



The Genuine Air Technology to achieve
the most of PVC-O pipes



Pushing limits beyond

Molecor, your partner for success in Molecular Orientation



Molecor is a leader company specialized in the development of the latest technology applying molecular orientation to pipeline solutions with astonishing mechanical properties. It was founded in 2006 by highly skilled engineers in this field with a proven experience in the plastic pipe division. Molecor's revolutionary process provides reliable and user friendly systems that widen the pipe global business possibilities.

- 
Our mission: to provide the market with efficient systems for manufacturing environmentally friendly products that will contribute to the human welfare through an optimum use of the water resources.
- 
Our vision: to be the global leader in molecular orientation technologies through innovation and commitment.

Institutional endorsement

Officially recognized as an innovative company and endorsed by the Spanish Department of Science & Innovation, Molecor has been supported through different programs to develop and implement its new technology. Molecor maintains collaboration agreements with different technological research centers and universities which contributes to extend the in-house engineering resources and to cover each of these key areas in an efficient and satisfactory manner.

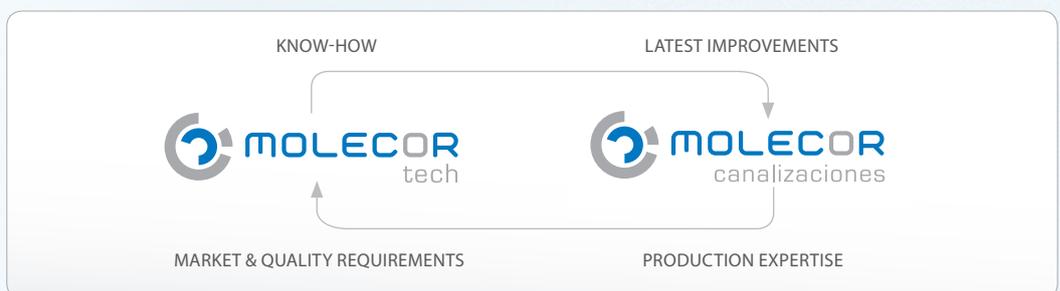
Research & Development

Molecor invests in R&D, intellectual property, as well as in human resources. Machine design, flow mechanics, heat transfer, materials and electronics are disciplines well covered at Molecor with its specialists. In fact, more than 65% of Molecor's personnel hold degrees in engineering or high technical sciences.

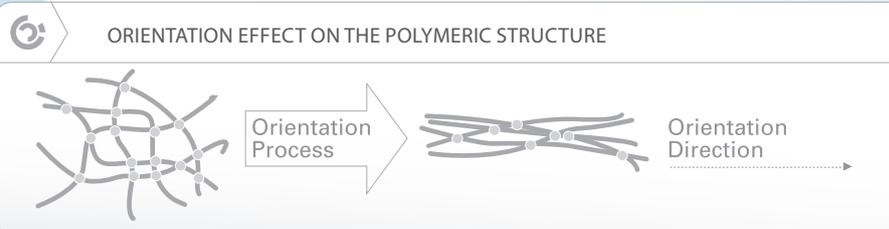
In addition to its valuable workforce, Molecor uses advanced and sophisticated design and calculus tools to provide always the latest and most advanced solutions. Molecor is a pioneer company specialized in the development of the latest technology applying molecular orientation to pipeline solutions with astonishing mechanical properties.

Molecor two divisions

Molecor is not just a machine manufacturer or engineering company, but a pipe producer too. The capability of simultaneous engineering with our customers allows us to accelerate the "time to market" for our new product's design and developments. As a result of this effort, our products have surpassed the most demanding implemented tests and can provide a longer working life under the most extreme conditions.



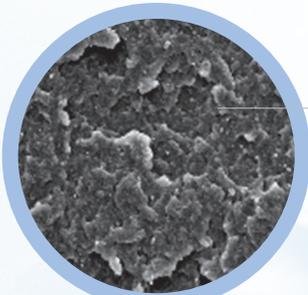
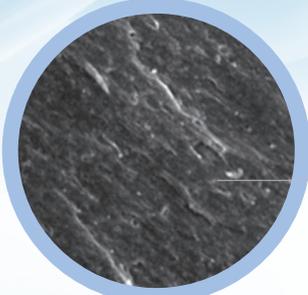
Molecular orientation, the PVC revolution



Molecular orientation process modifies the PVC structure by giving the polymers molecules a specific orientation.

Molecular structure is the main feature that confers its mechanical properties to the PVC. PVC is a polymer which presents an amorphous molecular structure, where chains are arranged at random directions.

PVC-
class 500



PVC-U



Data courtesy of BC Co. Polymer research and analyses. Jeol JSM-T-220-A Scanning Microscope 09-07-2009

However, when stretching the material and under certain conditions of pressure, temperature and speed, the polymer molecules are aligned in the same direction as the stretching, resulting in a laminar structure.

The result: the highest properties & the lowest costs

The process of molecular orientation greatly enhances the PVC physical and mechanical properties, maintaining the original polymer advantages. It becomes an unbeatable plastic in terms of strength, impact resistance and flexibility without altering its chemical properties.

When applied to high pressure pipelines, they are very resistant and have an extremely long life expectancy. Besides, the pipe is highly energy-efficient and environmentally friendly during all its useful life because of the considerable savings in raw material and also the ease of installation.



Hoop and axial orientation

The orientation degree defines the PVC-O class. The higher the class, the greater the orientation degree and the better mechanical properties achieved. The class is evaluated according to the long term hydrostatic strength test. The orientation is produced in the stretching direction. Molecor's Technology system enables to attain orientation both in the hoop and axial direction, obtaining complementary benefits.



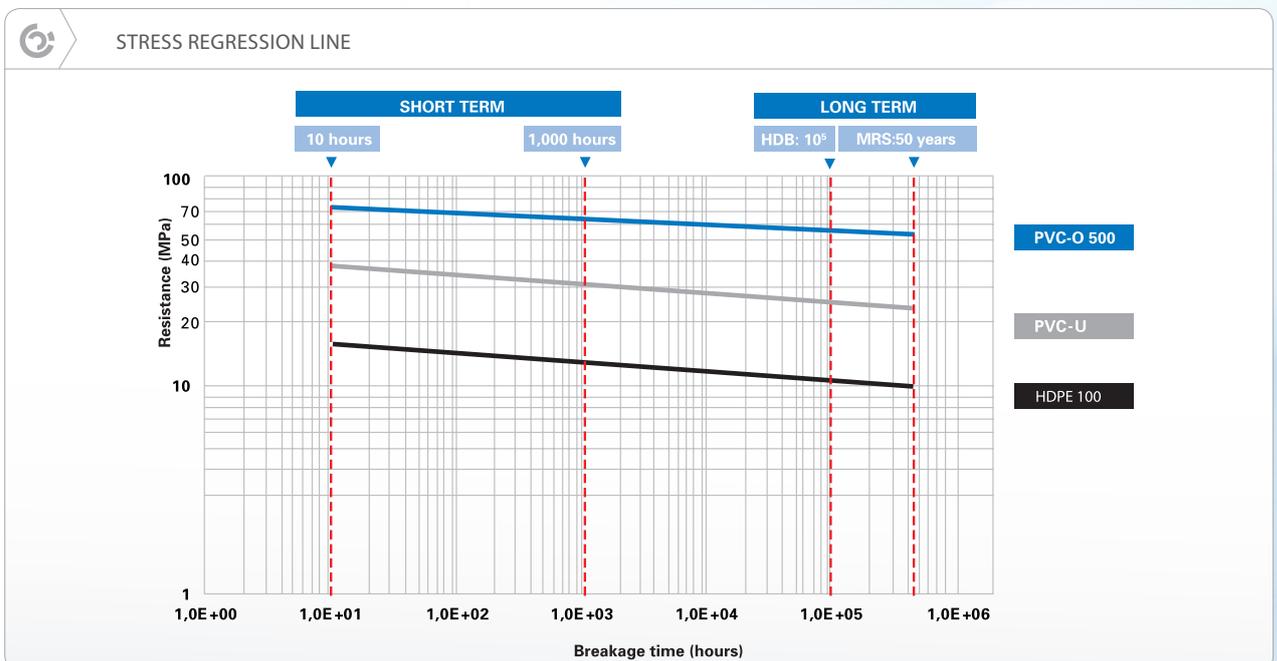
Hoop orientation confers excellent qualities such as impact resistance and internal pressure resistance.



