

PVC Pipe extrusion

A Theysohn core competence

PVC pipes are a major part of your activities – or will be? You fully agree that consistently fulfilling the quality defined by your national standard is a must! Yes, but a tight eye on monitoring product weight is vital for your commercial success and optimum output with minimum downtime and scrap rate always must be your target? If so, then do not hesitate to add another experience to your box of goodies and read this article about Theysohn Extrusion – one of the worldwide leading suppliers of PVC extrusion technology!

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Theysohn Extrusion - Headquarter Korneuburg, Austria

Pipes are the major volume when consumption of PVC in extrusion is on stake. Extruders with output of 2500 kg/h are known and plants are operated worldwide. PVC as a raw material still is one of the best choices when weather resistance, pollution to transported media or handling is a requirement. From clear-water supply to sewerage applications PVC is used as well as special applications like hot-media pipes for solar systems as well as high corrosive media in the food industry. Other applications are rainwater downfall pipe or cable protection pipes or cable ducts. All products are produced on Theysohn machinery and tooling. Close to 16 Mio tons of PVC annually is converted to pipes. Market surveys see more than 6000 extruders in action

showing an average output of around 400kg/h. The most popular versions produced are compact pipes and 3-Layer foam-core pipes. Special areas are C-PVC hot media pipes and PVC-coextruded downfall pipes. The following article gives a short overview of these applications and a glance into the production technology.

Based in Austria, just minutes away from the great centre of one of the most interesting cities world wide Theysohn operates it's head quarters. And the people of Theysohn often make friends during the time they spent with guest visiting the most impressive sights in old emperors capital with its unbelievable charm, culture and food. Customers often enrich their meetings with us by extending their trip with a weekend stay in Vienna.

Almost three hundred people are working for the Theysohn group of companies in their three production plants in Korneuburg/Austria (head office and machinery) in Kirchdorf/ Austria (tooling) and in Salzgitter/Germany (extruder components) or one of the sales offices operated in Russia, India, China or America. A history of experience reaching back almost 30 years is the technical basis for success at Theysohn. The "all in one hand" philosophy requires a deep understanding of all aspects of the process from formulations to material handling following a perfect plastification process, a reliable extrusion machinery, high output tooling down to testing and quality management.

The typical setting of a pipe extrusion line is consisting of an extruder, pipe head and downstream equipment mainly operating a calibrator unit, vacuum and spray tanks, haul-off, saw and belling machines. All equipment must work as a unit to allow a consistent process with high output.

All these components have been carefully chosen by Theysohn experts and are manifold tested and proven in practice. Some of the leading manufacturers worldwide are using Theysohn technology and experience to equip their plants. The core no doubt is the combination of extruder and pipe head. It is forming the heart of the process and guarantees output, quality and stability of the extrusion process.

3-layer foam core pipes, small pressure pipes, sewer pipes





High-performance extruder TTM



Compact pipes

meter) and pressure pipes (32 - 500mm) as well as venting installations or cable protection pipes.

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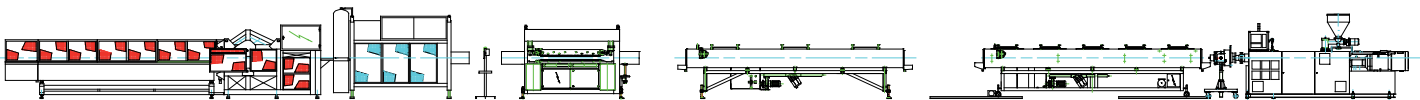
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PVC compact pipes – Solid tradition for low cost production

Compact pipes are the backbone of a pipe production. They consume the highest volume of PVC and are produced with the highest output of more than 2500 kg/h for twin-extruder applications in the industry too! Compact pipes are typically produced in accordance to local or international standards, as there are ISO-Standards in Europe and ASTM Standards in America. Middle East and Asian standards are mainly ASTM oriented whilst China's national standard is following the recommendations of the ISO standard. More than 300 local pipe standards are known so far.

