



Polymersan LLC - Company Presentation (Extrusion)

The Polimersan Group is an integrated thermoplastic stock-shapes manufacturer:

- The company was founded in 1980 and remains an independently owned family business
- The American facility, Polimersan LLC, was established in 2008 to build our US exposure
- Our core activities encompass the manufacture and supply of engineering plastic stock-shapes
- We are committed to outstanding service at all levels of the company

The following presentation provides a general overview of our company and capabilities:



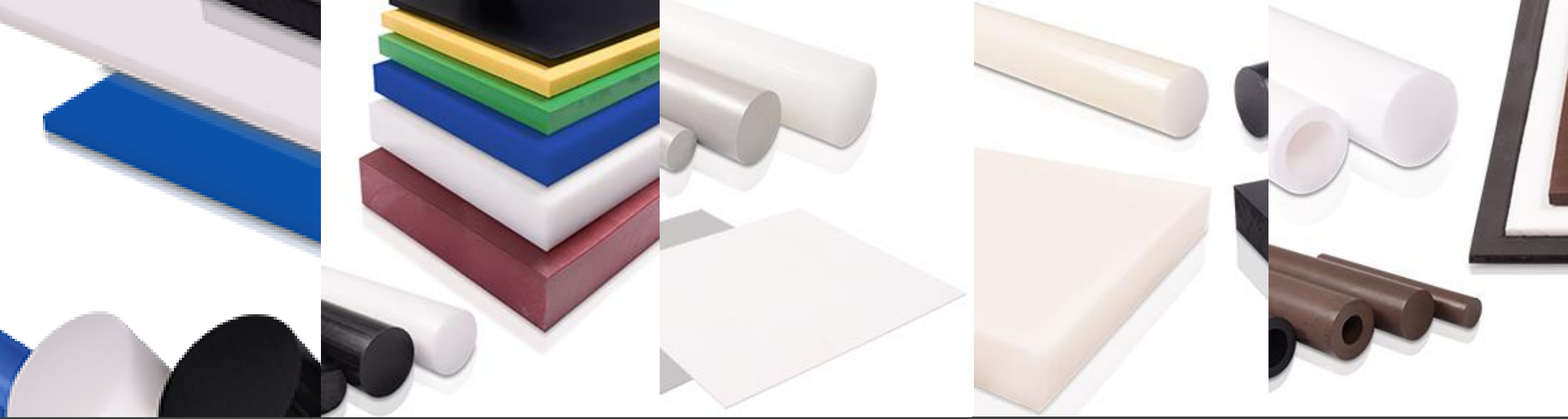


Primary International Locations

Polymersan has become a truly international supplier of semi-finished plastic stock-shapes:

- Polymersan LLC: 1181-B SE 9 TH. Terrace, Hialeah, FL. 33101 USA
- Polymersan SRL: Via Stelvio, snc – 25038 Rovato (BS) , ITALY
- Polymersan TOPÇULAR Topçular Mah. Rami Kışla Cad. Tikveşli Sok Emintaş 3.San. Sit. No:1-85/87 Eyüp/Istanbul, TURKEY
- Polymersan AS: Orta Mahalle Universite Cd. 29 Orhanli-Tuzla, 34956 Istanbul, TURKEY
- Polymersan IMES Y.Dudullu Mah. İmes San. Sit. A. Blok 106. Sok. No:4 Ümraniye / İSTANBUL





Product Portfolio (Extrusion)

Our extruded thermoplastic stock-shapes range (rods, sheets and tapes):