Axial orientation is particularly relevant in the socket, where axial strains could be produced.

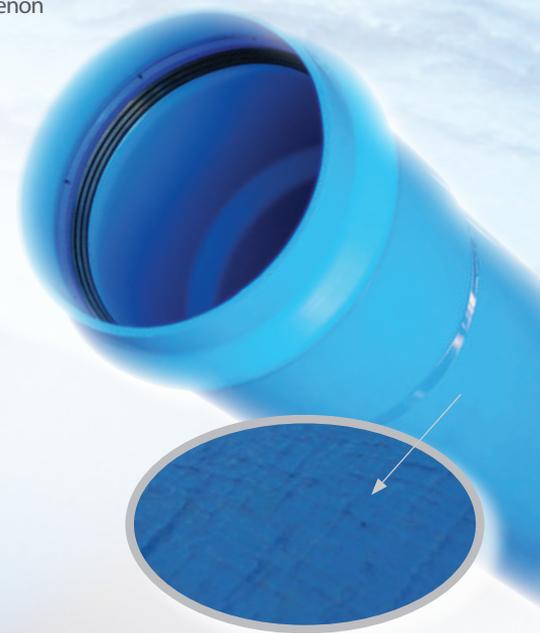
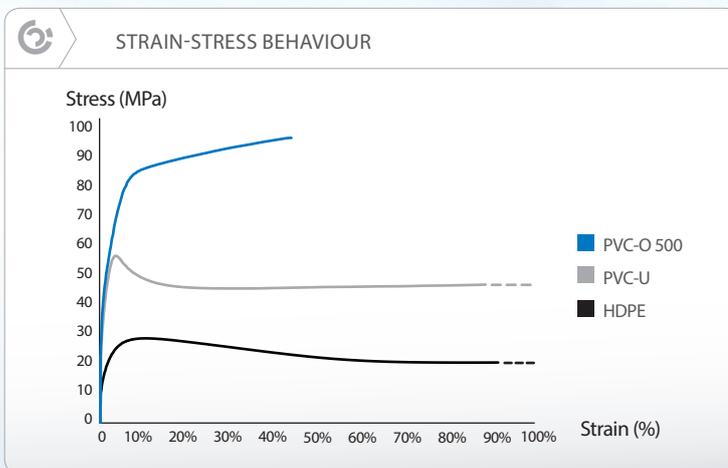
Long term hydrostatic resistance

Pipes are subjected to the internal pressure produced by the fluid circulation over a long period of time. The evolution in time of the material strength is known as creep, and appears to a far lesser extent in **PVC-O class 500** than in conventional plastics, which means better long term performance. **PVC-O class 500** is the highest class recognized by the International Standard ISO 16422, presenting the best mechanical properties.



Excellent short term performance

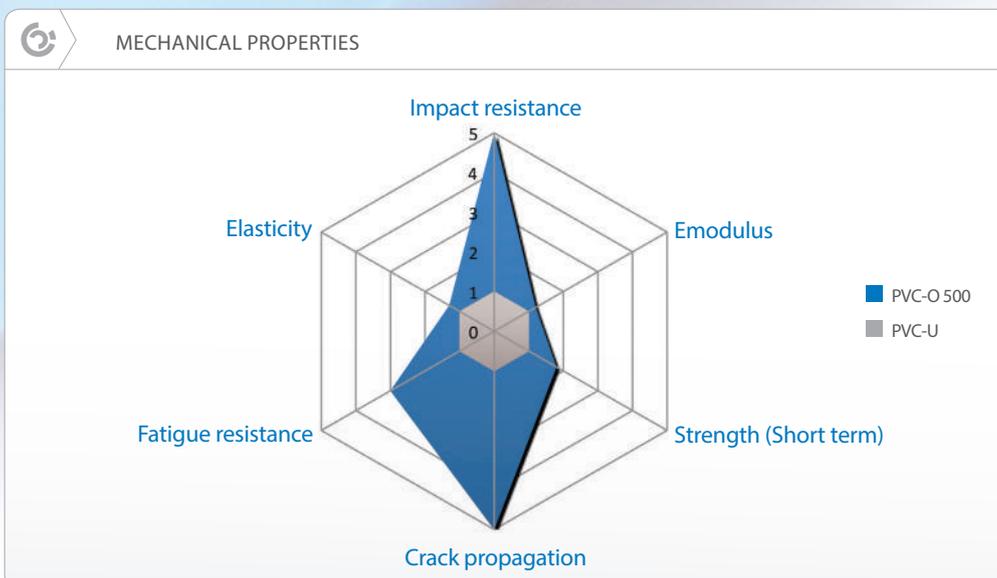
PVC-O class 500 pipes have a very different stress-strain curve when compared to other plastics and come very close to the curve of metals. The mechanical properties of PVC-O improve as the so called “creep valley” disappears. This phenomenon can only be achieved with the highest degree of orientation, class 500.



Mechanical properties

Molecular Orientation increases the PVC-U pipe's mechanical properties, obtaining a much more resistant and flexible pipe.

Impact resistance, no crack propagation and fatigue resistance, among other properties, are greatly enhanced without altering the chemical properties.

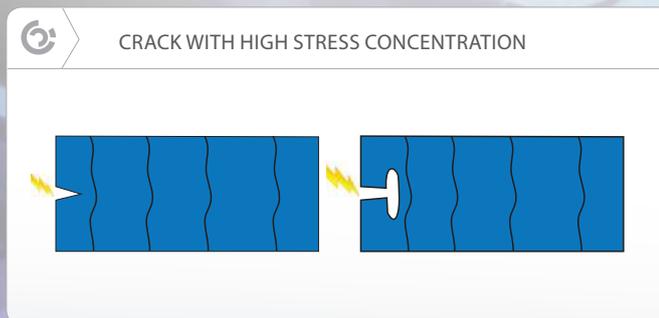


Unbeatable impact resistance

PVC-O CLASS 500 pipes are not easily destroyed by regular impacts. The risk of bursting during installation due to stone dropping or impact is minimal. The layered structure achieved with the molecular orientation process keeps from crack propagation and scratches.



No crack propagation



PVC-O 500 laminar structure. Stress concentration is expanded over the layers surface preventing failure

The layered structure achieved with the Molecular Orientation process is the main feature which prevents from crack propagation along the pipe wall thickness. During the installation, scratches caused by stones on the site might be produced. When cracks appear, they progress through the amorphous wall structure. In PVC-O CLASS 500 pipes, these cracks remain on the first layers, not affecting the pipe's properties at all.

Absence of RCP

The phenomenon of rapid crack propagation (RCP) can take place under certain conditions of temperature and pressure. Brittle cracks can propagate along the pipe wall in the axial direction at a speed of 100 to 400 meters/second. The energy needed for this fast propagation is supplied by the fluid under pressure within the pipe. This phenomenon, very common in some pipes, is minimized in PVC-O pipes due to the material's nature.

High short and long term hydrostatic resistance

PVC-O CLASS 500 pipes offer a resistance to internal pressure up to two times the nominal pressure, which means that they can bear a sporadic excess of pressure such as water hammers in the network.

The durability of the pipe working at nominal pressure is ensured thanks to the low material creep behavior for over a hundred years.

Increased hydraulic capacity

PVC-O CLASS 500 reduces the pipe's wall thickness, giving a greater internal diameter and flow section. Besides, the perfect finishing on the internal surface makes it extremely smooth, minimizing load loss and making it more difficult for deposits to be formed on the inner walls. As a result, PVC-O CLASS 500 pipes offer between 15%-40% more hydraulic capacity than pipes made from other materials (PVC-U, HDPE, Ductile Iron) with the same external dimensions.



Maximum flexibility



PVC-O CLASS 500 pipes can bear deformation up to 100 % of their internal diameter thanks to their excellent elasticity. When crushed, or in the event of a mechanical accident, they immediately recover their original shape, thus eliminating the risk of potential breakage by soil subsidence or sharp edges on rocks or machinery.