Typical applications are sewerage pipes (100 - 710mm dia-

Standard components of a modern pipe extrusion line



A EXTRUDER

A wide scale of models (conical and parallel) offering an output range from 10 - 2500 kg/h.

- high torque gearboxes allow back pressure up to 600 bar
- high quality wear protection for screws and barrels
- high safety factors for gearboxes
- special screw design allocated to material specification
- colour feed systems allow inline colour changes
- elliptic barrel shape and continuous temperature control of zone 5 ¹⁾²⁾
- water cooling or active screw core temperature control system ¹⁾
- ceramic screwshaft coating ¹⁾
- leveling pads for ideal setting ¹⁾

¹⁾ unique Theysohn technical solution

²⁾ patents registered

B PIPE TOOLING SYSTEM

Pipe tooling is a system of pipe heads and die sets including calibrator sleeves for single and dual extrusion

- pipe head
- die sets
- calibrator sleeves
- feedblock for 2 and 3 layer foam and coextruded pipes

C CALIBRATION TANKS

Single or double chamber vacuum calibration tanks for sizing and cooling to

stabilize the form and surface of the hot pipes and additional spray tanks for cooling.

- tanks for various pipe dimensions

D HAUL-OFF

Caterpillars offering a range of multiple chain settings (multi-belt-haul-offs) depending on pipe size and wall thickness.

- single and double strand
- synchronisation to extruder control system
- wall thickness control system for beelling section

E CUTTING UNIT

Product specific synchronised cutting solutions for pipes

- planetary saw systems to cut and chamfer the pipe on one or two sides
- cutting saw for electric conduit pipes
- double strand haul-off-saw-combination for smaller highspeed pipes

F TILTING TABLE

and/or beelling machine

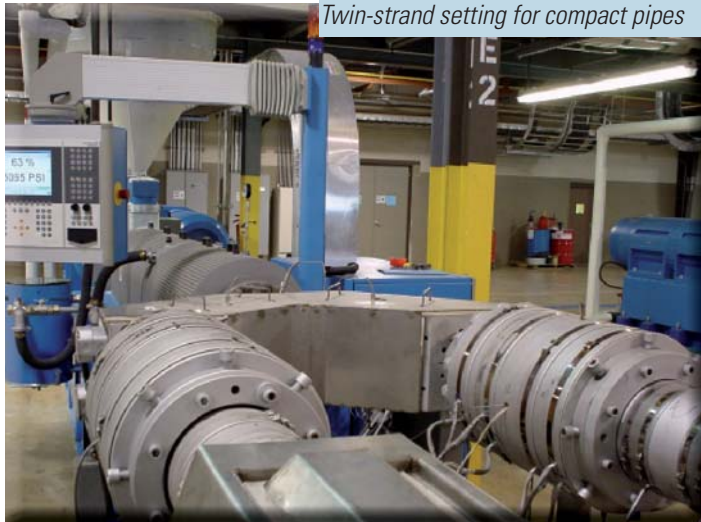
Final component is a table to tilt pipes into a storage box or a beelling machine to form

different types of socket.

- various dimensions
- individual socket forms
- additional pipe winders and packing systems available

Theysohn compact pipe technology

- Single and double strand
- 50 - 2500kg output
- Minimum overweight production
- High stability
- Complete equipment available



Twin-strand setting for compact pipes

3-layer foam core pipes – The 25% cost saving solution!

3-layer PVC-pipes are one of the absolute domains of Theysohn. "We are seen as technical market leader." says Peter Cervenka, product manager pipes at Theysohn. "Theysohn has already installed more than 100 lines. Cost savings in production of up to 26% mainly on material savings by a foam core is the vital argument to compete with compact pipes in non-pressure applications!"