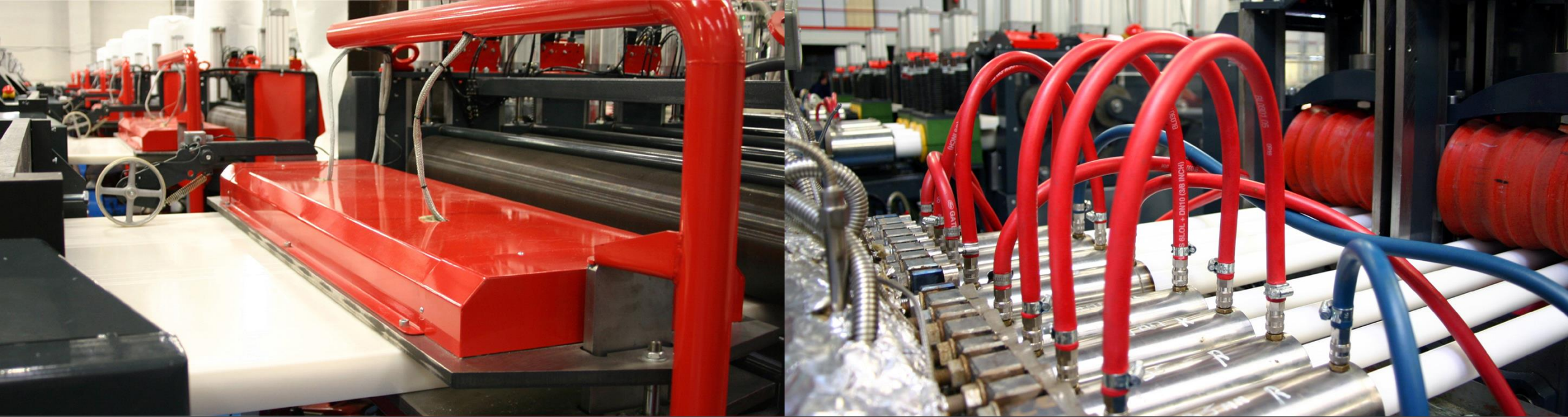
- Politef PTFE
- Polipom: POM
- Polipa : PA6
- Polipolen: HDPE
- Poliproblen PP
- Polikes PA6G



Product Size Range (Rod & Sheet)

Extensive rod-length and sheet-size options according to below diameters and thicknesses:

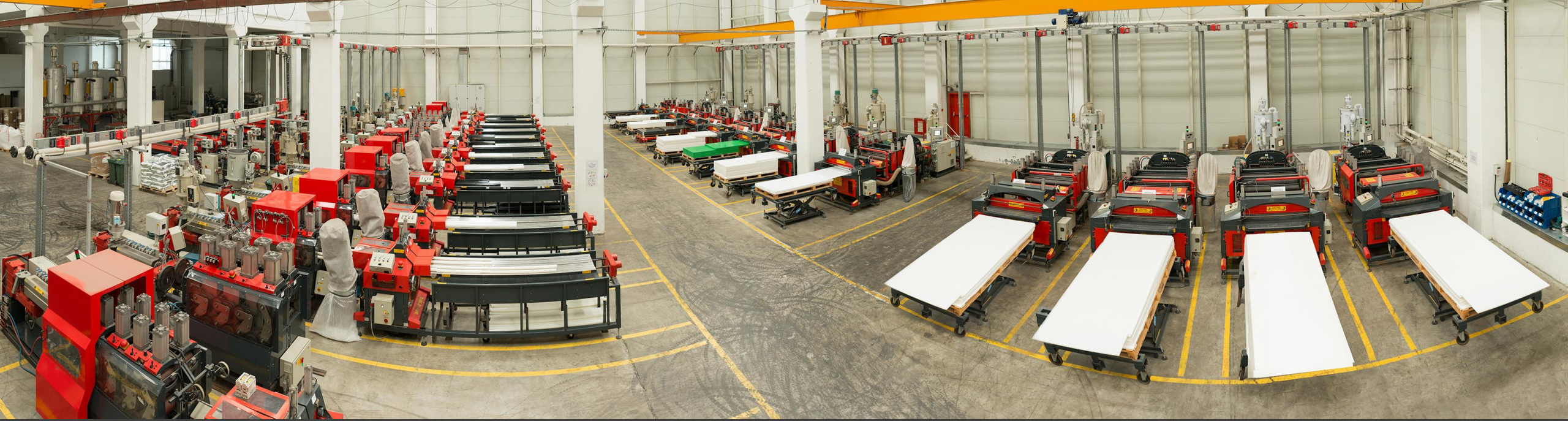
- | | | |
|--------------------|-----------------------------------|-------------------------|
| • POM: | Rod \varnothing 0.313" – 13.75" | Sheet = 0.313" – 4.750" |
| • PA6 & PA66: | Rod \varnothing 0.625" – 8.00" | Sheet = 0.375" – 2.000" |
| • HDPE, HMPE & PP: | Rod \varnothing 0.500" – 13.75" | Sheet = 0.040" – 4.000" |
| • PTFE | Rod \varnothing 0.313" – 6.25" | Sheet = 0.120" – 3.125" |