Excellent behaviour to extreme working temperatures

 **HOT:**
up to 45°C

 **COLD:**
down to -25°C

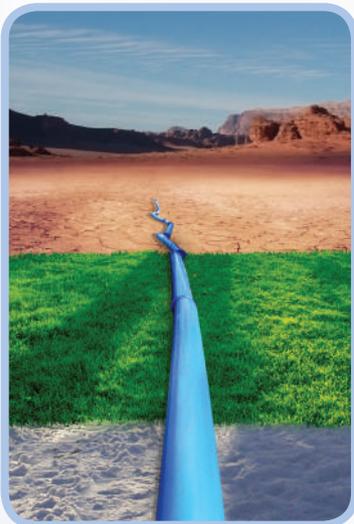
In general, the plastics capacity to absorb impacts is very much related to the temperature. Below -10°C, plastics can present a brittle behavior which makes them inappropriate for cold climates. PVC-O CLASS 500 does not present significant variations in its capacity to absorb impacts even in the most extreme cold areas of the world.

UV Radiation

UV radiation promotes micro cracks on the PVC-U surface and another plastic pipes exposed to sunlight over a long period of time. These cracks propagate through the plastic pipe's wall thickness. PVC-O pipes' layered structure blocks them, so they remain on the outside layer. That is why the pipe's behavior is not affected. Tests carried out with PVC-O pipes exposed to sunlight during a period of more than a year have shown an equivalent response than those non exposed to UV.

Corrosion resistance

PVC-O CLASS 500 is immune to the corrosion caused by natural substances in the soil or agricultural chemicals. Therefore, it is not degradable and does not require any special protection or coating solution, which is translated into cost savings. The quality of the conveyed fluid remains always unaltered, since there is neither corrosion of the material nor migration within the pipes or on their coating. Mandatory tests show compliance with the required health standards for water's human consumption.



Molecor canalizaciones: TOM[®]



TOM[®] is the registered trade mark for Molecor PVC-O CLASS 500 pipe. Due to the outstanding properties of these pipes, Molecor has become, within a brief period of time, a referent in the Molecor area, mainly Spain and France. Molecor Canalizaciones is Molecor's Piping Division and it is certified as a pipe manufacturer according to the ISO 9001. TOM[®] pipes have the AENOR

mark according to the Spanish Standard UNE-ISO 16422:2008, and the NF* mark according to the French standard AFNOR NF T54-948:2010

Lower installation costs

PVC-O 500 pipes are lighter and easier to handle than pipes made of other materials. In most cases, no machinery is required to handle them. Indeed, easy-handling, better performance and installation speed compared to other kind of pipes contributes to installation cost savings.



Charts figures for DN 200-250 mm PN 16 bar pipes

Lighter pipe: easy to handle, fast to connect

PVC-O 500 pipes weight less than half the usual weight of PVC and HDPE, and are between six and twelve times lighter than ductile iron pipes of the same diameter. They are easy to handle and they can be lifted without mechanical assistance (for pipes up to DN 315 mm). During the installation process, the connections between pipes are faster and there is no need for welded unions thanks to the pipe's design and the PVC-O 500 properties. Besides, due to the PVC-O 500 toughness, the scratches caused by impacts are minimal and the pipes present many advantages while unloading and burial.

Applications



SUPPLYING (blue TOM[®])

Conduits for potable water transport. It includes water extraction, water distribution network to city centers and industrial areas, and water transfer to tanks and reservoirs.



IRRIGATION (blue TOM[®])

Water transport pipes for irrigation purposes. It includes irrigation land pipelines, water transfer to tanks and reservoirs.



RECLAIMED WATER (purple TOM[®])

Pipelines for the transport of water that has been treated to remove impurities.

OTHER APPLICATIONS

- Sewage
- Fire Protection Nets
- Industrial Applications
- Infrastructural Nets

Fittings

TOM[®] pipes are compatible with all kinds of Ductile Iron fittings (T, elbows, etc) saddles and flanges.



Tapping saddles allow connecting the pipe in the perpendicular direction to all kinds of fittings, being available with screw ends and flange ends



Flanges with anti-traction system allow connecting the spigot ends to all kinds of fittings with connection to a flange.



Fittings with plugs euro type are connected directly to the pipe allowing for deviations, reductions and connections on the net.

Certifications

PVC-O pipes manufactured with Molecor Technology are certified according to the following standards:

UNE-ISO
16422:
N Mark
(Spain)



NF T54-948:
NF Mark *
(France)



AS/NZS 4441:
2008: SAI
GLOBAL Mark
(Australia)



ISO 16422
INEN mark
(Ecuador)



NTC 5425:
ICONTEC
mark
(Colombia)

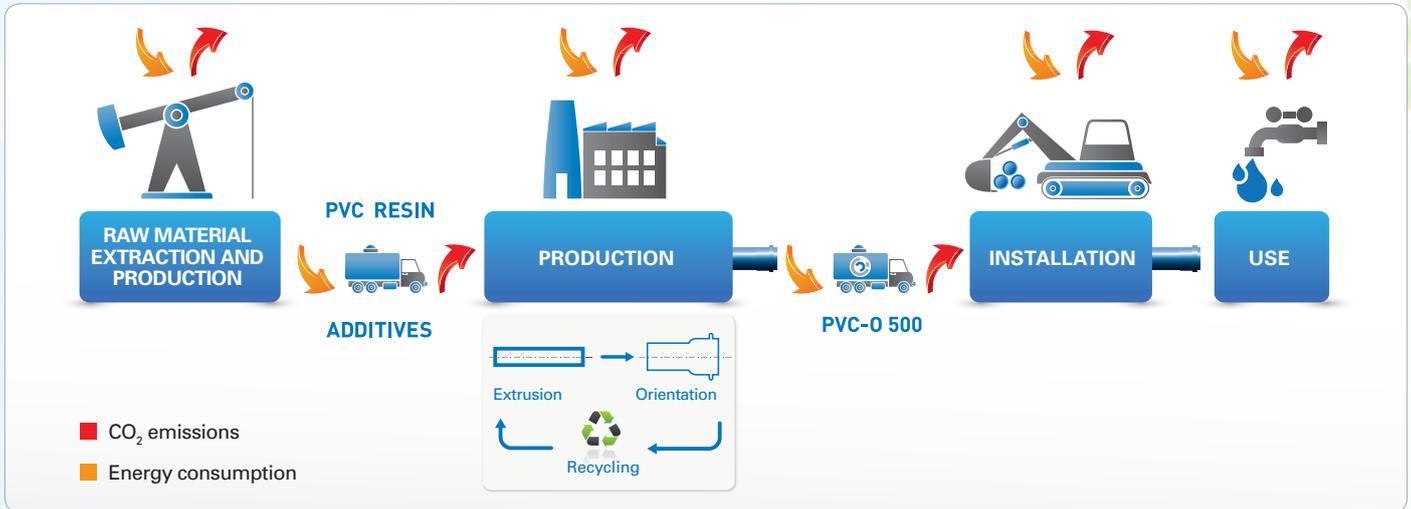


ISO 16422:
2006
SIRIM mark
(Malaysia)



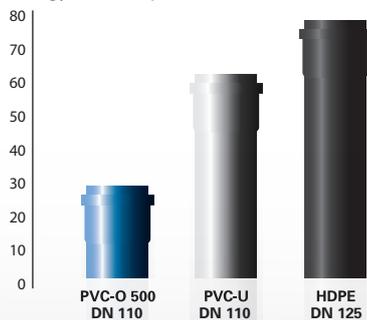
*  Mark for the range of products DN 90-315, DN 400 and DN 500 PN 16, DN 110-315, DN 400 and DN 500 PN 25.
Updated information and details can be downloaded from www.molecor.com

The most eco-friendly solution for water transportation



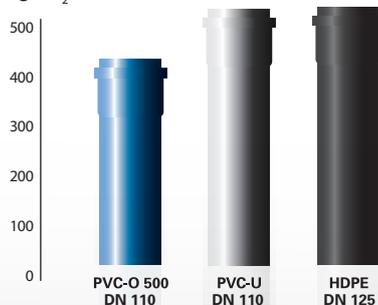
EXTRACTION AND PRODUCTION OF MATERIALS

Energy consumption (kWh)



LIFE CYCLE CO₂ EMISSIONS

Kg CO₂



"ESTIMATION OF ENERGY CONSUMPTION AND CO₂ EMISSIONS DUE TO PRODUCTION, USAGE, AND FINAL USAGE OF PVC, HDPE, PP AND CAST IRON PIPES". Department of Engineering Projects. Universitat Politècnica de Catalunya. Barcelona, December 2005. Requested by Foro Iberico del PVC.