Using virgin or recycling material has been the major advantage of this technology. Standard fitting systems, as known for compact pipes, can be used. The output ranges from 200 to 2000 kg/h using a combination of two or three extruders in a production setting. Highest capacity sold is 20 m/min. Smaller dimensions are using double-strand technology. "Another big advantage of Theysohn is the low-cost formulation recommended."

Pipes are usually produced to national standards. The main standards are EN 1401-1 and EN 13476 as well as US F 891. Wall thickness is determined in a way that ring stiffness classes of 2, 4, 6 and 8 kN can be achieved. Highest classes already done are 16 kN.



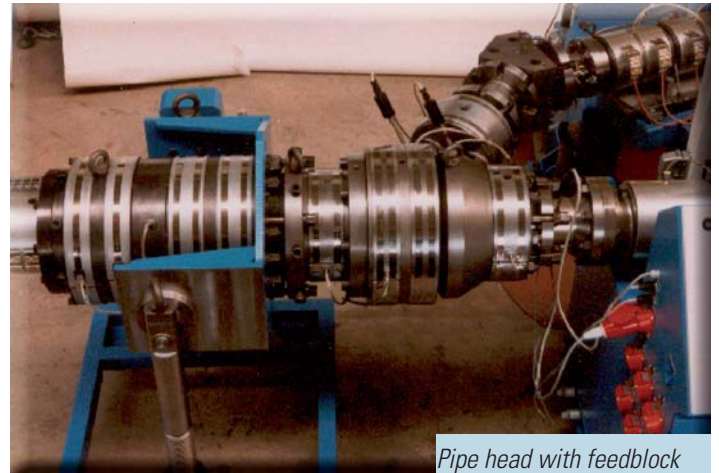
Inner layer (10 – 30 % of S)
Foam core (50 – 70 % of S)
Outer layer (10 – 20 % of S)

typical european 3-layer pipe

A typical application is sewerage pipes reaching a market share of 85 % on comparable applications in Europe, which have totally erased compact pipes for this application. There is a clear potential for massive growth in the region of middle and near east.

Theysohn 3-layer foam core pipe technology

- Single and double strand
- 200 - 2000 kg/h
- Cost saving up to 25 %
- High ring stiffness
- Sewerage, drainage pipes

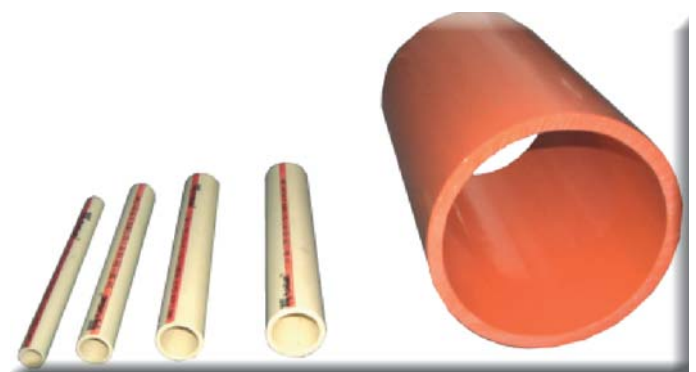


Pipe head with feedback block

Development priorities are higher filling of foam core and skin, 3-extruder settings with colouring of the outside skin only and extended use of recycling material in the middle layer.

C-PVC pipes - The „hot deal“ for special applications

More than 30 years C-PVC pipes are known to the market. Theysohn is one of the market leaders and has already installed 30 lines worldwide. Special developments on screw geometries, new pipe head systems and die sets with extensive multi-layer chromium plating were necessary. C-PVC (chlorine loaded PVC) enhances the chemical resistance of the final product but therefore requires intensive protection against corrosion of the parts of extruder, screw and pipe head being in direct contact with the melt.



