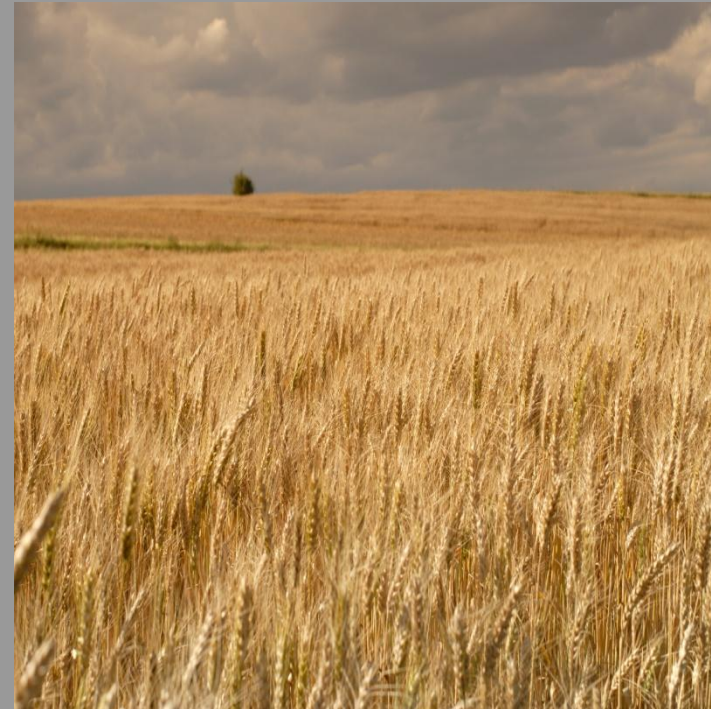


Diversification strategies for the milling industry.