Energy savings

Embodied energy is defined as the non-renewable energy consumed in all the activities associated to the pipe's lifecycle. This lifecycle includes raw material extraction, manufacture, installation and other supporting functions, such as transport.

The key factors that determine energy savings are the type of raw material used, the production process, the quality of the finished product and the pipe's life expectancy. Raw material saving implies energy reduction during the extraction and the material production. This is also a factor to bear in mind during the installation and transportation: weight reduction makes it easier and quicker for the installer.

The energy consumption required by Molecor Technology is not only lower than the required by pipes made of other materials, but also compared to the required by other PVC-O pipe's production processes.

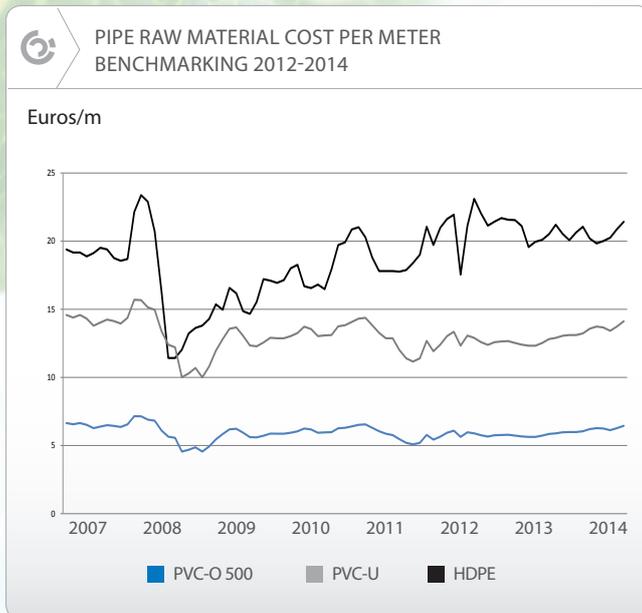
PVC-O 500 pipes inner wall is extremely smooth keeping pressure loss down to a minimum, which considerably reduces the energy required for the fluid transportation. Throughout the entire lifecycle, PVC-O 500 pipes avoid the unnecessary use of energy. Water supply networks made of traditional materials are currently registering a leakage rate of up to 25% of channeled water and their chemical deterioration results in having to replace some water conduits despite having been laid only a few years before.

CO₂ is one of the main responsible gases for the greenhouse effect. The Kyoto Protocol recently updated in the Copenhagen protocol is aimed to achieve the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous interference with the climate system.

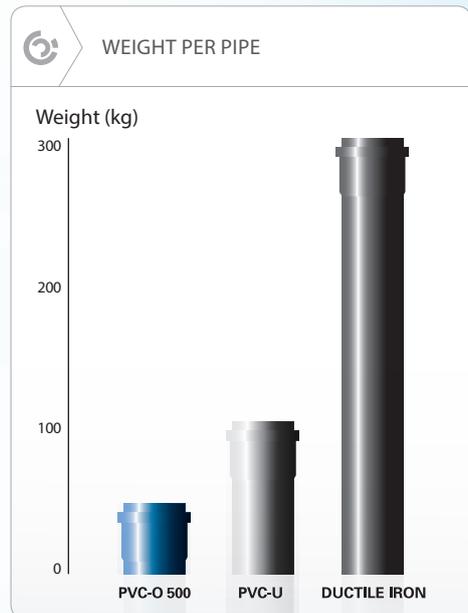
Molecor Technology is committed to collaborate with the reduction of the greenhouse effect. PVC-O 500 pipes reduce CO₂ emissions in every link of its lifecycle chain and are, therefore, a tool for managing water resources for generations to come.

Material savings

Material savings becomes nowadays an ever more important issue due to the constant rising of prices. The following graph shows how PVC-O remains the most profitable option when compared to other materials.



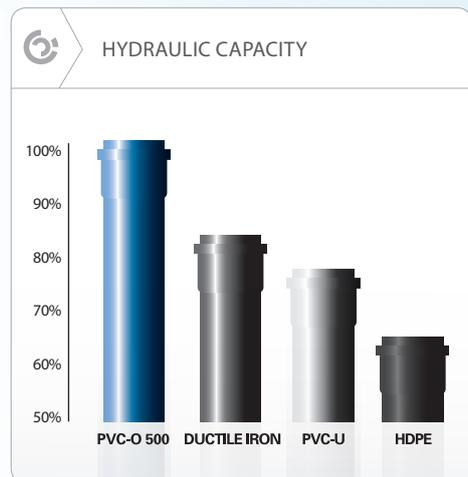
ISO 16422. For a DN 250 mm PN 16 bar pipe



ISO 16422. For a 6 m pipe DN 250 mm PN 16 bar

Hydraulic capacity

The spectacular **PVC-O 500** properties make it possible to reduce the pipe's wall thickness to maximize the required resources. The raw material's reduction is Internationally regulated. It implies less material per pipe and consequently, a reduction in the associated costs. Water pipes not only have to be pressure-resistant, they also have to transport the highest amount of water while consuming the least amount of energy. **PVC-O CLASS 500** pipe walls are thinner than those of conventional plastic pipes and smoother than those of metal pipes, which means greater hydraulic capacity.



ISO 16422. For a 1m DN 250 mm PN 16 bar

100% recyclable

PVC-O 500 pipes are 100% recyclable. They can be ground and processed as rework material to be used in pipe production again or in the manufacturing of other plastic products, without losing any of its properties.



THE GENUINE AIR SYSTEM

- Efficiency and cleanness: easy maintenance, start-up and diameter change
- Safety: the absence of boiling water prevents from leakage risks
- Cost effectiveness: energy applied just to the pipe throughout specific air distribution

INTEGRATED SOCKET SYSTEM

- Socket conformed at the same time as orientation takes place
- Guaranty of no orientation degree loss
- No extra maintenance, time for changing, etc.

IN LINE PROCESS

- Minimum labor and maximum effectiveness achieved
- Standard factory lay-out
- Shortest line length even for the biggest pipes

WIDEST RANGE OF PRODUCTS

- DN: from 90 mm to 800 mm (4" to 30")
- PN: up to 25 bar (365 psi) / 305 psi (21 bar)
- Compliance with worldwide standards
- Special projects for larger diameters

FLEXIBILITY IN THE PROCESS

- Designed to work in line or in batch, small pipe batches may be produced if required by market demands
- Capability of producing "Taylor-made pipe solutions" under client's request



HIGHEST ORIENTATION DEGREE: UP TO CLASS 500

- 🔄 The best mechanical properties
- 🔄 Maximum material savings
- 🔄 The real guaranty for competition, being the best and the cheapest at the same time!

STABILITY

- 🔄 Easy and fast start-up, less than 1 hour
- 🔄 Normal production with recycled material at any percentage
- 🔄 Independent extrusion and orientation processes, disconnected to avoid collapse in the whole line when singular failures in production occur.

