

Double-Strand Extrusion of Multilayer Pipes is an Efficient Solution

When investing in an extrusion line, flexibility in the manufacture of different products, maximum energy efficiency, minimal personnel requirements, and minimal raw material consumption are of crucial importance.

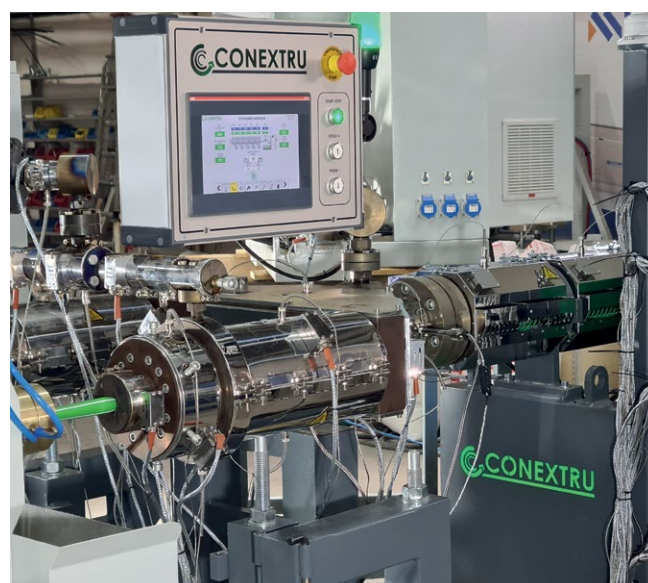
One way to increase the productivity of the extrusion line is through double-strand extrusion. This solution is well known for single-layer pipes. The dimension range described here extends from 20 mm for pipe materials that are problematic at high line speeds to a high output of up to 2 tons per hour for pipes with a diameter of up to 160 mm made of PVC.

To make such a twin-strand line even more efficient, there is the option of

Conextru specializes in the production of various products. Below, one such system is presented.

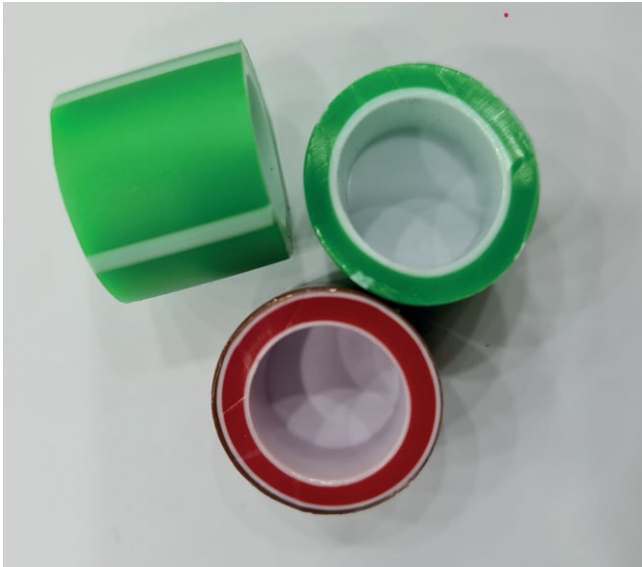
The task was to produce the following products in dimensions 16, 20, 25, and 32 mm SDR 7 from PPR material on a twin-strand line.

The product consists of a pipe with a thin white inner layer and a strong outer layer. It is provided with colored stripes.

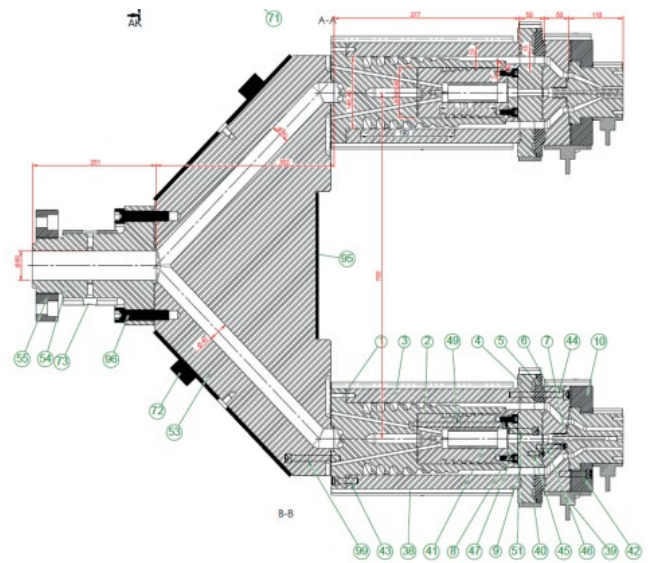


Extruder arrangement

The product consists of a pipe with four layers, whereby the inner layer has a low thickness, the middle layer has a high density, and the outer layers have a low thickness.