Ch.Rubin, Bühler AG



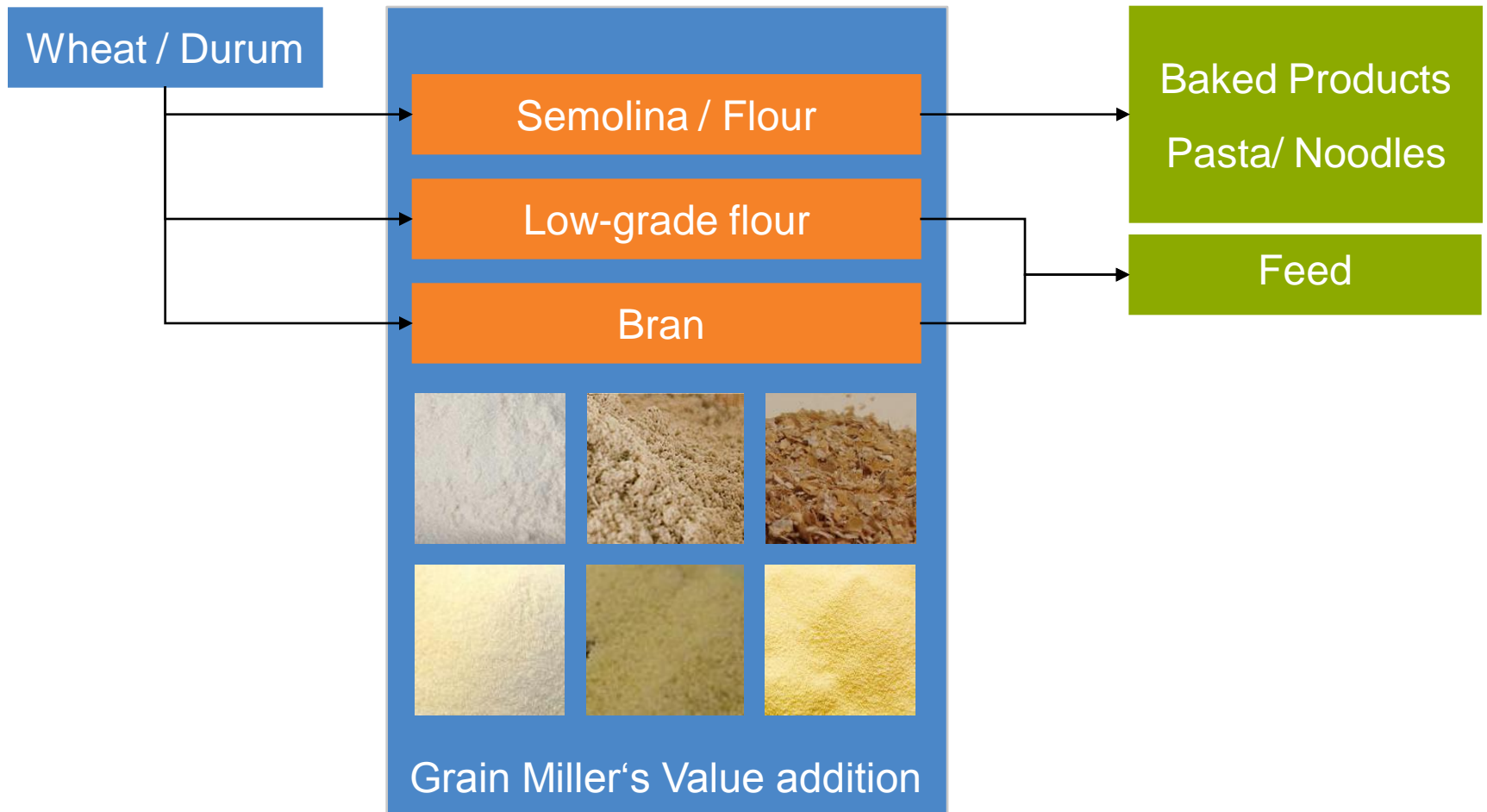
Agenda

- 1 Value addition in Grain mills
- 2 Diversification strategies for millers
- 3 Bühler's contribution
- 4 Reference Plants

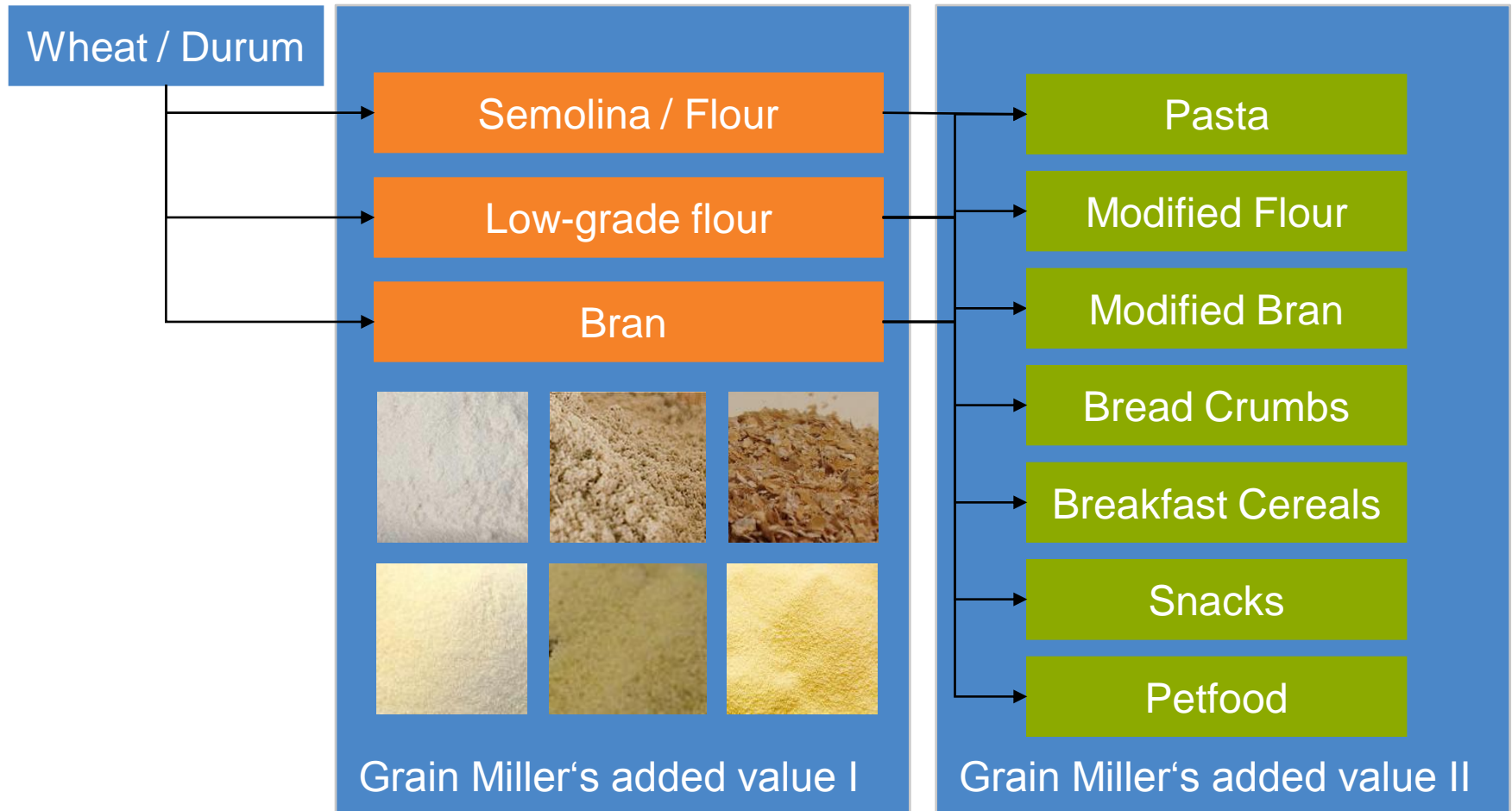
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Conventional Product Portfolio of Grain Mills.



