# Small, dark and strong ...

**... or with milk and sugar? No matter whether it is drunk as Turkish mocha, espresso, cappuccino or café au lait – coffee travels a long way from the plantation to the cup. Pneumatics accompanies it on its journey and helps pack and seal this "brown gold" into airtight packets.**

Perfect handling: Air is extracted from the cans and replaced by inert gas. The cans are then sealed with plastic lids.

www.illy.com

Coffee is cultivated today in more than 50 countries in the world's tropical and sub-tropical regions. Raw coffee grows on the branches of the coffee plant family, which can grow up to 10 m high. The fruit of these plants contains two kernels which are the coffee beans. The main species are arabica and robusta. Its natural propagation area is in the south-western highlands of Ethiopia. Here, it flourishes as undergrowth in cool shady woods at altitudes of 1,300 to 1,800 m above sea level. Coffee plants like a balanced climate as far as possible, without too much sun or heat.

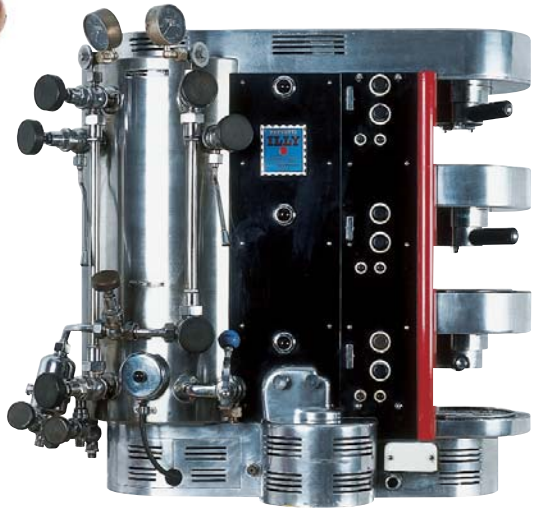
**After the harvest ...**

... the coffee fruits are not yet fit for human consumption, nor are they capable of being kept for any length of time or transported. In order to produce coffee which is fit to be sold, the entire casing surrounding the beans must be removed. There then follow numerous cleaning and sorting operations until the coffee is finally ready for market.

Depending on the desired flavour and aroma required in a coffee blend, coffee roasters mix together coffees of different origins, types and quality. During the roasting process, the coffee beans are subjected to dry heat at normal atmospheric pressure. This causes the water contained in the beans to evaporate, while carbon dioxide and carbon monoxide diffuse out of the bean cells. This makes it necessary to equip coffee packs with valves which allow these gases to escape. More about this later.

**The packaging is the key**

Coffee roasters pack their roasted coffee either as whole beans or as ground coffee. To keep the aroma in, they use aluminium cans or flexible foil vacuum packs. Provided that these vacuum packs remain undamaged, the stimulating drink which they contain can be stored for up to 18 months. Common forms include packs at atmospheric pressure, vacuum packs and gas-filled vacuum packs. Oxygen is excluded from the packs either by evacuation or by replacing the oxygen in normal air by an inert gas (nitrogen), since the greatest enemies of coffee as an aromatic drink are oxygen and humidity.



Illeta espresso machines were working with compressed air as early as 1935.

**One of the true masters ...**

... of Italian espresso is Illy of Trieste. In 1935, company founder Francesco Illy di Illetta developed the archetypal "Macchina Espresso". The espresso machine used until the 1930s used the steam of their water boilers to generate the pressure to extract the coffee aroma from the ground coffee beans. Instead of steam, Illy used compressed air.

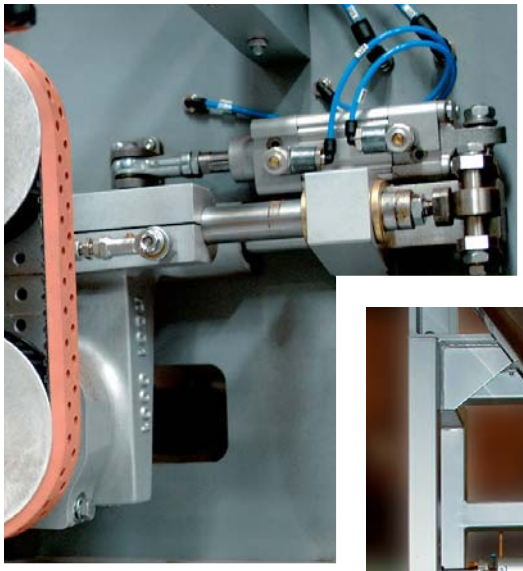
In the 21st century, Illy is still working with compressed air – to produce the aluminium cans with the red logo which are the company's emblem and for the critical

operation of sealing the cans. In these cans, “Illycaffè” remains for months just as fresh as immediately after roasting and packing. “Pressure packaging” is the key note phrase: Illy fills the coffee beans into absolutely airtight metal containers, extracts the air and replaces this by inert gas at low pressure (nitrogen and carbon dioxide). The packs are then sealed airtight. Held under pressure, the aromatics in the beans cannot escape. Coffee packed and stored in this way is still fresh after three years.