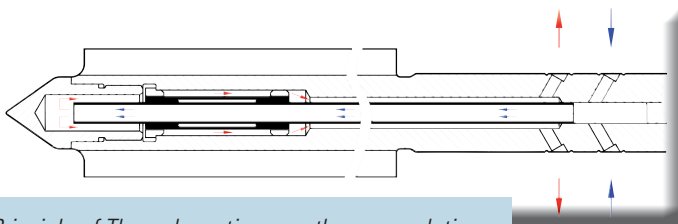
C-PVC hotwater pipe, C-PVC cableprotection pipe

High output lines with a speed of 2 x 14 m/min. are possible based on new pipe head and calibration technology. Typically a premixed dry blend will be used. Mixing plant options are available, but are rarely seen. Reason is that the typical application in the chemical and food industry requires severe tests and homogenisation provided by the suppliers of dry-blend to be used by the extrusion companies.

Shortage on raw material availability in general leads to supply contracts between extrusion company and the ten leading material suppliers. "Theysohn with its excellent connections to the dry blend suppliers will always assist to make contact to the decision makers." says Mr. Cervenka.

Typical dimensions are 16 – 63 mm with wall thickness of 2 – 5 mm.

Very critical for a successful production is an optimal tuning of the screw to ideally work with the formulation of the raw material. A major advantage of Theysohn is the active core thermoregulation system for the screw allowing a wide production window to cope with fluctuations in the process or material. This technology allows to actively control the melt temperature, another vital factor in the process.



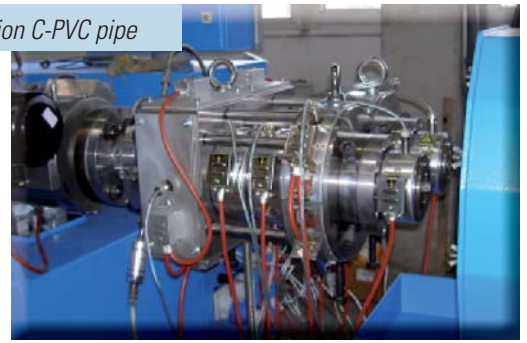
Principle of Theysohn active core thermoregulation system for extrusion screws

Typical applications are C-PVC hot water pipes (outside mat, inside highly glossy) used to avoid corrosion and chalk residue block the flow. Solar heating systems use these pipes to transport hot water at up to 95° C from the heat collectors to the heat exchanger. Other applications are to transport hot or chemically corrosive media in the food- and chemical industry to replace highly expensive metal pipes or PP pipes showing much less resistance to heat and chemical substances. Another big advantage is the utilization of glue-based connection systems instead of welding or mechanical fittings.

Theysohn C-PVC pipe technology

- Single and double strand
- 16 – 630 mm
- 50 - 700 kg/h
- Hot water pipes for solar, chemical and food industry and fire sprinkler systems worldwide

Twin screw extrusion C-PVC pipe



Roof-drainage downfall pipes - Gloss and colour is a must!

Drainage systems to guide rain from roofs into the canal systems are one of the major application of smaller co-extruded (2-layer) or compact pipes. For the inner side of the product often a certain amount of recycling material is used, the outside is PVC highly loaded with pigments and/or ASA for higher weathering and especially UV resistance. Theysohn has developed special solutions using ring-channel-dies to form the outer skin. This is an excellent example for combining the competences of Topf tooling on rain gutter profiles with its high requirement for gloss with the vast Theysohn experience in pipes leading to a close match on optical appearance factors, as there are colours and gloss, for systems utilizing gutter systems made from downfall pipes as well as half-shell profiles.

Roof-drainage downfall pipes



Theysohn's overall-know-how - An ideal foundation for turn-key projects!

Theysohn for years has encouraging know-how in almost all aspects of PVC pipes. This includes also formulations and recipes, definition of raw materials, procurement requirements, storage and material handling including large-scale fully automatic mixing plants, conveying systems to feed material directly to the extrusion line. Single components like extruders, downstream and tooling are carefully arranged to form a reliable production setting. Advisory services include project management for total plant engineering including layout and monitoring.

Theysohn is always willing to incorporate local sources and services to allow lowest possible budgets.

A PARTNER TO LISTEN, WITH POWER TO SUPPLY

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