Primary Process – Rod & Sheets Extrusion

Many Polymersan semi-finished stock-shapes are manufactured using the extrusion process:

- Thermoplastics are relatively easy to form, melt and recycle, making them ideal polymers for extrusion
- Extrusion is a continuous and extremely efficient method of manufacturing thermoplastic stock-shapes
- Plastic raw materials are melted and formed into continuous streams of rod, sheet and or tube profiles
- Each of our automated lines are design to produce specific dimensions at optimum outputs



Processing Know-How:

Extruding engineering polymers requires an in-depth understanding of both polymer and process:

- The combination of high production temperatures and sensitive raw materials means that the entire extrusion process must be under complete control at all times
- Our extrusion departments are planned and purpose built to provide continuous-flow manufacturing
- All elements of our manufacturing process are disciplined to ensure mass production of quality materials



Extruded Rod

Polymersan produces rods from 0.25" \varnothing to 13.75" \varnothing across a variety of technical polymers:

- Our rods are ultrasonically tested both during and after the manufacturing process
- All rods are available in both imperial and metric dimensions
- Standard colors are natural and black with virtually any color available upon request (note MOQ)
- Our acetal rods are produced porosity-free





Rod Extrusion

The basics of how our polymer rod extrusion process works:

- Our process starts with the feeding of dried polymer raw material (RM) from a hopper into the barrel of the extruder
- The RM is then taken to a molten state by a combination of heating elements and screw generated shear
- The extruder then forces the liquid polymer through a heated distribution manifold, splitting the polymer stream
- Jacketed tools (or dies) are connected to the heated manifold to accept the divided polymer streams



Rod Extrusion (Continued)

The basics of how our Polymer rod extrusion process works (continued):

- The tools have specific internal dimensions and act to cool / solidify the polymer to the desired diameter
- The now solid rods pass through driven rollers to provide tension (or back pressure) on the extrusion line
- This breaking system, called a haul-off, is essential to control die fill, output speed and material quality
- Finally, an automated circular saw is activated to cut the rods when they reach their desired length



Small Diameter Extruded Rod

Polymersan small diameter rod is available in all standard grades:

- Our smallest lines produce 8 rod strands between \varnothing 0.25" – 0.375" or 4 strands or \varnothing 0.50" – 0.875"
- Our small lines produce 4 rod strands between \varnothing 1.00" – 2.00"
- Rod lengths from 48" to 120"
- The smaller lines are also employed to perform processing research and product development work





Mid Diameter Extruded Rod

Polymersan mid diameter rod is available in all standard grades:

- Our mid sized lines produce 4 rod strands between \varnothing 2.00" – 3.00" or 2 strands or \varnothing 3.25" – 6.00"
- Left and right hand strands can differ in diameter
- Rod lengths from 48" to 120"





Large Diameter Rod Extrusion

Polymersan large diameter rod are available in all standard grades:

- Our large lines produce 2 rods strands between \varnothing 6.25" – 12.00"
- Our largest lines produce 1 rod strands between \varnothing 12.25" – 13.75"
- Rod lengths from 48" to 120" (note maximum handling weight restrictions apply)



Extruded Sheet

Polymersan produces sheets from 0.040” to 4.75” thickness across a variety of technical polymers:

- All our sheets are ultrasonically tested both during and after the manufacturing process
- All our sheets are available in imperial and metric sizes
- Standard colors are natural and black with virtually any color available upon request (note MOQ)
- Our acetal plates are porosity-free





Calendar System Extrusion Line (Sheet)

The basics of how polymer calendaring works:

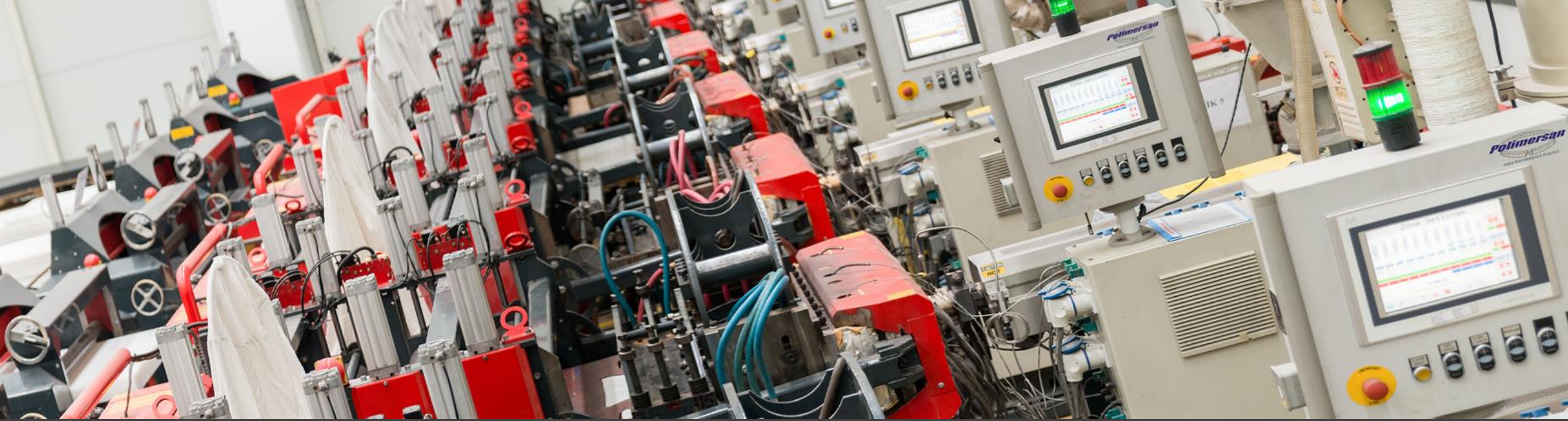
- Like our general sheet extrusion line, the process employs an extruder and die before differing downstream
- The downstream involves passing / squashing the heat softened polymer between three chilled rollers
- The sheet's final thickness is created dependent mainly on the gap between the last two rollers employed
- The thickness range for Polymersan's calendered sheet is 0.04" up to 1.00" in our PE and PP grades



Calendering - Advantages & Efficiency

The basics of how polymer calendering works (continued):

- The now solidified polymer sheet is continuously conveyed to the end of the sheet-line
- At this point, circular saws trim the sheet's width and length according to required dimension.
- The major benefits include achievable high output speeds, reduced stress, high tolerance thin gauge thicknesses (from 0.04"), accurate thickness tolerances and variable width capabilities (up to 60").



General Sheet Extrusion

The basics of how our polymer general sheet extrusion process works:

- Our process starts with the feeding of polymer raw material (RM) from a hopper into the barrel of the extruder
- Energy generated by the extruder's screw and heaters positioned along the barrel melts the raw material
- The molten RM is then forced into a die, which forms the liquid polymer into the shape of a coat hanger
- The still molten RM stream is then forced into a cooling tool which forms the desired thickness and width



General Sheet Extrusion (Continued)

The basics of how our polymer general sheet extrusion process works (continued):

- The cooled and solidified sheet is steered and fed through a system of driven rollers called a haul-off
- The haul-off is used to provide tension on the extrusion line which is essential to pressurize and fill the tools
- Acting as a driven break, the relationship between the haul-off and extruder provides control to the system
- On exiting the haul-off, the cool sheet passes through an in-line heater to de-stress the sheet before cutting