Diversification strategies for grain millers.

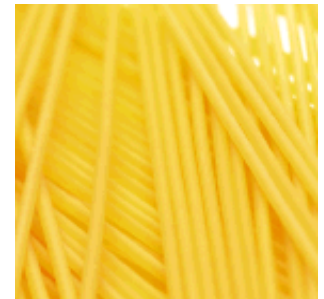
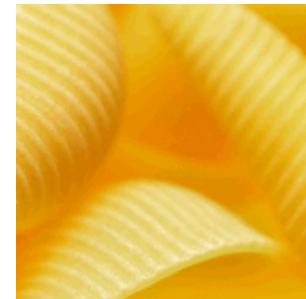
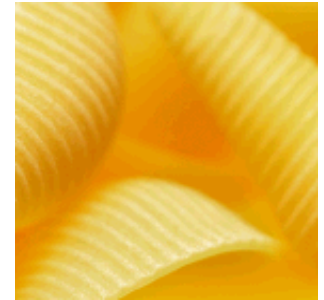


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Dry Pasta.

- Long good pasta
 - e.g. Spaghetti, Buccatini
- Short good pasta
 - e.g. Penne, Ragatoni
- Stamped pasta
 - e.g. Farfale, Oricchiette
- Speciality Pasta
 - e.g. Nidi, Lasagne



Raw material: Durum or bread wheat semolina

Pasta from gluten-free raw material like corn or rice.

- Production of dietetic product
 - For people having celiac disease (0.01 to 1.5 % of the population)
 - Families of celiacs
 - General tendency towards nutrition conscious consumers

- Alternative to common pasta
 - Usage of local cereals for pasta
 - Usage of cheaper cereals than wheat (locally grown)
 - Usage of by-products (e.g. broken rice)
 - Consumers looking for different meals



Raw material: Corn or rice semolina

Modified Flours and bran.

Functional Ingredients but clean label.

- Soups and sauces
 - Binders and thickener
- Bakery products
 - freshness extender, fibre provider
- Desserts
 - Thickener
- Instant beverages
 - Thickener
- Feed
 - Bases in calf rearing

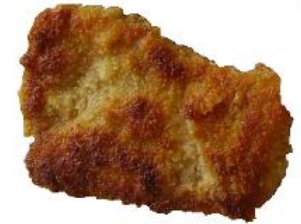


Raw material: Flour, fine semolina, bran

Breadcrumbs.

Up to 40% less energy compared to traditional process.

- Breadcrumbs as coating
 - For Meat, poultry, fish, cheese
- Breadcrumbs as filler and binder
 - For Meatballs, Pizzatoppings, stuffed Pasta
- Breadcrumbs as intermediate products
 - for households, industry, food service



Raw material: Flour, fine semolina, bran

Breakfast Cereals.

A still growing market.

- Direct expanded Breakfast Cereals
 - Balls, rings, stars, crispies, ...
- Flaked Breakfast Cereals
 - Cornflakes, Multigrain Flakes
- Multicolored Products
 - Six different colours on one extruder
- Filled Pillows
 - with chocolate or fruit filling



Raw material: Flour, Dark Flour, Semolina, Bran, broken kernels

Pet foods.

- Basic dry Petfood
 - brown pellets with simple shapes
- Premium Petfood
 - multicolored, marbled, new shapes
- Snacks and treats for Pets
 - rubbery stripes and sticks



Raw material: Flour, dark flour, bran

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Pasta.

108 years of passion for process solutions for the Pasta industry.

Products & services

- Product solutions for making long and short goods, nidi, lasagne, couscous, instant pasta and rice & corn/maize Pasta.
- C-Linie® for meeting rigorous sanitation requirements, maximizing flexibility, achieving fast recipe changes, and generating value from intermediate products and byproducts.