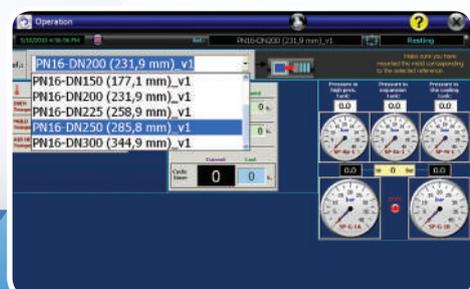
INTEGRATED SEAL SYSTEM +



- 🔄 100% Automatic system
- 🔄 Reinforced rubber gasket
- 🔄 Excellent mechanical properties in the socket

FULL AUTOMATIZED PROCESS: RECIPE SYSTEM

- 🔄 Easy manufacturing
- 🔄 Logic intuitive control for the operator
- 🔄 Low learning curve



SURVEILLANCE

- 🔄 Remote internet assistance
- 🔄 Immediate technical support

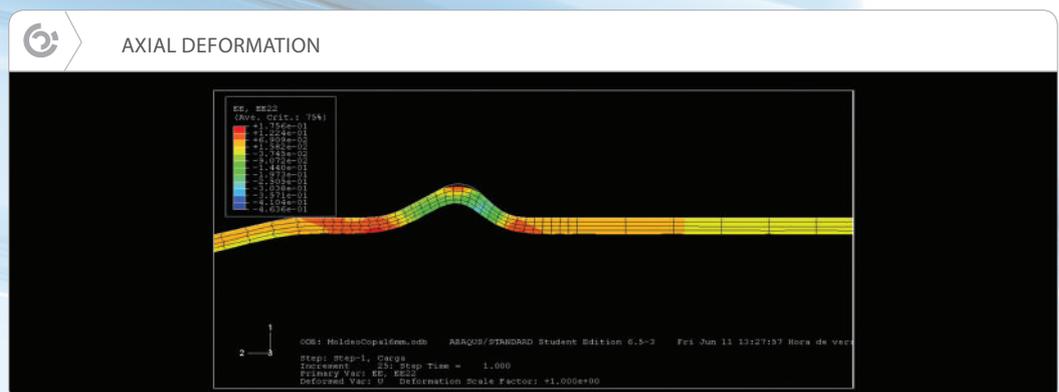
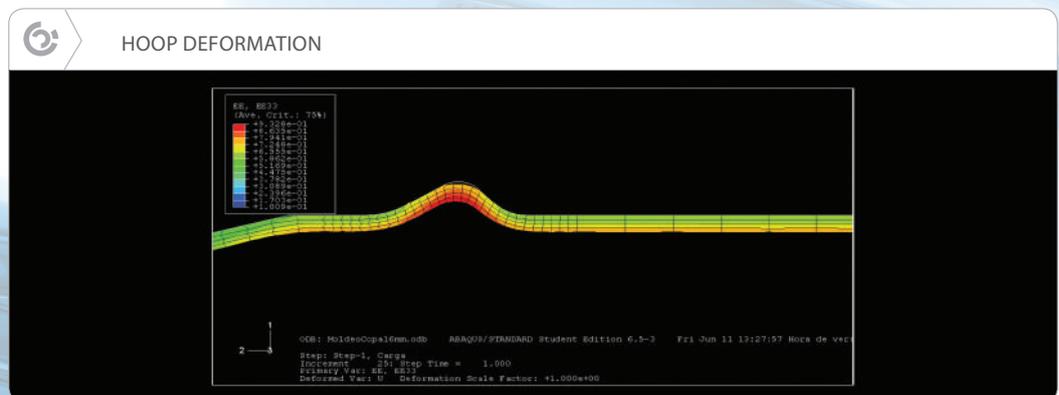
Molecor socketing system features

The socket is the most important part of the pipe. Socket geometry is complexer than in the rest of the pipe, and stresses are higher, mainly in the axial direction. Moreover, its extra dimension compared to the barrel makes it more exposed to impacts, scratches and other damages during installation.

Molecor has researched all aspects surrounding the correct way of working of a rubber ring socket union, in order to design the best system for a PVC-O pipe. The mechanical and geometrical parameters of a socket need to be considered. However, the aspects related to the orientation process, commonly underestimated, are the real issue for a proper PVC-O pipe equipment design.

Fundamentals of a proper socketing system for PVC-O

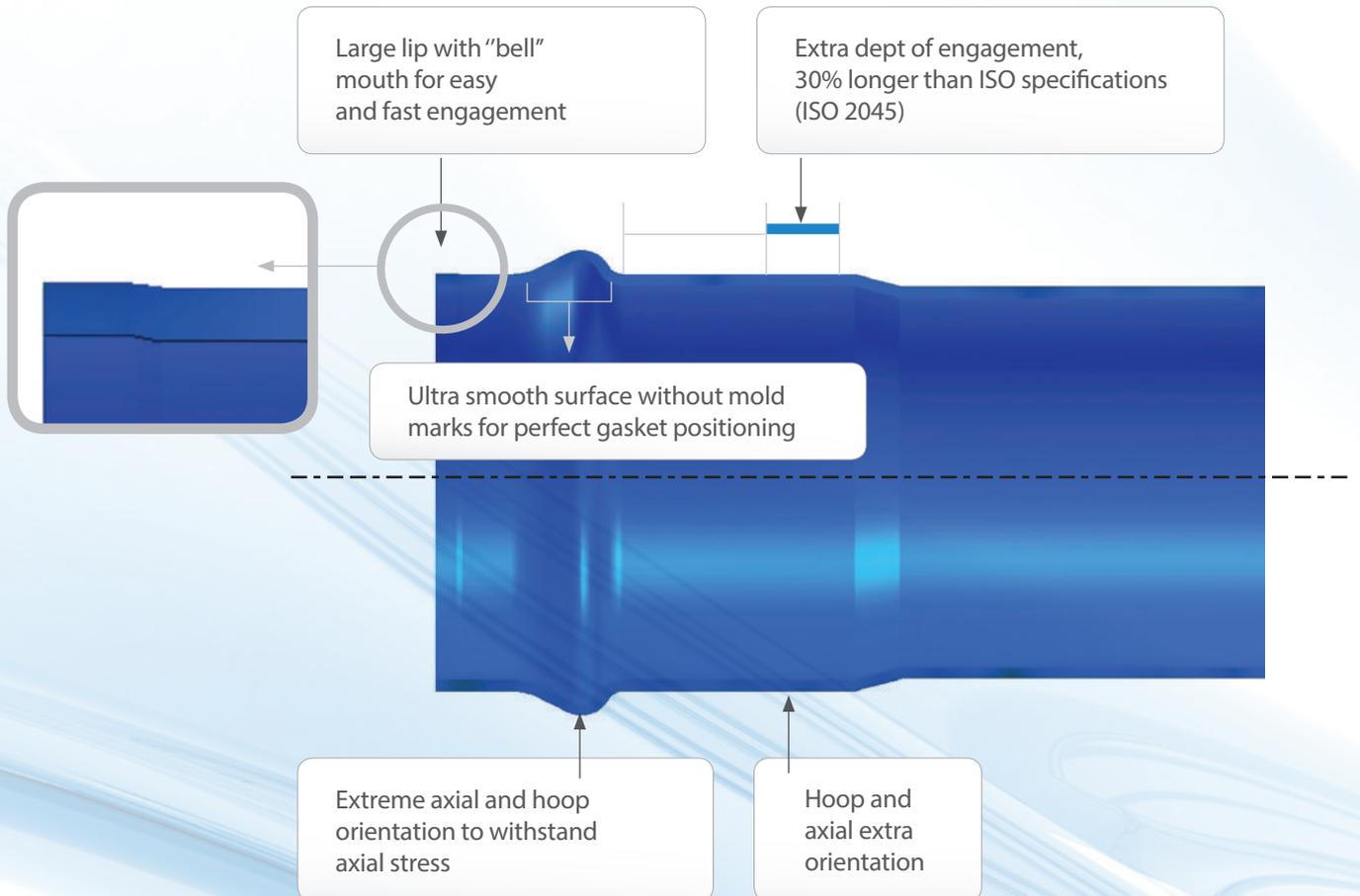
The socket's purpose is the union between pipes ensuring leak tightness and enabling a quick and easy installation on site. Sockets have to be designed so as to provide mechanical resistance. The socket's design in PVC-O pipes does not only depend on certain geometry criteria or thickness distribution. Sockets are expected to maintain the excellent properties attained during molecular orientation. For that reason it is important to attain the right orientation degree on each part of the socket, since it is known how stresses are different along the different sections of the socket.



FEM simulation of a PVC-O pipe behaviour with axial and hoop orientation

Socket design improvements

Molecor has enhanced the classical socket shape to give it extra security with an extra large depth of engagement to enable a safer installation. Molecor special design includes an open lip with a bell shape that improves the pipe's assembly process. Furthermore, Molecor provides local orientation to reinforce the stress concentration areas.



Smooth air molding

Socket shaping is done with air, thus avoiding marks of mold unions and scratches on the inner surface, which provides perfect leak tightness and very easy gasket positioning.

Integral socket

In opposition to other existing systems, Molecor Technology produces the socket at the same time as the rest of the pipe to achieve the optimum conditions for molecular orientation. Therefore, there is no secondary process of reheating and reorientation which could result in a degradation of its properties. In addition to the process simultaneity and stability, Molecor's patented technology allows for different degrees of orientation in the required sections of the socket and for specific wall thickness distribution. In any case, it can be adapted to external machinery devices specially designed for socketing PVC-O pipes.