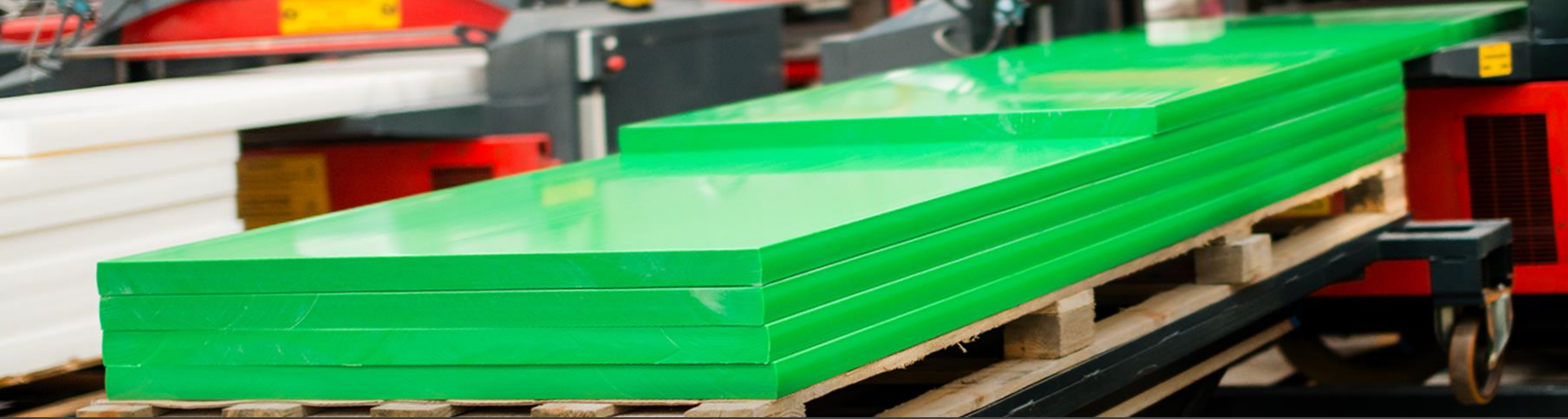


Imperial Sheet Extrusion

Our sheet lines are equally split between imperial and metric widths – Imperial Sheet Sizes:

- Our imperial lines produce a sheet width of 48.50”
- The lines produce variable plates thicknesses from 0.313” to 4.75”
- Sheet lengths from 24” to 122”





Metric Plate Extrusion

Our plate lines are equally split between metric and imperial widths - Metric Plates Sizes:

- Our metric lines produce a plate width of 1010 mm
- The lines produce variable plates thicknesses from 8 – 120 mm
- Plate lengths from 500 mm to 3100 mm



Raw Material Selection Process

Polimersan use a global network of leading polymer producers with quality being tantamount:

- We operate a constant polymer processing research and development strategy
- We employ both primary and secondary producer for all Engineering Polymers, Polyolefins & Fluoropolymers
- We perform continuous in-house testing of existing and new raw materials, additives and masterbatches
- We formulate and test processing aids to improve production parameters



Gravimetric Blenders

Employed to accurately weigh two or more components and then mix them prior to processing:

- For blending virgin polymer resin granules with concentrated color masterbatch compounds
- For blending virgin polymer resin granules with various performance additives
- For blending 2 differing polymer resins to create bespoke copolymers formulations
- For blending virgin polymer resins with recycled polymer resins



Raw Material Preparation

Our chosen raw materials are carefully controlled and prepared before processing:

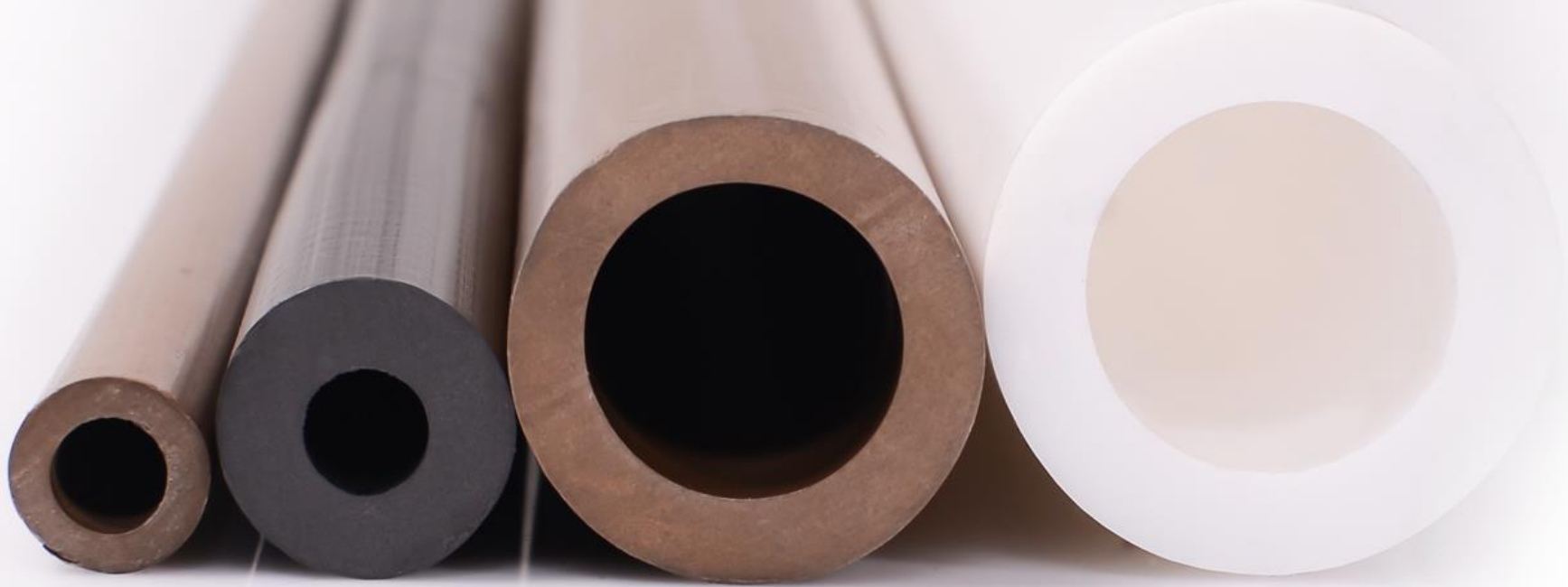
- Selected raw materials are batch specific allowing us total traceability from resin to finished product
- Raw materials batches are independently dried to specific PPM moisture levels to optimize processing
- Our raw material handling and management eliminates the possibility of cross polymer contamination



