

Complete Continuous Rotary Extrusion Lines for Processing Aluminum Rod

Continuous rotary extrusion is a low-cost, continuous process for creating a variety of wire, cable, and other forms from aluminum feedstock. Through its Research & Development Department, Continuous-Propenzi, based in Italy, has developed a new continuous rotary machine for the processing of aluminum and its alloys (1xxx, 3xxx, 5xxx), as well as copper. The Pro-Form (or Properzi Forming) machine is capable of producing products for a number of different applications (Figure 1), including aluminum alloy rod (directly from the cast bar), solidal cables and conductors, profiles, bus-bars, tubes, and multi-port tubes, etc.

Pro-Form is also able to produce aluminum-clad steel (ACS) wire, a semi-finished product typically used for the construction of high voltage aluminum conductor steel-reinforced (ACSR) cable. Aluminum cladding of steel wire is a growing market, as cable makers seek to solve challenges associated with standard steel transmission lines. The bimetallic conductor solves a number of these challenges, with the aluminum cladding providing lighter weight and reducing galvanic corrosion and sparks.

Rotary Extrusion

The rotary extrusion process (Figure 2) begins when the aluminum wire rod feedstock is fed into the groove of the rotating extrusion wheel. An idle roller (coining roll) compresses the feedstock against the groove, thereby generating the friction force necessary for the process. The upper part of the groove—within the circumference arc between the coining roll and the abutment—is closed by a series of fixed plates that create a pressurized chamber. The abutment forces the material to flow from the wheel's groove to the extrusion die. This process generates a high tem-

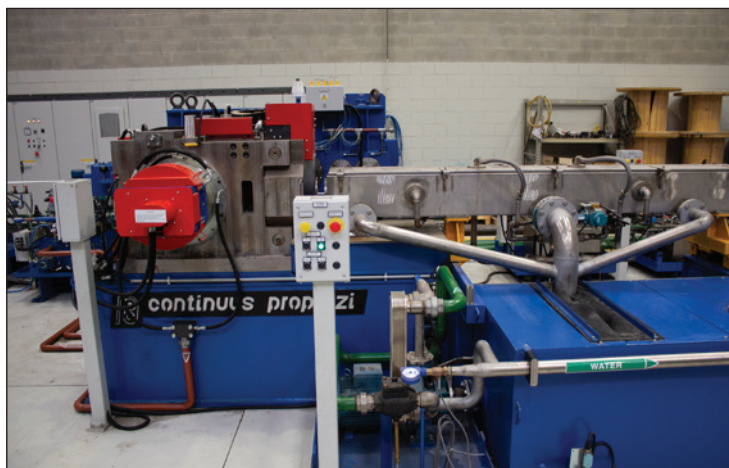


Figure 1. The Pro-Form continuous rotary extrusion machine.

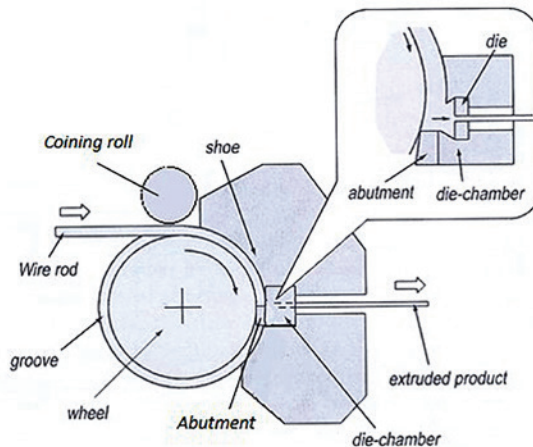


Figure 2. The continuous rotary extrusion process.

perature and pressure, which makes the feedstock material more plastic so that it begins flowing through the extrusion die—thus producing the extruded product.

The Pro-Form machine can be installed at a new facility or within an existing rotary extrusion line. The machine is equipped with a 300 mm, 420 mm, or 500 mm wheel a 200 kW motor. In general the machines are designed to not occupy much space, with the 300 mm wheel with machine having a foot print of 2.5 m wide by 2.5 m long with a height of 2 m. The largest 500 mm wheel machine is slightly larger at 4.5 m x 5.5 m with a height of about 3 m. With all of the auxiliary equipment in place (double entry, wire cleaning, defect deflection, etc.), the Pro-Form line is about 20 m in length.

Depending on the size of the machine, the size of the feedstock, and

the type of finished product, Pro-Form is capable of obtaining production rates as high as 1,000 kg/hr (for the 300 mm wheel). Since the machine's productivity is continuous and doesn't require intervention by the operator, it can be assumed that with an efficiency of 0.9, the Pro-Form would be able to produce around 650 tpm with a 24/7 operation.

Complete Lines

With the introduction of Pro-Form, Continuous-Propenzi is now capable of manufacturing complete continuous rotary extrusion lines for aluminum—from molten metal to extruded shapes. The complete line includes Properzi's proprietary continuous casting and rolling (CCR) rod line (processes molten aluminum into rod feedstock), the Pro-Form machine (extrudes the feedstock into the final extruded product), and the various auxiliary equipment required to manage the incoming feedstock (pay-off, wire rod straightener, cleaning system) and outgoing product (cooling system, dimensional and surface control systems, take-up, etc.). In addition, for the production of ACS wire, the company can provide steel rod drawing machines, wire drawing machines, and wire stranding machines.

Conclusion

The first Pro-Form machine is currently operating within the Research & Development Department at Properzi headquarters. It is currently producing short production runs of special profiles and semi-industrial runs with different solidal conductors. As part of a complete rotary extrusion line, the Pro-Form provides a number of advantages, including continuous production, high production rates, close tolerances, low installation and maintenance costs, low energy consumption, and low scrap levels. ■