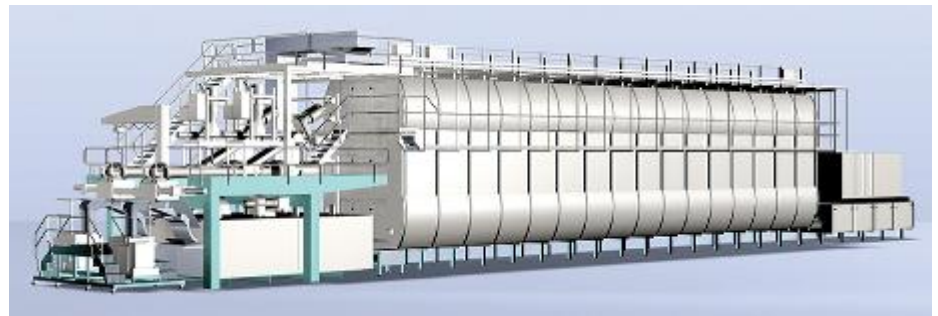
Customer value

- Patented and proven technologies such as the C-Line® for short and long goods or Polymatik® extrusion press technology.
- Responsible and gentle handling of all resources.
- Over a century of experience in Pasta technology.

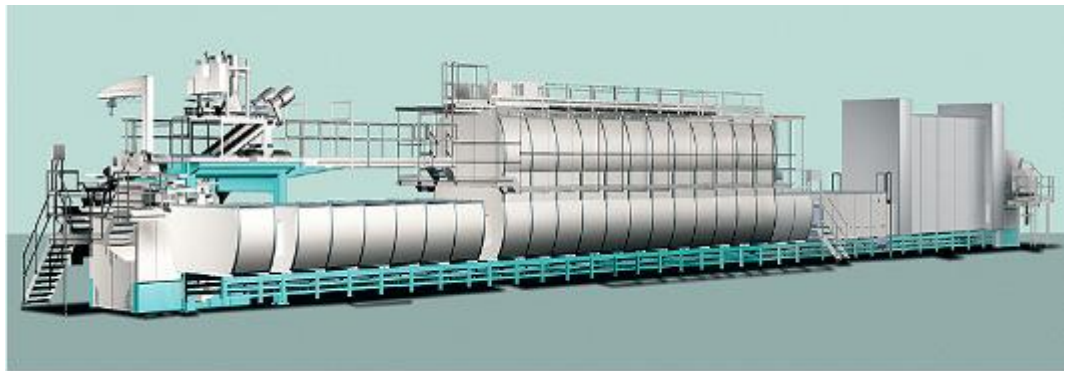


Bühler C-line® for short and long good Pasta.
Flexible, but high capacity lines with optimized running costs.

- Short goods lines 1 – 6.5 t/h 25-60 m length



- Long goods lines 1.25 - 5.5 t/h 40-90 m length



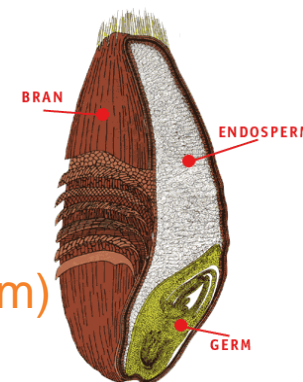
Bühler's process know-how from grain to Pasta.

Properties of the raw material wheat influencing Pasta quality.

Grain properties affecting Pasta quality

(Improvements achievable in wheat supply chain)

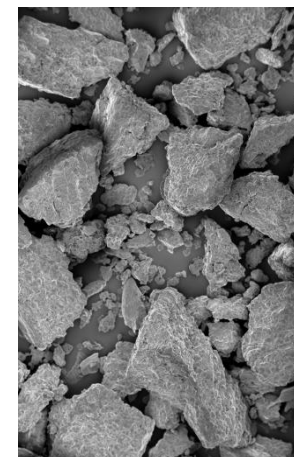
- Protein quantity and quality → Cooking quality
- Kernel vitreousness → White spots (only for Durum)
- Yellow pigment content → Colour of Pasta



Semolina / flour properties affecting Pasta quality

(Improvements achievable in milling processes)

- Ash content / extraction rate → Red-brown colour of Pasta
- Narrow and fine granulation → Homogeneity of Pasta
- Brown and black bran particles → Brown and black spots
- Damaged starch content → Stickiness of cooked Pasta



Innovative extrusion solutions without limits.

Extruded Products.

Products & services.

Integral solutions for:

- Breakfast cereals.
- Breadcrumbs and modified flours.
- Grain milling byproducts.
- Textured proteins.
- Reconstituted or fortified rice.
- Pet food.

Customer value.

Individual solutions meeting all requirements:
from market leaders to producers of niche
products or proprietary brands.

