W**e remember Mr. Henry Ford who made his idea come true: an affordable car for all, for any class of people! He was able to cut the production costs and this was a success. He was a charismatic leader, able to act as a "glue" between different ideas and solutions. In the same way, in everyday life, the glue consists in the so-called "adhesives", composed of a number of ingredients having different chemical-physical features. These ingredients are mixed together to produce a homogeneous material able to create a synergy between the different elements. Adhesives are contained in most of the objects around us: under our feet, in our clothes, in our smartphone, in our car, our furnishings, and so on. For this reason, these products have to be highly diversified, depending on their specific use and highly performing.



Henry Ford with 1921 Model T

One of the instruments to produce this type of material at high technological content is the co-rotating twin-screw extruder.



Maris started in the early 70's to approach the world of adhesives, reaching step by step, the position of world leader as producer of specific co-rotating twin-screw extrusion lines for this field of application.

**On the subject of machineries and processes for the production of adhesives, we ask some questions to the experts working in our Technological Center.**

**Why use a co-rotating twin-screw extrusion line for this type of application?**

**T**here are three different advantages: the first one is that Maris extruder is modular and runs in a continuous process. This type of work improves the reproducibility of the product features, granting a constant quality of the adhesive produced. The second one concerns the screws geometry; thanks to the self-cleaning shape of each screw element, it is possible to process sticky mate-

rials changing the formulations without wasting material during the machinery cleaning. Last but not least, the residence time inside the extruder is very short and therefore, the risk of thermal-degradation is dramatically reduced, compared to the batch process.

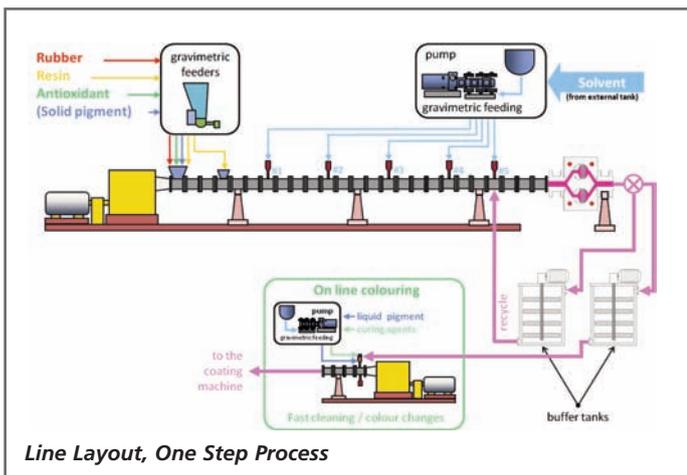
**Which is the most used system for the production of adhesives?**

While in the past the adhesives were mainly produced with discontinuous systems (batch), now the co-rotating twin-screw extruders are being used more and more. It should be kept in mind that the discontinuous systems involve a number of complications and critical issues in terms of both the product quality and the safety at the workplace. At this point, two examples can be useful: the Hot Melt Pressure Sensitive Adhesive (HMPSA) and the Solvent Based Adhesives. HMPSA are materials, which need high temperatures to be melted. An organic substance left in such thermal conditions and in an open container, produces oxidation phenomena, resulting in molecular weight variations inside the same stock of material. In this case, using a co-rotating twin-screw extruder to produce HMPSA improves the quality of final product. As far as the Solvent Based Adhesives are concerned, the advantages are in terms of safety. In fact, the co-rotating twin-screw extruder collects the solvent in a closed system, reducing the solvent released into the workplace and

Visit our **NEW WEB SITE** click on **www.mariscorp.com**

Subscribe to receive next editions of Maris Journal, as well as the newsletters.





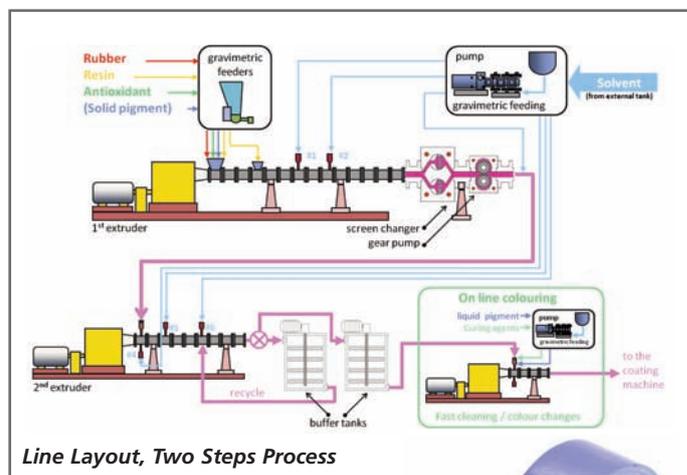
**You have mentioned flexibility. How does the co-rotating twin-screw extruder reach a better flexibility?**

For example, during the two-steps production process of Solvent Based Adhesive, the first extruder processes the solid components of the recipe, with just little quantity of solvent. In the second extruder, it is added the quantity of solvent required by the final recipe. The shear-stress conditions of the material inside the two extruders are quite different, allowing better flexibility operations in terms of materials choice and output.



lines, complete with the necessary equipment. The first step for the organization of the trials is to identify, together with the custo-

For the HMP SA, the flexibility of our extruder concerns the resin feeding: the total amount of



resin can be injected in different sections of the barrel. Thanks to this solution, the number of workable recipes can be increased using a single production line.