The biggest PVC-O pipe in the world...



The biggest PVC-O pipe has been developed by Molecor, a pipe of DN 800 (30").

The manufacturing of this pipe is preparing the field for our next development DN 1000 (36").

Technological improvements to meet PVC-O market demands: M-OR-P 3180



Molecor has developed the first system in the world able to manufacture PVC-O pipes up to diameters DN 800 mm (30"). This system: M-OR-P 3180, is able to manufacture from DN 315 mm (12") to DN 800mm (30"). Due to the bigger dimensions of these pipes this machine has been upgraded.

-  Very robust system for heavier pipes
-  Molds and receivers with high safety factors using international designing code ASME VIII
-  Mechanical and electrical security systems. Fail-Safe concept
-  Servo-Hydraulic devices in order to achieve more accurate results
-  More powerful and energy efficient oven

M-OR-P 3180

This system allows, in less than 60 meter length, to manufacture a 800 mm PVC-O pipe.

This length includes the extruder, a nine meter vacuum tank, a six meter spray tank, the haul off, the saw, and the orientation equipment. It is 100 % compatible with standard layouts on plastic pipe factories.



800 mm / 30" PVC-O pipe

Molecor is continuously searching to satisfy the market needs. Therefore, a development on bigger diameters and higher pressures has been pursued, reaching PVC-O pipes of 800mm(30") diameter and pressures of PN 25 (365 psi).

A new system has been engineered in order to meet the new challenges of these big pipes. Molecor is proud to introduce its new equipment **M-OR-P 3180**. This system is able to manufacture pipes ranging from 315 (12") to 800 mm (30").

Molecor, pushing limits beyond

ISS+ Integrated Seal System

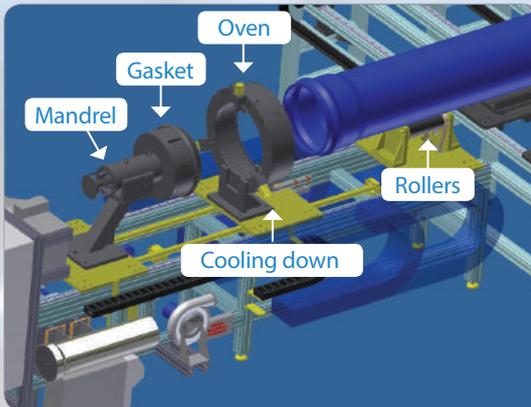


Molecor has developed a new system, patent pending, to manufacture PVC-O pipes with Integrated Seal System. The joining of PVC-O pipes is achieved by means of a rubber sealing ring seated on the pipe bell to effectively prevent leakage between the two adjoining pieces of pipe after the spigot (male end) is inserted into the bell (female end).

Molecor has implemented an Integrated Seal System in order to introduce a reinforced rubber gasket inside the pipe right after orientation, keeping the excellent mechanical properties of PVC-O pipes especially in the socket.

Steps:

1- Gasket Positioning 2- Heating up 3- Cooling down 4- Extraction



The integrated Seal System ISS+ applied to PVC-O pipes presents improvements in the pipe's behavior, especially in larger diameters and high pressures. Up to now, this technology had not been applied to PVC-O pipes.

-  100% Automatic system
-  Reinforced rubber gasket
-  Mechanical and electrical security systems. Fail-Safe concept
-  Excellent mechanical properties in the socket

PVC-O Fittings

The technological development of Molecor, specialized in Molecular Orientation, has allowed the expansion of the use of PVC-O pipes, known since the 70's.

Given the high technical performance of the Oriented PVC applied to pipes, and thanks to the knowledge of the industry, Molecor has developed a research line towards launching PVC-O fittings, a unique product worldwide. Currently, Molecor offers elbows, couplings, reducers and extensions in PVC-O with which the company offers a complete solution for water pipes 100% in PVC-O that can be used for irrigation systems, transportation of drinking water, industrial applications, wastewater, infrastructure and fire protection networks, etc. among many other applications.



Worldwide regulations support

PVC-O pipes manufacture is worldwide supported. There is an International Standard as well as national Standards in USA, France, South Africa, Australia/NZ, Spain, Canada, Brazil, Colombia, Saudi Arabia, Peru and UK.

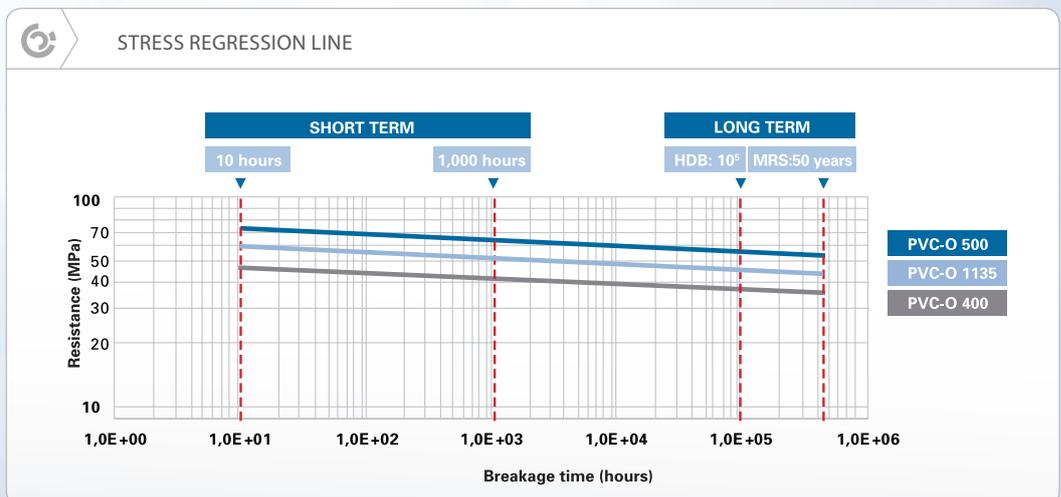
| HYDRAULIC DESIGN | | | | | | | |
|------------------|------------------------|---------------------------------------|-----------|----------------|----------------|----------------|--|
| Standard | CLASS | σ_s | Cs | HDB (psi) | (MPa) | MRS (MPa) | |
| ISO 16422 | | | | | | | |
| UNE-ISO 16422 | 500 | 36-32-25 | 1,4-1,6-2 | | | 50 | |
| BS-ISO 16422 | 450 | 32-28-23 | 1,4-1,6-2 | | | 45 | |
| SANS 16422 | 400 | 25-20 | 1,6-2 | | | 40 | |
| NTP-ISO 16422 | | | | | | | |
| SASO-ISO 16422 | | | | | | | |
| AS/NZS 4441:2008 | 500 450 400 | 32 28 25 | 1,6 | | | 50 45 40 | |
| ASTM F1483-12 | PVCO 1135 | 24,46 (3.550 psi) | 2 | 7.100 | 48,92 | 42,6 (stim.) | |
| AWWA C909-09 | | 24.48 (3.550 psi) | 2 | 7.100 | 48,95 | 42,6 (stim.) | |
| CSA 137.3.1-09 | | 24,48 (3.550 psi) | 2 | 7.100 | 48,95 | | |
| NTC 5425 | PVCO 1139 PVCO 1135 | 26,9 (3.900 psi) 24,46 (3.550 psi) | 2 | 7.490 7.100 | 51,64 48,92 | 42,6 (stim.) | |
| ABNT NBR 15750 | 450 400 | 25 28 | 1,6 | | | 45 40 | |
| AFNOR | * NF | 500 | 40 | 1,6 | | 50 | |
| NF T 54-948 | 450 400 | 36 25 | 1,25 | | | 45 40 | |

* Mark for DN90 to 315, DN400 and DN500 in PN16, DN110 to 315, DN400 and DN500 in PN25

Orientation degree: class

The material class is defined by the material behavior in the long term test. The higher the class achieved, the better the mechanical properties attained. There are two main classifications, the International Standard and the American Standard. As reported by the International Standard, ISO 16422, the **PVC-O CLASS 500** is the highest. It is based on the ISO 9080 test conducted at 10^4 hours and extrapolated to 50 years. For **PVC-O CLASS 500** the MRS (Minimun Required Strength) is at least 50 MPa in 50 years, whereas for example for the class 400 the nominal test pressure minimum value is 40 MPa.

