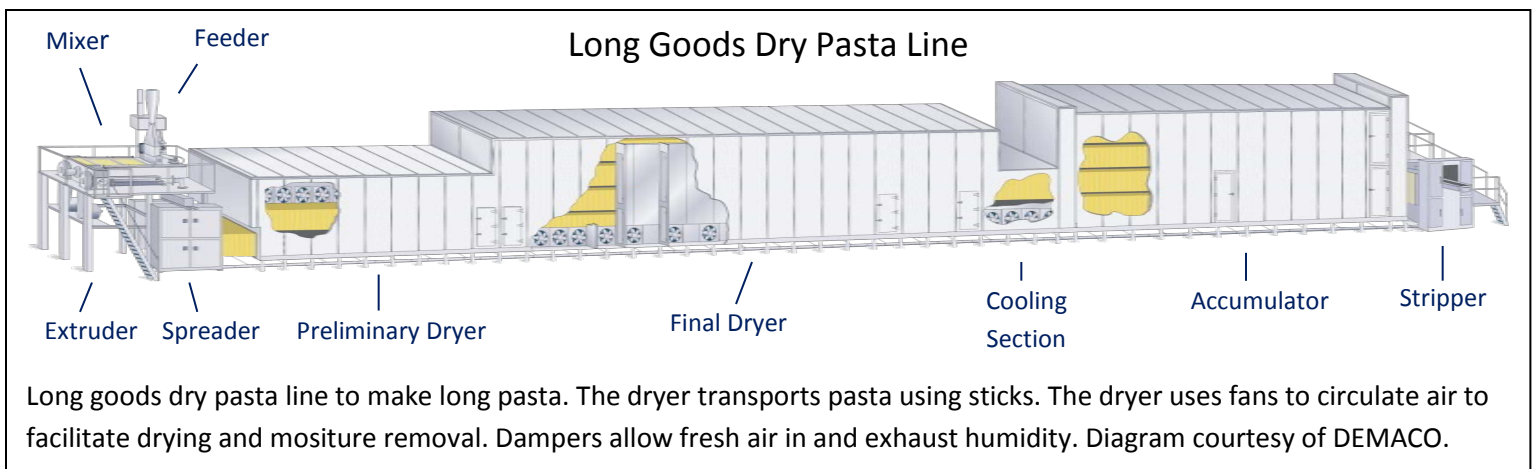


Leonard J. DeFrancisci  
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Industrial manufacturers of dry pasta use machines called “dry pasta lines” to make high volumes of product. These machines produce from 500 to 8,000 kilograms per hour of pasta. Long goods dry pasta lines make long pasta, such as spaghetti and linguini, and short goods pasta lines make short pasta, such as elbows and penne. The machines make pasta in a “continuous” process with ingredients going in one end and finished products out the other without interruption. They are fully automated with computer controls making the process hands free. A typical dry pasta line consists of an extruder, dryer and packing system, which are positioned linearly in a row thus forming a “line” of interconnected machines. A line is between 60 to 120 meters long depending on the production capacity.

Dry pasta is a category of products that contains about 12% moisture in the finished state.<sup>1</sup> This makes the product rigid, such as seen in products typically sold on the shelves of supermarkets. Fresh pasta is a category of products that is undried and contains about 30% moisture.<sup>2</sup> Fresh pasta is supple and requires freezing, refrigerating or canning for storage, such as seen in frozen entrées or canned soups.



## Extruder

The extruder mixes semolina and water to make dough, kneads the dough and pushes it through a die to form the shape, and cuts the pasta to the correct length. Short and long goods lines use a similar extruder, except short good dies usually have a round body to hold the forming inserts while long good dies usually have a long, rectangular body to hold the forming inserts. A die contains a plurality of forming inserts and each forming insert contains a precisely made hole that creates the shape of the pasta as the dough passes through it. A feeder adds semolina in proportion to the water added to the mixer. There are two basic kinds of feeders, one that measures ingredients by weight and the other by volume.

## Dryer

The dryer dries the pasta to the correct moisture level. Due to the length of the product, long and short goods lines employ two different methods for handling pasta. Once extruded, long goods pasta, such as spaghetti is spread across a horizontally oriented stick so the product hangs vertically. The dryer conveys the stick of pasta through the drying chamber. Short goods pasta, such as penne is placed on long horizontal conveyors that permit airflow by using, for example belts with screens or slats. Long goods pasta takes about 5-9 hours to dry depending on the temperature used in the drying process and short goods pasta takes about 3-5 hours.