**Which are the new trends in adhesives production?**

The interest for the so-called "Total Solid Adhesives" is increasingly growing. These adhesives are based on natural rubber without solvent. This type of adhesive can be produced with our machines, too, and we have already tested some recipes with our customers.

mers, the most interesting formulations. At this point, as soon as the samples quantity to be produced has been defined, we will prepare the correct line configuration for the tests. The customer will be involved during each step and can be present. At the end of the tests, together with the samples, we will share all the process parameters of the tests. It is therefore an experience of absolute and constructive sharing of information and data, which leads to professional growth for both parties involved in the project; in this way, success is guaranteed!

**How does Maris Technological Center support the companies for developing new projects? Is it possible to carry out some tests?**

Our Center is at complete disposal to carry out process trials using our customers' materials. We are ready to support each type of project thanks to four

into the atmosphere. The final result is less pollution and reduced costs of solvent recovering. It should not be forgotten, finally, that a batch system requires numerous manual operations, as well as cleaning and reproducibility difficulties.

**The example concerning the Solvent Based Adhesives is very interesting and well worth further attention. How does Maris co-rotating twin-screw extruder realize this process?**

We have developed and patented two different processes. The first one, a single-step machine, is certainly an out-of-the-ordinary system! This extruder has a length of 100 L/D, compared to the average length of the extruders, which is normally between 40 and 52 L/D. The further development of this system is a two-steps machine, resulting in higher production flexibility and production capacity.

Both processes have been tuned together with a long-time customer for HMP SA. In their plant, we have installed two new lines for the production of Solvent Based Adhesives, replacing the outdated batch systems. From the quality point of view, the adhesives produced are comparable with those produced with the

batch system, with the further advantage that all types of natural rubbers can be processed with a reduced quantity of solvent (with positive effects on environment and workplace safety, as well as costs saving). Furthermore, the system is fully automatic: from the mill, which reduces the natural rubber to a size suitable for the extruder feeding, up to the coating machine.

**The natural rubber has different properties depending on its geographical origin and the characteristics may be related to seasonal factors; how is it possible to keep constant the final product properties?**

The key point is to keep the viscosity constant. This can be done by means of an on-line rheometer, which continuously monitors such property. In this way, the operator can adjust the process parameters, such as the solvent distribution and the screw speed, in order to keep the viscosity required. Therefore, the quality of the material entering the coating machine is always constant.

**This suggests that the operator intervention is minimal.**

Exactly. Of course, the simultaneous presence on the line of different machineries working together requires suitable attention levels and monitoring. However, the effort of the operator is quite reduced.



## EXTRUSION LINES: MACHINERY OR PARTLY COMPLETED MACHINERY?

In our first article, we dealt with the difference between a machine and a partly completed machine, underlining the fact that, in case of a partly completed machine, being the machinery user the person who incorporates into or assembles with other machinery the partly completed machinery, it is the customer's responsibility to affix the CE marking to the assembled machinery. The above is not just a matter of arranging a plate according to the Machinery Directive; in fact, CE marking is a process that must be followed to ensure that assembled machinery meets the Essential Health and Safety Requirements (EHSRs) detailed in Annex 1 of the Machinery Directive. The machinery user 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 meets the EHSRs and it is safe. If a new machine is being created from a complex assembly

guarantee the machinery user that the machinery is safe. For this reason, in case of a machinery created from a complex assembly of machines, Maris suggest the machinery user should appoint either one of the supplier of the machines or, better, a third party to coordinate the different manufacturers and to perform the whole CE marking process. This is a costly procedure, but failing to do so could lead to an insufficient protection for the workers, causing serious troubles in the future. For a better understanding of what the CE marking process means, let us consider the simple case of a customer that, for any reason, buys a Maris extruder without the control board, which is designed and assembled by another company. In this case, Maris provide the customer with the Declaration of Incorporation (DoI), listing all the Essential Health and Safety Requirements (EHSRs) of the Machinery Directive applied and fulfilled. In addition, Maris provide the customer with the Instructions for incorporation. These Instructions contain all the information for the correct design of the control system: which kinds of alarm are needed for a safe running, how the emergency stop