Comprehensive application know-how.

Extrusion application laboratories (Switzerland
and China).



Buhler Twin Screw Extruder.



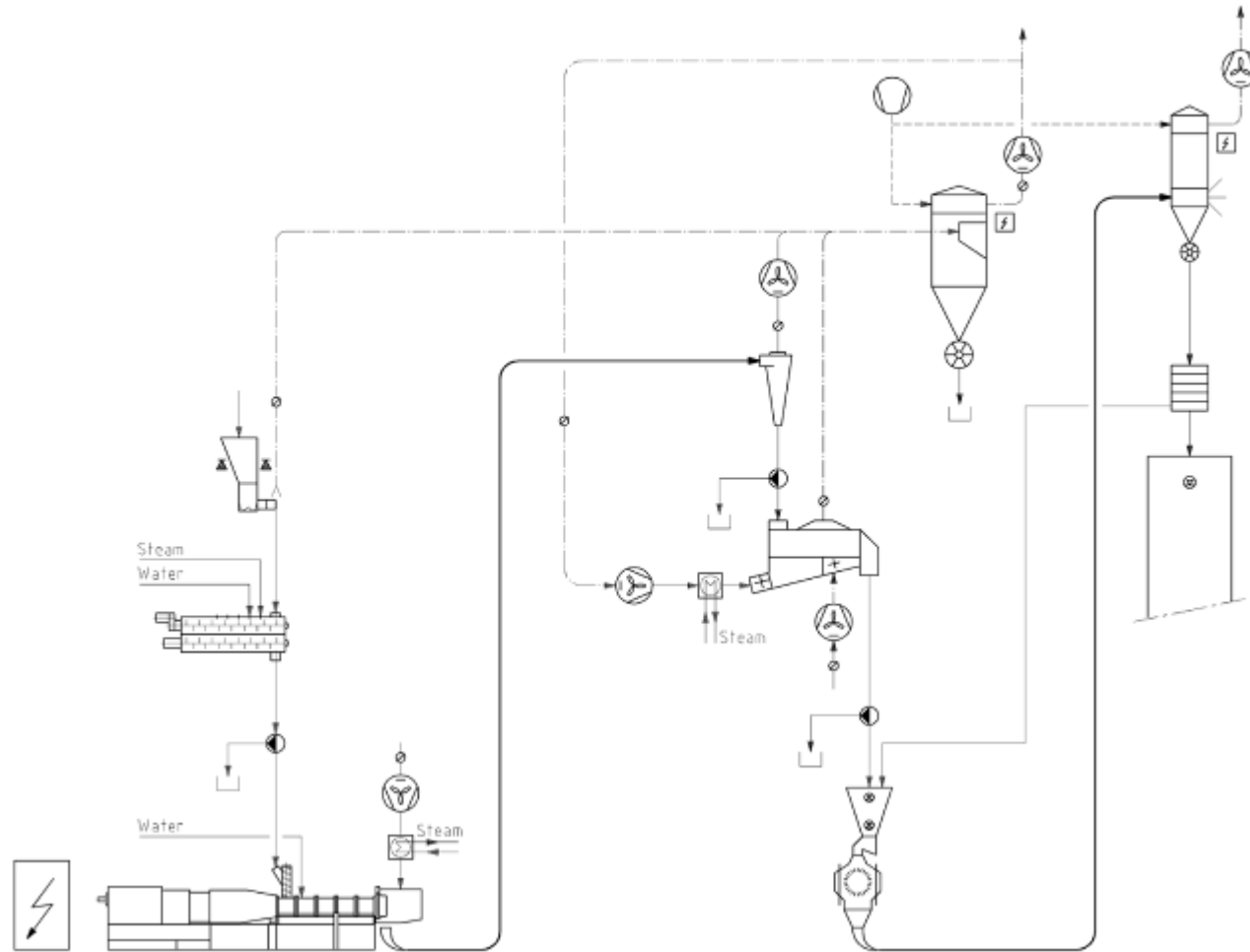
Extrusion Process - Unit Operations.

The extruder is a continuous working process system providing a lot of basic process steps.

- mixing / kneading
- homogenizing
- gelatinizing
- cooking / melting
- heating / cooling
- texturing
- shaping / forming
- coloring
- flavor development
- evaporation
- pressurizing
- expanding
- etc.



Flowsheet of an extrusion plant for modified flours.



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Extruder for Reconstituted Rice in China.



Extrusion Plant for Breakfast Cereals in Germany.



Pasta line for short goods in Italy.



Pasta line for long goods in Italy.



www.buhlergroup.com/extrusion

www.buhlergroup.com/pasta