Products to make



Y-Block with Layer Head

The goal is to work with a minimum number of extruders and as little effort as possible to switch from product A to product B.

Both pipes have a thin inner layer and a further, stronger layer above it.

To accomplish this task, a distribution block was designed that comprises two flow channels: one channel for the inner layer and another channel above it for a thicker layer.

The two extruders supply these channels with the respective layers. Due to its smaller dimensions, the extruder for the inner layer was specifically optimized for higher output.

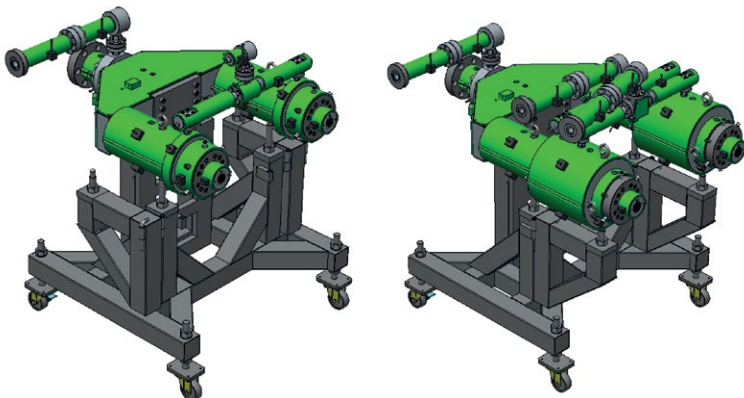
Two layer die heads were then mounted on the aforementioned distribution block with two melt lines. Both melt streams are distributed by a spiral distributor. A replaceable color stripe unit was mounted in the head, which allows the melt to be fed from above via a melt bridge from an extruder. The first task was thus successfully solved using three extruders.

To implement the second solution, it is necessary to dismantle the color stripe unit and install two co-extrusion units instead. In principle, it is possible to work with radial distribution here. However, this design has the disadvantage that it must be built with a larger diameter than spiral distributors. Due to the small center distance of the Y-distributor, small helical distributors optimized for throughput were used.

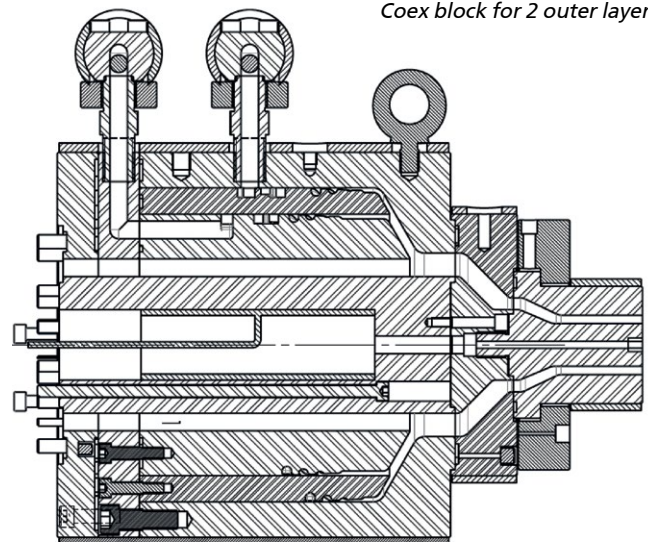
The thinner layer further inside is fed via the same melt bridge and extruder as the heads. The same melt bridge and extruder were also used for the color stripe.

A melt bridge with another extruder was also used for the thin outer layer.

