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introduction ▶

Product Background

Worldwide Use

Polyethylene (PE) materials were initially introduced in the UK in 1933 and have progressively been used in the pipeline industry since the late 1930s.

The physical properties of the PE materials have been continually upgraded with improvements in crack propagation resistance, increased hydrostatic pressure resistance, ductility and elevated temperature resistance resulting from developments in the methods of polymerisation. These developments have resulted in increased applications of PE in the pipeline industry in such areas as gas reticulation, water supply, mining slurries, irrigation, sewer and general industrial applications.

The engineering application basis for the use of PE pipes in Europe was provided by the German Standard DIN 8074 developed in 1960, and in the UK by the British Standards Institution BS 3284 for cold water service applications developed in 1967. Progressive developments have followed European standards throughout Europe, North America and Asia, with the development of International Standards Organisation and National Specifications.

The well recognised attributes of high impact resistance, ease of installation, flexibility, smooth hydraulic flow characteristics, high abrasion resistance,



and excellent chemical reagent resistance have resulted in PE pipeline systems being routinely specified and used in a wide range of applications in pipe sizes up to 1600 mm diameter.

Australian Use

PE pipe extrusion commenced in Australia in the mid 1950s where small diameter pipes were used in irrigation, rural and industrial applications.

The Australian Standards for PE pressure pipes were initially developed as ASK119 in 1962, and progressively improved and metricated as AS1159 PE Pipes for Pressure Applications in 1972 to include 1000mm diameter. These specifications provided the engineering basis for the approval and use of PE as approved pipeline materials in such applications as

potable water and natural gas reticulation by gas and water utilities throughout Australia.

Subsequent developments at Standards Australia resulted in the progressive development of Standard Specifications for PE compounds, PE gas pipes, PE fittings, irrigation systems, drainage, sewer and PE pipeline system installation guidelines.

Recently, significant PE polymer developments have led to review of these specifications, culminating in the publication of the 1997 PE Standards AS/NZS 4130 PE Pipes and AS/NZS 4131 PE Compounds.

These Standards have introduced the latest International developments and terminologies, and also provided uniform specifications throughout Australasia.

Polymer developments have resulted in PE80B materials, which have improved ductility and thermal stability, plus PE100 materials for use in large diameter and high pressure applications for gas and water distribution.

Large diameter PE pipelines have now become the preferred solution in many applications where the unique properties of PE provides the most cost effective solution.

Vinidex provide Australia wide manufacturing and supply services for PE pipeline systems in a wide range of end use applications for pipes up to 1000 mm diameter.

Pipe Extrusion

Vinidex PE pipes are extruded using sophisticated, highly controlled manufacturing processes and technologies.

The PE raw materials used in extrusion are compounded into pelletised form containing precise amounts of polymer, lubricants, stabilisers, antioxidants and pigments for the specific end product application.

The PE compound (1) is preheated to remove moisture and volatiles and is conveyed into the extruder by a controlled rate feeder (2).

The extruder (3), consists of a single screw configuration which melts and conveys the PE material along the length of the extruder barrel. The design of the extruder barrel/screw is complex and takes into account the properties of the various types of PE material grades used in pipe applications. Various zones exist along the length of the screw and act to melt, mix, de-gas and compress the PE compound. External electrical heater bands along the barrel, together with the frictional heat generated as the PE material passes through the gaps between barrel and screw provide the energy needed to fully melt the PE compound materials. The total heat input is carefully controlled to ensure full melting of the PE without thermal degradation.

After passing through a mixing zone at the tip of the extruder, the PE melt then feeds into a head and die combination (4), where the melt is formed into the size of pipe required. The correct design of the head and die is essential to permit the production of pipe to Australian Standards requirements and to ensure

retention of the physical properties of the PE materials.

Once the molten PE pipe form leaves the die, it enters the sizing system (5), where it is initially cooled to the required dimensions. This is performed using an external vacuum pressure system where the pipe surfaces are cooled with refrigerated water sprays whilst in contact with precision machined sizing sleeves. The initially cooled pipe is then progressively passed through a series of water spray cooling tanks (6) to reduce the PE material to ambient temperature, and to finalise the pipe dimensions.