But one thing at a time: The roasting plant, which processes 70 tonnes of coffee beans every day in its roasting drums, has its own mechanical engineering department. This department designs and builds all the modules for the machines used to weld the company’s patented 3 kg white-metal cans and for most of the machines used to fill and seal the cans.

**Automated with compressed air**

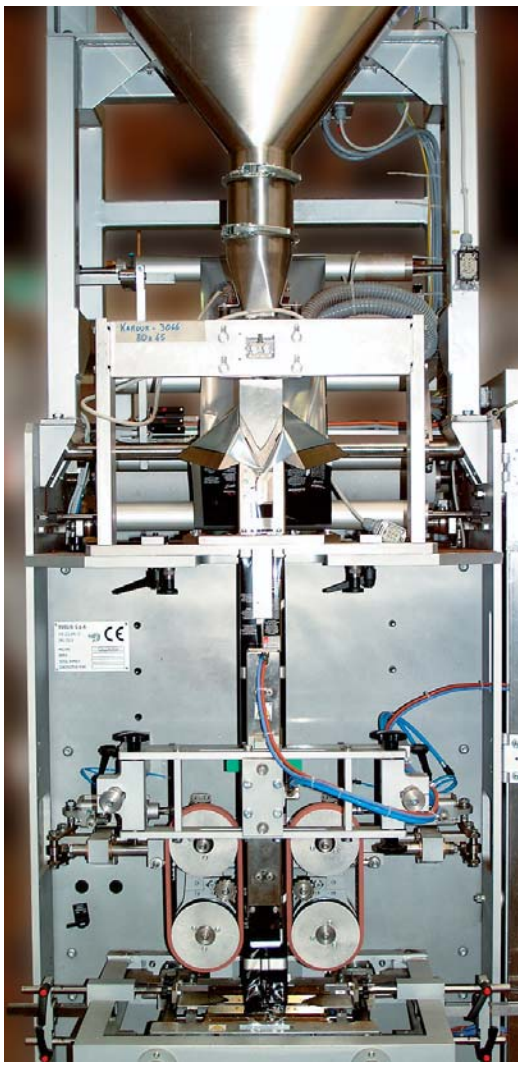
As illustrated by the example of Illetta, compressed air plays its part in improving the process of coffee production. Even at the can manufacturing stage, many



The fres-co® system: Shaping flexible plastic packaging in one processing phase

automation components are used, such as short-stroke cylinders and grippers for holding, motion and feed functions. The most interesting use of compressed air, however, is a machine which extracts the air from cans, replaces this with inert gas and then seals the cans with a plastic lid. A DNC standard cylinder ensures an even replacement of air by gas. Following this, a handling module places a plastic lid on the open top of the can and seals this. The lids are fed by a DSL swivel/linear unit. This drive provides both a linear and a swivel motion in a single unit. An HGD three-point gripper removes each lid from the feed system, which is driven towards the can by

www.goglio.it



**Festo components on the Illy machine**

DNC standard cylinders

DSL linear/swivel units

HGD three-point grippers

DRQD rotary drives

a DRQD rotary drive and places the lid on the open top of the can. Each of these stations is capable of sealing 3,000 cans per day.

These automated machines allow the espresso manufacturer to maintain and constantly improve his outstanding quality standard.

**The highest quality in the world**
This is the aim of the coffee-roasting company F. Gaviña & Sons of Vernon, California, who have great plans for expansion in the North American market. The company soon realised that they could win market share in this tough environment only by using highly-automated packaging machines and high-quality foil packaging. In its desire to minimise costs in its packaging process, it has therefore turned to the fres-co® system, the international brand name for Goglio foil packaging and packaging machines.

White-metal cans are not the only way of keeping coffee fresh. Many coffee roasting houses prefer the advantages of flexible foil packs, which can be shaped and filled at high speed on automated production lines. These flexible foil packs, after all, offer the greatest possible number of individual customer solutions and the highest cost-effectiveness, being very light and capable of high-density filling.

**Flexibility is the key**
Goglio, located close to Milan, develops not only individual customer foil packaging solutions but also the necessary packaging machines. F. Gaviña & Sons recently commissioned several new packaging lines supplied by Goglio. In a single processing step, it is possible to produce packaging in various shapes and sizes, with individual customer printing, specialised finishes and functions such as the fitting of one-way gas vents and the “Easy Open” system which allows the packs to be opened without scissors and re-sealed using a tin tie, zipper or sticker. The aim of this comprehensive range of products is to be able to offer end customers a product which can easily be recognised on the supermarket shelf and has an attractive design which encourages consumers to buy.