The Annealing Process

Our semi-finished stock-shapes undergo post extrusion heat treatments to achieve the following:

- To minimize internal stresses and tension held by the stock-shape
- To ensures dimensional stability before, during and after machining operation
- To assist the polymer in forming a consistent crystalline structure, imparting optimum mechanical characteristics



Politef (Polytetrafluoroethylene) (PTFE)

PTFE is a fluoropolymer with extremely high thermal and chemical resistance properties:

- Exhibiting excellent temperature resistance (-330 to +500°F (short term exposure up to 570°F)):
- Exhibiting an extremely low coefficient of friction and low surface tension
- Exhibiting excellent chemical resistance properties
- Modified grade include carbon, bronze and glass filled PTFEs
- Skived and molded sheet, molded and extruded rod and extruded tube capabilities



Polipom (Polyacetal) (POM)

Acetal (POM) is a highly versatile engineering material exhibiting excellent all round performance:

- The ideal combination of good dimensional stability, mechanical strength and wear resistance
- Good mechanical stiffness, ductility, creep resistance, impact and fatigue strength
- Exhibits low moisture absorption (0.8%), good dielectric and insulation properties
- Resistant to hydrolysis, strong alkalis and thermo-oxidative degradation



Polipa (Polyamides) (PA6 & PA66)

Also known as nylon, Polimersan offer both extruded PA6 and PA66 semi-finished stock shapes:

- PA6 is perhaps our more general purpose grade but has a proven record of outstanding service:
- PA66 exhibits marginally higher mechanical strength, stiffness, heat and wear resistance (compared to PA6)
- Both provide a good combination of mechanical capabilities, electrical insulation and chemical resistance
- Cast Nylon (PA6G) is also part of our product range but covered in a separate presentation



Polipolen (Polyethylene) (HDPE)

Polimersan produce 2 grades of PE that vary in molecular weight HDPE (300) and HMWPE (500):

- Both our high density (HD) and our high molecular weight (HMW) grades exhibit similar characteristics:
- They are moisture repellent and exhibit excellent resistance to chemical agents and corrosion
- They exhibit high impact strength (even at low operating temperatures)
- They possess a low coefficient of friction, providing non-stick and good wear resistance capabilities



Poliproblen (Polypropylene) (PP)

Polypropylene is similar in appearance to PE but exhibits differing mechanical characteristics:

- Higher strength, hardness and rigidity at appropriate operating temperatures:
- Excellent chemical and corrosion resistance properties
- Good electrical insulator properties
- BUT, sensitive to low temperatures, normally used between +40°F and +190°F



Polikes (Cast Polyamide) (PA 6G)

Polikes brand of our product is “Cast Polyamide” which is also known as PA6 C; PA6G.

It's tough and high mechanical strength and produced by casting. It's preferred instead of metal parts because of being cheaper:

- Cast polyamide is being produced using some fillers to develop technical properties for different applications. (MOS2, oil) Wearing resistance is high and service temperature is between -40° and +100 °c. Good electrical insulator properties
- **PROPERTIES:** Wearing resistance is high, high toughness and impact resistance, lower water absorption in comparison with Polipa (PA 6), resistance to some acids and bases, workable without lubrication and noise.