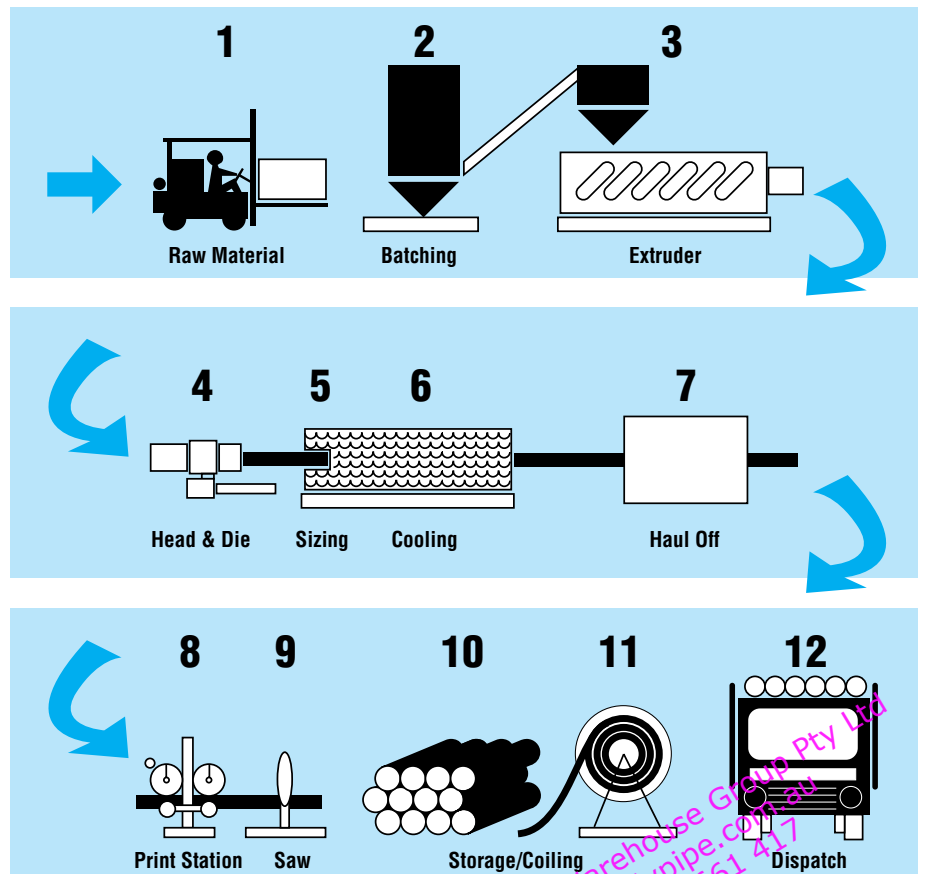
As the pipe passes along the extrusion line, it is pulled along at a constant speed using a caterpillar track haul off (7). This haul off speed is closely co-ordinated

with the speed of the extruder output using closed loop process controllers, to minimise built in stress in the pipe.

The pipe information of size, material, class, and batch data required by Australian Standards, or by specific client specification, is then marked on the pipe by an in-line printer (8) to provide continuous branding at specified intervals.

The completed pipe is then cut to standard or required length by an in-line saw (9), and then packed into stillages, or for large diameter pipes stored (10). Small diameter pipes are either cut to standard length, or coiled (11), and the finished coils are strapped in standard coil sizes.

Figure 1.1 Typical Pipe Extrusion Line



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Fittings

Fittings used with Vinidex PE pipe systems depend on the diameter and the end use application of the pipes. Small diameter pipes may use compression joining systems made from metal or plastics materials, socket fusion or electrofusion systems made from PE materials.

Large diameter fittings are injection moulded or fabricated from PE pipe and joined to the pipe by butt welding and electrofusion.

Details of the specific Vinidex fitting systems are contained in the *Product Data* section.



End Treatments

Vinidex PE pipes are supplied in a number of alternative end treatment configurations.

Small diameter pipes are supplied with plain ends to allow joining by butt welding, socket fusion, electrofusion, or compression fittings.

Large diameter pipes are supplied with plain ends to allow joining by electrofusion, butt welding, or mechanical couplings. Alternatively, flanges can be welded on to the ends of the pipes under factory conditions.

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Product Standards

The raw materials used in Vinidex PE pipeline systems are required to meet stringent specifications and supplies are made against the latest Australian and International Standards.

The production of PE pipe within Vinidex factories is subject to detailed process control procedures, continuously monitored by trained staff.

Finished goods are inspected and tested to ensure compliance with the relevant Australian or International Standard for the particular field application. The monitoring and recording system used allows for full tracing of production.

The quality assurance schemes adopted by Vinidex have been accepted by appropriate government purchasing authorities and have led to Vinidex being regarded as a preferred supplier.

This commitment to total quality management is further evidenced by accreditation under the Supplier Assessment Scheme as a Quality Endorsed Company to AS 3902/ ISO 9002.

Relevant Australian Standards

AS 1460-1989

Fittings for use with polyethylene pipes
Part 1: Mechanical Jointing Fittings
Part 2: Electrofusion Fittings

AS 2033-1980

Installation of Polyethylene Pipe Systems

AS/NZS 2566.1-1998

Buried Flexible Pipelines

AS/NZS 2698-1984

Plastics Pipes and Fittings for Irrigation and Rural Applications

Part 1: Polyethylene Micro-Irrigation Pipe

Part 2: Polyethylene Rural Pipe

Part 3: Mechanical joint fittings for use with micro-irrigation pipes

AS 3723-1989

Installation and maintenance of plastics pipe systems for gas

AS/NZS 4129(Int)-1997

Fittings for polyethylene (PE) pipes for pressure applications

AS/NZS 4130-1997

Polyethylene pipes for pressure applications

AS/NZS 4131-1997

Polyethylene compounds for pipes and fittings applications

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