Air circulation, heat and humidity are critical factors to the pasta drying process. These are carefully managed using sensors and computer controls. Fans circulate air through the dryer and baffles direct air flow. Vents with dampers regulate air flow from inside the dryer to the outside in order to exchange humid air with fresh air. This exchange of air rids the dryer of the moisture removed from the drying pasta. The dryer uses a preliminary dryer and a final dryer, each serves as a distinct section with different atmospheric conditions that is precisely monitored with sensors.

Long Goods Dryers. Long goods dryers contain a spreader, preliminary dryer, final dryer, cooling section, accumulator and stripper.

*Spreader.* Places extruded pasta onto the drying stick. The spreader “spreads” pasta across the length of the stick.

*Preliminary Dryer.* Conducts a preliminary drying of the pasta.

*Final Dryer.* Completes the drying of the pasta.

*Cooling Section.* Cools the pasta after drying using ambient or chilled air.

*Accumulator.* Stores sticks with dried pasta prior to stripping.

*Stripper.* Removes pasta from drying sticks and cuts product to length.

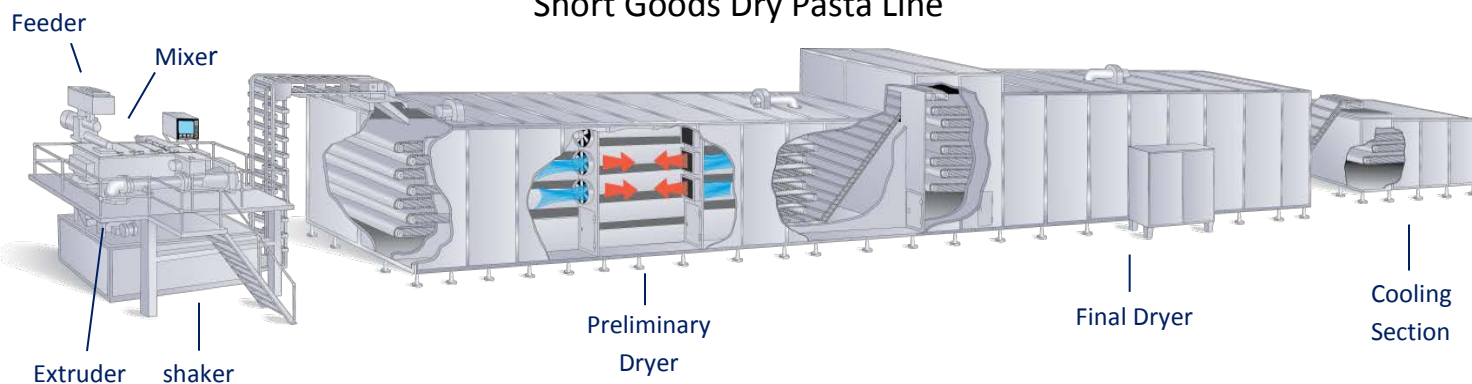


Spreader with long goods pasta extruding and getting ready for placement on drying stick. Photograph courtesy of DEMACO.



Stripper taking pasta off drying stick and getting ready for trimming to length. Multi-level accumulator in background. Photograph courtesy of DEMACO.

## Short Goods Dry Pasta Line



Short goods dry pasta line for making short pasta, such as elbows and penne. The dryer uses conveyors to transport pasta. Controlled moisture removal using heat and air circulation is critical to drying pasta. Diagram courtesy of DEMACO.

**Short Goods Dryers.** Short goods dryers contain a shaker, preliminary dryer, final dryer and a cooling conveyor.

**Shaker.** Removes free moisture to prevent sticking usually with high velocity heated air and a vibratory conveyor.

**Preliminary Dryer.** Conducts a preliminary drying of the pasta.

**Final dryer.** Completes the drying of the pasta.

**Cooling Section.** Cools the pasta after drying using ambient or chilled air.

### Packing

There are many options for packing pasta once dried. Packing can include placing in boxes or bags using a large range of sizes. Pasta for retail consumers is typically sold in ½ Kilogram (≈1 pound) packages while industrial consumers use 10 kilogram (22 pound) boxes for restaurants or 500 kilogram (≈1,100 pound) totes for frozen entrée plants or canneries. Pasta manufacturers often use storage systems to hold finished pasta prior to packing since packing takes much less time than production. Thus, packing can be done in one shift while production is done continuously in three.

<sup>1</sup> R. Carl Hosney. *Principles of Cereal Science and Technology*, 2d ed. (Saint Paul, Minnesota: American Association of Cereal Chemists, 1998), p. 326.

<sup>2</sup> Ibid.

Leonard J. DeFrancisci works at DEMACO. All pictures & diagrams compliments of DEMACO.

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