The throughput between the left and right strands is finely adjusted using screws in the melt bridge. Turning these screws reduces the throughput. Practical experience has shown that this is not necessary. It is understandable that both heads have the same flow channel and the same temperature. As a result, the

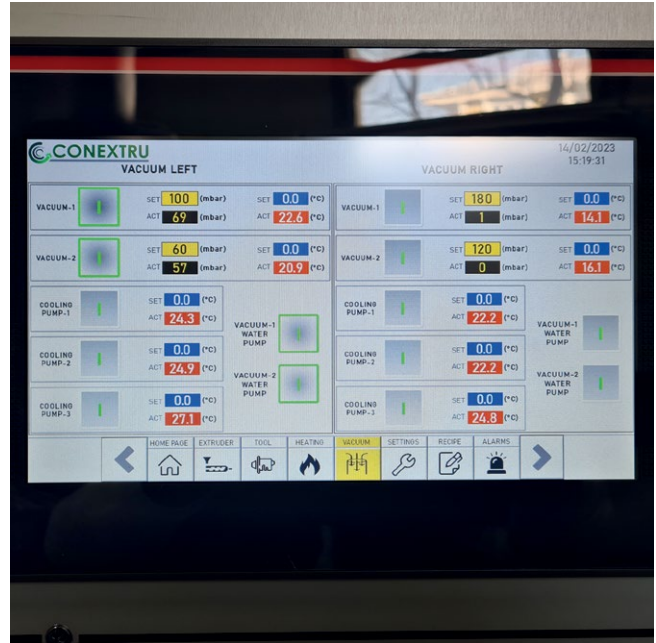
2-Layer version
4-Layer version

Coex block for 2 outer layers





2 Strand / 2 Chamber Vacuum Tank



Control page for process data cooling

flow resistance is also identical, which in turn influences the throughput or layer thickness.

The Y-block and the two pipe heads are mounted on a fixed pipe head carriage or frame. Due to the greater overall length of the 4-layer version compared to the 2-layer version, it was necessary to use an additional pipe head support, which is designed for the 4-layer head and can be swiveled in if required.

An essential component of the system is the pipe cooling, which enables high line speeds to be achieved.

Cooling is provided by two separate cooling sections, which are arranged on the left and right. The systems consist of a 9 m long vacuum full bath with two chambers, followed by four baths, each 9 m long, in spray bath design.

Each vacuum bath is equipped with two separate vacuum pumps and two separate spray pumps.

The vacuum is controlled via PLC in the extruder control system of the main extruder. The vacuum is set via the speed of the vacuum pump motor. Either the speed or the pressure in mbar can be specified as the setpoint.

The water temperature in the vacuum bath is also controlled by the extruder control system, and the cooling water temperature can be set as a target value. To ensure a constant water temperature, a fresh water inlet and a controlled cooling water outlet are installed.

The process data can be viewed and modified both in the extruder control system and on the operating terminal on the tank. Of course, the two operating terminals also feature buttons for the "pump on/off" and "vacuum on/off" functions, as well as for operating the motorized longitudinal adjustment.

The decision to use a high line speed is essential to ensure smooth running of the pipe. The special design,

which does not require silicone seals, is an essential prerequisite.

In this configuration, line speeds of 40 meters per minute per strand can be achieved, which corresponds to a total speed of up to 80 meters per minute. In this case, twin-screw extrusion is a sensible method.

The two draws can be controlled independently of each other. Relative meter weight control can be implemented very well by means of optical measurement, which keeps the production process constant.

The use of gravimetric dosing to control the output per extruder is standard practice and an absolute necessity.

The advantage of such a system lies in the possibility of producing two different products from the same material at high performance with only four extruders.

The task at hand was solved in a special way, which makes it truly remarkable. However, it is unlikely that this solution can be considered standard in the future. Rather, this example illustrates the technical possibilities of twin-screw extrusion.

CONEXTRU thus demonstrates that it is actively committed to developing special solutions, in contrast to other suppliers of extrusion systems who mainly work with standard solutions. Such special one-off solutions are of secondary importance to these companies due to the uniqueness of the high engineering content and the risk involved.

By J. Dobrowsky

CONEXTRU

Klosterstasse 19, 3011 Irenental, Austria
Dobrowsky.j@conextru.eu