For the American Standards the class should be 1135, according to ASTM D 1483-12. The value is related to the Hydrostatic design Basis (HDB), tested at 10^4 hours and extrapolated to 10^5 hours. Class 1135 means that after 10^5 hours the material withstands at least 6810 psi (46.92MPa).



MRS- Minimum Required Strength

The Minimum Required Strength (MRS) is determined by the material's degree of orientation and therefore it is a key factor in order to determine the hydraulic design stress. The higher the MRS the longer useful life expected and the better guaranty for long term behavior.

Overall service design coefficient: c

This variable takes into consideration service conditions as well as the properties of the piping system components. It goes from 1.25 to 2.0, being 1.25 the lowest overall service design coefficient allowed only for the French Standard NF T54-948:2010 and for the highest classes 450 and 500.

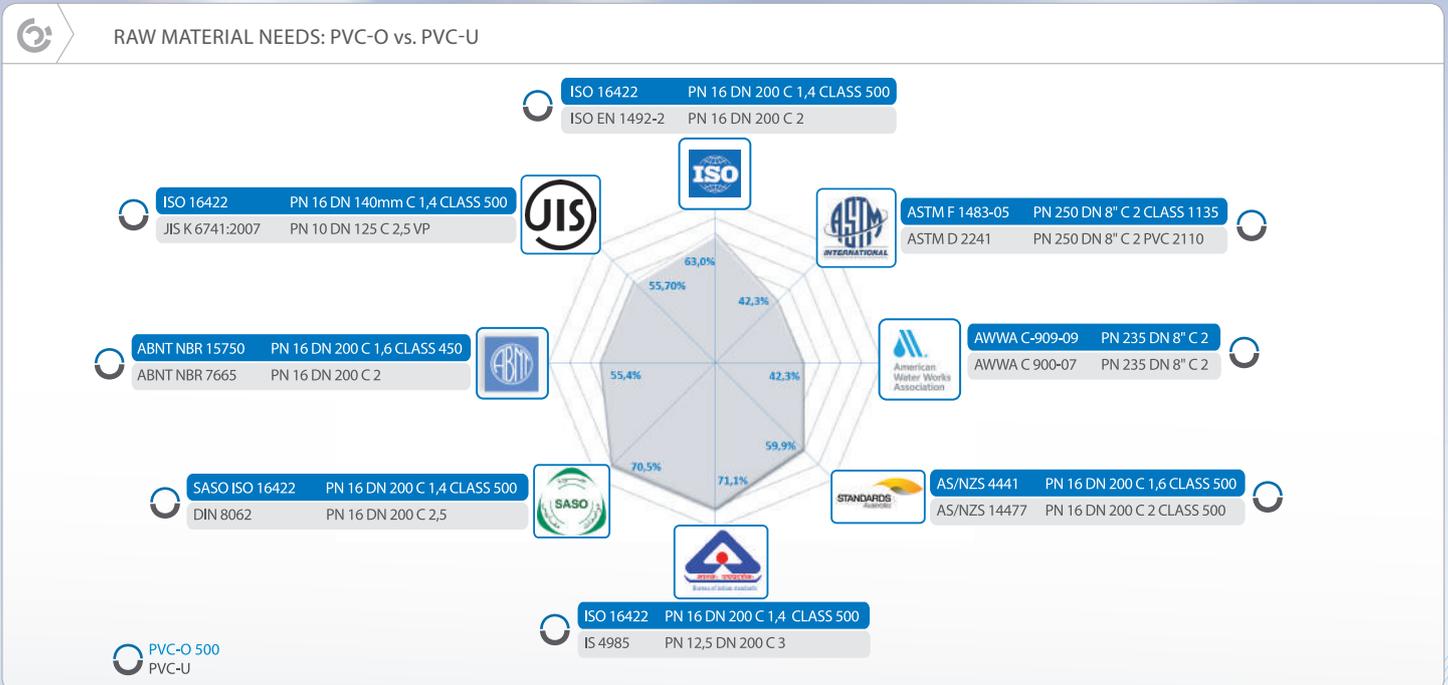
HDB - Hydraulic design stress

It is the estimated maximum tensile strength the material is capable of withstanding continuously with the confidence that pipe failure will not occur. It is related to the MRS and C by the following equation.

$$\sigma_s = \frac{MRS}{C}$$

PVC-O vs. PVC-U

The substantial improvement of the PVC-O's mechanical properties due to Molecular Orientation results in a reduction of the material needs compared to PVC-U. The following chart compares the raw material needs for PVC-O and PVC-U according to the different Standards.



Rework material



Molecor Technology is very stable and robust. Therefore, it works perfectly with rework material. Most of Standards reviewed on the table on the preceding page allow the use of the manufacturer's own reprocessable material produced during the manufacture and testing of products.

MOLECOR HEADQUARTERS (Spain)

Located in the industrial area of Madrid, only 40 minutes from the Barajas International Airport, Molecor has a manufacturing plant for PVC-O pipes, and also an industrial site to manufacture the machines for producing PVC-O pipes, taking advantage of these two complementary points of view and learning from both of them. Molecor offers tailor made solutions to its customers adjusting its technology to their needs.

Canada

Spain

PLASTICOS RIVAL (Ecuador)



RIVAL, leader company with over 35 years of experience in manufacturing plastic pipes in Ecuador, is characterized by its cutting edge vision, always looking for innovation and technology to improve its products portrait. As a result of this company strategy, it has recently completed its PVC, HDPE and GRP pipeline range with the most advanced technology for water solutions, PVC-O with MOLECOR Technology. They are currently producing PVC-O pipes in its modern plant located in the city of Cuenca.

Colombia

Ecuador

GERFOR (Colombia)



GERFOR is a multinational company 100% Colombian with 44 years of experience in production and trading of PVC pipes and fittings, taps, PVC slates and geosystems, with presence in various countries in South America. It exports its products to more than 10 countries in America, and offers high quality solutions for the efficient use of water, committed with welfare, development, and wealth of fields and cities in the countries where Gerfor is present. Since 2011, PVC-O pipes are being manufactured with Molecor Technology.

The highest engineering capabilities in addition to a real production experience make of Molecor system a brilliant, robust and reliable technological item. With its two areas of activity, pipe and technology manufacturer, Molecor completes a circle of successful implementation, achieving its vision of being a global leader of molecular orientation technologies through innovation and commitment.

GDS (Italy)



Sirci Gresintex Dalmine has been created to be the leader Company in Italy in the production of PVC pipes and fittings. Two historical firms are working today in a sole big Company, keeping their values and traditions. Since March 2010 they are manufacturing PVC-O pipes with Molecor Technology. They obtained in a record time the NF mark certificate according to NF T54-948:2010 for the range of products DN 110-250 mm PN 16 bars.

MOLECOR SEA (South East Asia)



Molecor (SEA) was incorporated in 2013 to manufacture and distribute PVC-O pipes in South East Asia, under the "HYPRO" brand.

Our HQ is in Kuala Lumpur, Malaysia and our first plant is in Gebeng, Kuantan, Malaysia.

They are committed to manufacturing and delivering products and services of the highest possible quality, on time, guaranteed to meet or exceed their customer's expectations at the most economical level.

FLOKING PIPES (India)



Floking Pipes Pvt. Ltd. is promoted by Electro Group of Companies and Modi Group of Companies, two of the well established houses who have developed core competences in their respective fields. Equipped with the ground-breaking technology developed by MOLECOR, Floking Pipes becomes the first PVC-O pipe manufacturer and is all set to revolutionize the PVC-O pipe segment in India.

Australia

PIPEMAKERS (Australia)



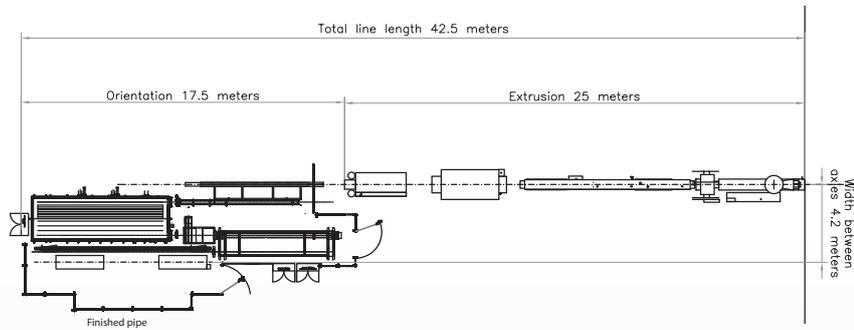
Pipemakers Australia is a leading manufacturer and supplier of PVC piping to the construction and building industry. Product quality, exceptional customer

service and environmental responsibility are the guidelines that have spearheaded its growth.