of machines, the CE marking process is very challenging. In fact, the machinery user needs to assess the hazards created by linking the machines, remove or reduce to the minimum possible level these risks, create a Technical File for the complex assembly of machines (not just a collection of individual manuals), prepare adequate use and maintenance instructions for the assembly, and issue a Declaration of Conformity when the equipment is safe. This process requires to consider all the risks of the machinery: mechanical, electrical, chemical, explosion, etc.; therefore it is very unlikely that one expert alone can

system works, how interlocks work, etc. The information should be transmitted to the control board designer who, following the European Normative standards (EN standards), designs and validates the control system to ensure the functional safety of the equipment. Compliance with these standards requires experienced electrical engineers who understand the basics of functional safety. This process results in a report that should be part of the Technical File, which is responsibility of the end user to record and keep for the whole life of the machine. If the equipment is modified in the future, the whole




### LINES FOR ADHESIVES

#### Stick with Maris!



MARIS

**State-of-the-art Co-Rotating Twin-Screw Extruders, for continuous production of quality adhesives, including:**

- HOT-MELT
- TOTAL SOLID
- SOLVENT - BASED
- INDUSTRIAL

CE marking process may need to be performed again. It is easy to understand that even in the simple case described above, the customer bears all the responsibility described by Article 5 of Directive 2006/42/EC and, therefore, is responsible for any accident that may be caused by lack of communication between the different manufacturers.

**In the next article, the EHSRs and the Technical File will be further analysed.**

...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](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](http://ec.europa.eu/enterprise/sectors/mechanical/documents/guidance/machinery/index_en.html)

## CASE HISTORY: POLYOXYMETHYLENE PRODUCTION USING REACTIVE EXTRUDERS

At the end of the 80's we received a very important and challenging request: to test our co-rotating twin-screw extruder as a "reactor" extruder, for the continuous Polymerization of Acetalic Resin (POM). This idea was born by a group of chemists from a North Eastern European Research Institute. The process they wanted to obtain by our "reactor" extruder was to feed a certain number of monomers in liquid form and to achieve, at the end, a polymer.



The test done at our Technological Center with the Lab. twin-screw "reactor" extruder was giving promising results. This was also possible due to our previous experiences in "reaction extruders" for other kind of process, always starting from liquid monomers for obtaining the proper reaction and a good polymer.

- After many other tests, the first production line was put into operation with very satisfying results. From that moment, other important tasks have been achieved. These "Reactor" extruder lines are composed by two extruders in cascade. The first one, acting as a chemical reactor, is performing the most important task: to transform liquids into crystalline polymer. After the polymerization, the powder goes to an intermediate phase, where polymer is grinded, dried and the catalyst is deactivated.

- The final step is the thermostabilization and granulation, achieved in the second twin-screw extruder, where the POM is degassed to remove the unstable fraction of the polymer (some special vacuum pump are used for this opera-

tion). These lines are installed next to the chemical plants for having constantly access to raw materials.

- Very important results have been achieved in this sector and a considerable number of lines have been installed. Our "reactors" twin-screw extruders are recognized as one of the best solution for continuous production of POM



## PLAST EURASIA 2015 EXHIBITION

ISTANBUL,  
December 3rd to 6th, 2015

THE EVENT WAS  
CONFIRMED AS A RECORD  
EXHIBITION FOR BOTH  
VISITORS AND EXHIBITORS,  
BECOMING A MEETING  
PLACE OF STRATEGIC  
IMPORTANCE.



Maris were very pleased to be part of the fair with its own booth, showing the laboratory extruder model TM20Hi-Tech. The features of flexibility and reliability of this machine caught the interest of many visitors.

All the customers were welcomed by our team, with the precious support and co-operation

of the company Enpa Endustri Kimyasallari ve Ekipman Pazarlama Ltd. Sti. (representing Maris on Turkish market).

## K 2016 – EXHIBITION PREVIEW

**K 2016, the World's No. 1**  
Trade Fair for Plastics and Rubber will be held in Düsseldorf from 19th to 26th October, 2016.



With its almost 3.300 exhibitors on an area of more than 170.000 sq., K 2016 will be again the biggest event for the industry and the starting point for economic decisions about products and processes. The event is expected to attract around 220,000 visitors from over 100 different countries, because when you plan to do business in the innovative plastics and/or rubber industry, the foremost platform worldwide is K. For this exhibition, Maris have

been assigned a booth of 170 sq. in the **Hall 16, with stand number 16B59.**

...hope to meet you there!



C.so Moncenisio, 22 / 10090 Rosta (TO) Italy  
Tel. +39 011 9567925 / Fax +39 011 9567987  
info@mariscorp.com / www.mariscorp.com  
Editorial coordination: Maris spa