Physical testing

Polimersan employ both in-house and external laboratory testing to validate performance:

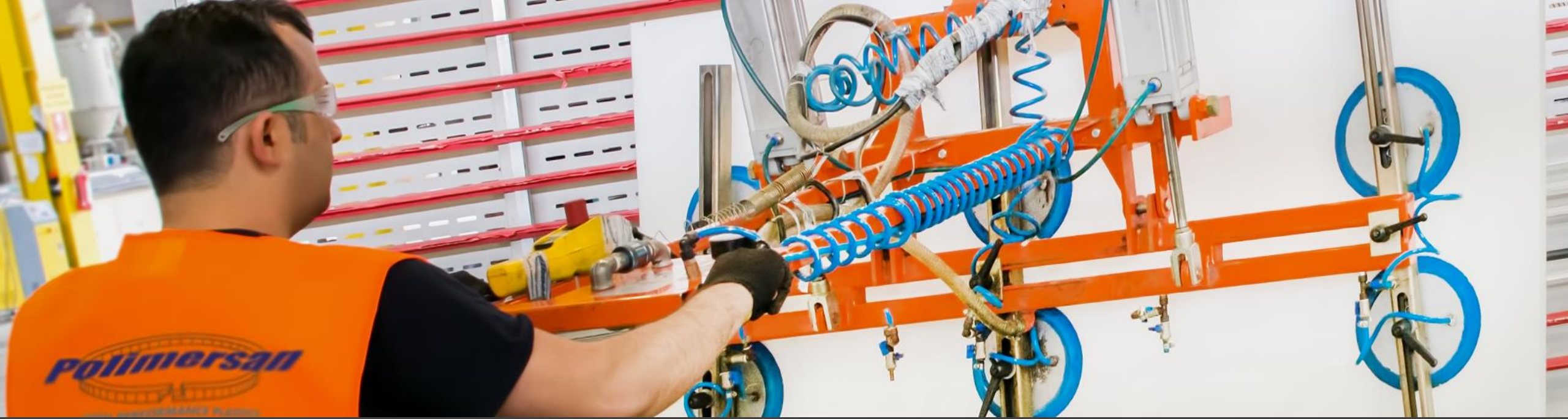
- Basic material characteristics, such as hardness, are tested in-process to ensure material quality
- Melting point and crystallinity tests are performed in-house using Differential Scanning Calorimetry (DSC)
- Material density tests are performed using an electronic balance



Physical testing (Continued)

Property and performance testing (continued):

- We employ a tensometer device to evaluate material tensile and flexural properties
- A pivoting arm device is used to determine impact energy and notch sensitivity
- Compressive strength, modulus of elasticity and yield strength are performed externally



Semi-finishing (cut-to-size) Capabilities

Polymersan employ an extensive range of semi-finishing equipment for cut piece derivatives:

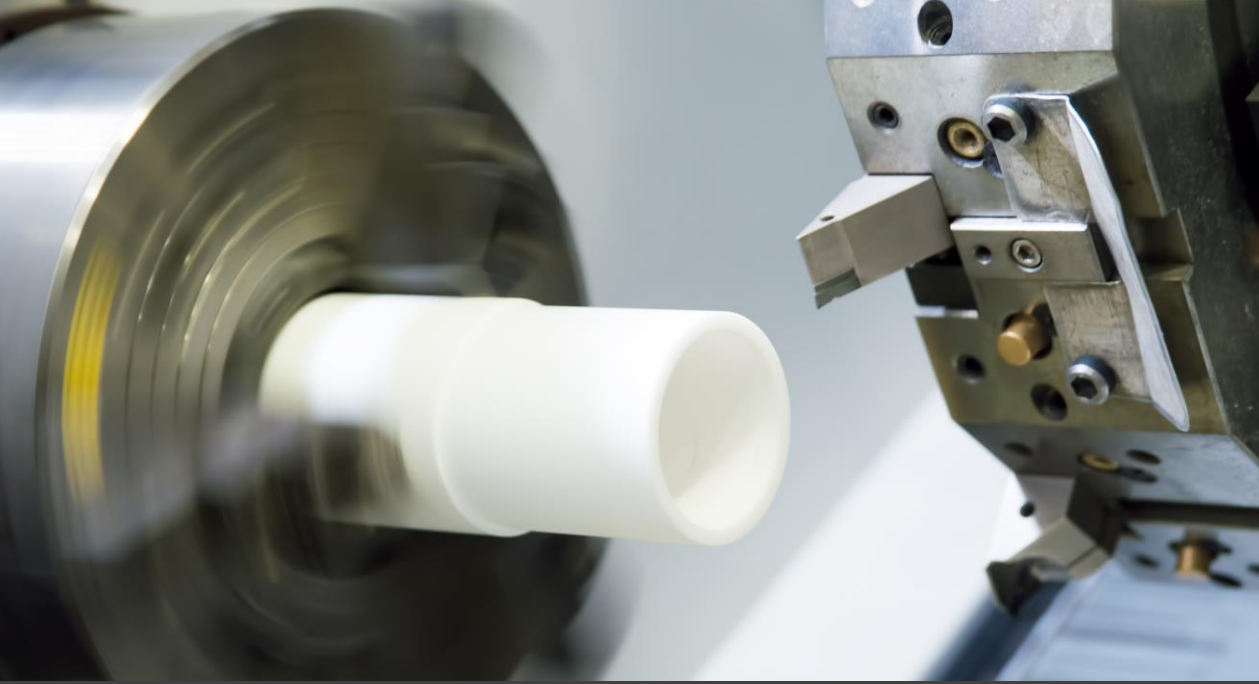
- A combination of automated beam, sliding table and cross-cut saw technology for cut sheets
- Multiple circular billeting saws for rod and tube billets
- High tolerance semi-finishing through the use of planers and centreless grinding



Material Application Know-How

A well chosen engineering polymer will lower system costs and improve application performance:

- Coupled with our materials knowledge, Polimersan have an excellent understanding of polymer applications
- Our materials and finished components are used across a myriad of applications in many key industrial sectors
- Our in-house machining service produces high quality engineered components to clients specifications
- Polimersan is ISO 9001-2008 certified, as quality is considered to be a critical factor in all our activities



Machining Facility

Our highly skilled Machinists are experienced in all aspects of machining thermoplastic materials:

- Although we're better known for our shapes, we operate both conventional and CNC machining centers
- Our differing polymer-shapes exhibit different machining characteristics and material tolerances
- Our experience and know-how allow us to provide guidance on material selection, design and conversion



Machining Facility (Continued)

For those clients requiring finished components, we offer the following in-house services:

- CNC routers and mills for efficiently cutting complex shapes from any thickness of plate
- Conventional and CNC lathes are used to manufacturing parts that are round in cross section

“As many of our clients focus on machining plastics, we work hard to avoid any conflicts of interest”



Product Inspection Process:

Our continuous quality assurance process monitors product to the point of dispatch:

- Firstly we examine all incoming raw materials for compliance to supplier specifications
- We then perform in-process stock-shape dimensional and ultrasound testing / inspection
- Dimensional and visual inspection occurs after all secondary processing such as annealing and cutting
- Warehouse inventory inspection occurs upon receipt of material into stock and and prior to packaging / dispatch



Stock Forecasting & Composition

Extensive stocks and effective supply chain management to meet our customers' demands:

- We work hard to optimize our stock composition by careful analysis of our sales history
- Our sales teams also influence our stock levels by determining (predicting) future market trends
- We offer our key clients the option to place repeating orders / consignments in controlled stock locations



Warehouse Management Systems

Dispatching high volume of material requires extremely effective warehouse management:

- We employ WMS software to support the day-to-day operations of our various global stock facilities
- Stock locations are designed to ensure efficient picking, inspection and packing tasks
- Our material handling solutions are design for both efficiency and the safety of our warehouse personnel



International Logistics and Shipping

Polimersan semi-finished products are exported all over the world:

- Over 50% of our group's products are exported to international clients
- From each stock locations we provide professional advice on local and international transport of your cargo
- We provide an excellent export packaging service to ensure your products are secure and protected



Conclusion & Commitments:

We pride ourselves on building rewarding and long term relationships with our business partners:

- Continuously improving our processes to offer an ever growing spectrum of semi-finished machinable plastics
- Developing bespoke and innovative supply solutions for our domestic and international customers
- Manufacturing polymer stock-shapes that exceed the expectations of our growing distributor client base
- Providing our clients a competitive edge to meet the requirements of a commercially demanding market



THANK YOU