The Australian company, committed to the latest modern practices, has incorporated the technology developed by Molecor in order to provide the most advanced solutions for water transport, manufacturing PVC-O pipes since June 2014.

M-OR-P 1640

LAY-OUT



RANGE OF PRODUCTS
DN 90 mm to 400 mm (4" to 14")
PN up to 25 bar (365 psi) or 305 psi (21 bar)

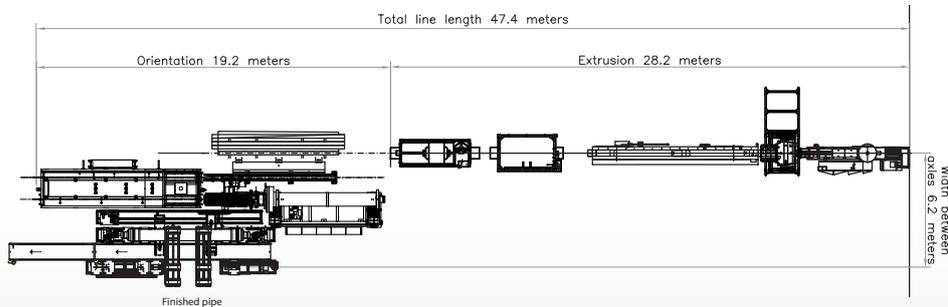
RECOMMENDED EXTRUSION LINE
 ARGOS 93, PH 4, PH5

battenfeld-cincinnati

OUTPUT
 3,000 Tons/year

M-OR-P 3163

LAY-OUT



RANGE OF PRODUCTS
DN 250 mm to 630 mm (10" to 24")
PN up to 25 bar (365 psi) or 305 psi (21 bar)

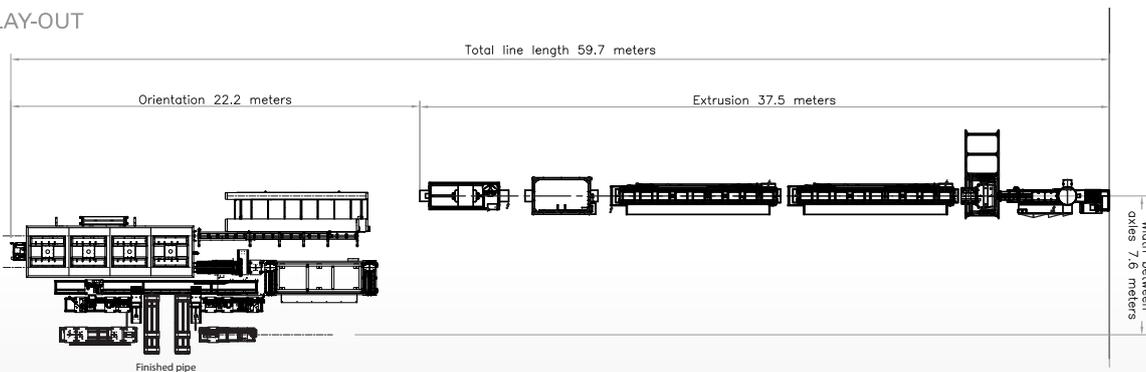
RECOMMENDED EXTRUSION LINE
 ARGOS 114, PH 5 to PH7

battenfeld-cincinnati

OUTPUT
 5,000 Tons/year

M-OR-P 3180

LAY-OUT



RANGE OF PRODUCTS
DN 315 mm to 800 mm (12" to 30")
PN up to 25 bar (365 psi) or 305 psi (21 bar)

RECOMMENDED EXTRUSION LINE
 ARGOS 135, PH 5 to PH7

battenfeld-cincinnati

OUTPUT
 6,000 Tons/year

| M-OR-P 1640 | | | | | | | | |
|-------------|--------|---------|------|---------|----------|------|-------|------------|
| ISO | AS/NZS | ASTM | | AWWA | CSA | | NBT | SASO ISO |
| 16422 | 4441 | 1483-05 | | 909-09 | B137.3.1 | | 15750 | 16422:2009 |
| DN mm | DN mm | DN inch | | DN inch | DN inch | | DN mm | DN mm |
| | | IPS | CIOD | CIOD | IPS | CIOD | | |
| 90 | 90 | | | | | | | 90 |
| 110 | 100 | 4" | 4" | 4" | 4" | 4" | 100 | 110 |
| 125 | | | | | | | | 125 |
| 140 | 150 | | | | | | 150 | 140 |
| 160 | | 6" | 6" | 6" | 6" | 6" | | 160 |
| 180 | | | | | | | | 180 |
| 200 | | | | | | | 200 | 200 |
| 225 | 200 | 8" | 8" | 8" | 8" | 8" | | 225 |
| 250 | 225 | | | | | | 250 | 250 |
| 280 | 250 | 10" | 10" | 10" | 10" | 10" | 300 | 280 |
| 315 | 300 | | | | | | | 315 |
| 355 | | 12" | 12" | 12" | 12" | 12" | 350 | 355 |
| 400 | | 14" | 14" | 14" | 14" | 14" | | 400 |

| M-OR-P 3163 | | | | | | | | |
|-------------|--------|---------|------|---------|----------|------|-------|------------|
| ISO | AS/NZS | ASTM | | AWWA | CSA | | NBT | SASO ISO |
| 16422 | 4441 | 1483-05 | | 909-09 | B137.3.1 | | 15750 | 16422:2009 |
| DN mm | DN mm | DN inch | | DN inch | DN inch | | DN mm | DN mm |
| | | IPS | CIOD | CIOD | IPS | CIOD | | |
| 250 | 250 | 10" | 10" | 10" | 10" | 10" | 250 | 250 |
| 280 | | | | | | | | 280 |
| 315 | 300 | 12" | 12" | 12" | 12" | 12" | 300 | 315 |
| 355 | 375 | 14" | 14" | 14" | 14" | 14" | 350 | 355 |
| 400 | | 16" | 16" | 16" | 16" | 16" | 400 | 400 |
| 450 | 450 | 18" | 18" | 18" | 18" | 18" | 450 | 450 |
| 500 | 500 | 20" | 20" | 20" | 20" | 20" | 500 | 500 |
| 560 | 560 | 20" | 20" | 20" | 20" | 20" | | 560 |
| 630 | 600 | 24" | 24" | 24" | 24" | 24" | 600 | 630 |

| M-OR-P 3180 | | | | | | | | |
|-------------|--------|---------|------|---------|----------|------|-------|------------|
| ISO | AS/NZS | ASTM | | AWWA | CSA | | NBT | SASO ISO |
| 16422 | 4441 | 1483-05 | | 909-09 | B137.3.1 | | 15750 | 16422:2009 |
| DN mm | DN mm | DN inch | | DN inch | DN inch | | DN mm | DN mm |
| | | IPS | CIOD | CIOD | IPS | CIOD | | |
| 315 | 300 | 12" | 12" | 12" | 12" | 12" | 300 | |
| 355 | | 14" | 14" | 14" | 14" | 14" | | 315 |
| 400 | 375 | 16" | 16" | 16" | 16" | 16" | 350 | 355 |
| 450 | 450 | 18" | 18" | 18" | 18" | 18" | 400 | 400 |
| 500 | 500 | 20" | 20" | 20" | 20" | 20" | 450 | 450 |
| 560 | 560 | 20" | 20" | 20" | 20" | 20" | 500 | 500 |
| 630 | 600 | 24" | 24" | 24" | 24" | 24" | 600 | 560 |
| 710 | 750 | 30" | 30" | 30" | 30" | 30" | 700 | 630 |
| 800 | | | | | | | 800 | 710 |

Range of products highlighted in blue are special adaptations processed under request.
The diameters in blue print are not contemplated in the Standards.

Licensees



Reputed partners



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