**120 packs a minute**
The packaging machine is loaded with foil film on reels, which is

**It is not only the samba ...**

... which has made Brazil famous. On the international coffee market, too, this South American country plays a major role – and not only as an exporter of ”brown gold” but also as a leading manufacturer of machines for coffee processing. With a 55% share of its home market, Metalúrgica Leogap of Curitiba is the clear leader in the field of coffee grinding and roasting. The flagship of this company's product range is the fully-automatic “Turbo Roaster”, which is able to carry out 14 to 18 roasting operations per hour. It operates without smoke or odours and thus meets the most stringent environmental standards. Once again, we find “Pneumatics inside”, since Leogap works with the HACCP philosophy (Hazard Analysis Critical Control Point).
This demands maximum protection against contamination – protection which pneumatics is able to deliver. Examples of variant S6 of the DNC cylinder, able to withstand high temperatures, are installed in the interior of the roasting machine. Their task is to open and close the doors through which the coffee beans exit from the roasting phase. Also on board are CPV14 valve terminals with multi-pin connectors to control the cylinders and process valves which guide the coffee beans during the roasting process.

www.leogap.com.br/eng

**Festo components on the Goglio machine**


DNC standard cylinders


ADVU compact cylinders


DSNU standard cylinders


CPV valve terminals

**Automatic coffee packaging machines ...**

... are a speciality of Lombardy, the region around Milan. Comunetti Romano is one of the companies which design and build fully- and semi-automatic coffee packaging machines. Their customers are small and medium-sized coffee roasters all over the world – from Brazil to South Africa, and from Malaysia to New Zealand. And their machines, too, feature Festo industrial automation products ...

www.comunetti.com

unwound automatically by the machine rollers and fitted with one-way gas vents. DNCB cylinders drive the rollers in the desired way and are robust and dependable. An ADVU compact cylinder presses the plastic valve against the foil and welds it thermally to this. The ADVU is powerful but occupies up to 50% less space than other maker's products. The plastic valve on the coffee pack ensures that the carbon dioxide which has been generated in the coffee beans during the roasting process can escape without oxygen entering the packaging.

Empty packs, open at the top, are created by welding the foil material all round a well. The packs produced in this way are fed onto a conveyor belt, which marks the start of the production phase in which the packs are filled with coffee beans or ground coffee, a vacuum is generated or the pack is filled with inert gas, and the packs are then finally finished. A DNCB drive feeds a blade to the foil and produces a clean cut – millions of times over. The most productive machines offered by Goglio achieve an output of 120 finished packs of coffee every minute. Naturally the pneumatic automation equipment is required to keep up with this pace.

Dosing stations fill the shaped packs with coffee, while at a further station a vacuum is generated in the packs, oxygen is replaced by inert gas and the packs are sealed. They are then given their final shape in line with the coffee roaster's marketing requirements. Here, too, DNCB drives and DSNU round cylinders are hard at work wherever reliable components are required in order to hold, clamp or transport the packs of coffee.

All the pneumatic drives on the packaging and filling lines of Goglio's fres-co® system are controlled by CPV valve terminals, which in the case of certain machines are equipped with Profibus interfaces. Its facility for direct integration of fieldbus connections makes the CPV the preferred solution where a particularly compact design is required. The fact that these terminals need very little installation space means that they can be installed close to actuators, thus giving shorter switching times and faster machine cycles. Service units for air preparation from Festo's D series complete the pneumatic equipment for coffee roasting.


All shapes and colours – coffee packaging produced using Goglio's fres-co® system.

**Coffee time & “Clean Design”**
Even though teabags have been around for 50 years, we now have instant coffee bags, too: One example is the Cafusa coffee bags from Great Britain. Each coffee bag is individually packed in foil and contains 7.5 g of ground coffee, roughly corresponding to 40 coffee beans or one cup of espresso.

Cafusa is a product which has been developed through a strong partnership. The prime mover in the project was the machine constructor Molins International Technology Centre Machines, which sold the product concept to the British supermarket giant Sainsbury and chose to rely on Festo automation technology.

No matter whether the concern is regulations governing hygienic design or questions of materials and surface finishes – the right choice of suitable pneumatic components is a crucial factor in the production and packaging of foodstuffs. Festo has a tailor-made product range for these needs, with valves and cylinders for the food industry which are particularly easy to clean and are resistant to aggressive environmental conditions and cleaning agents. They thus meet the stringent hygiene standards of both the European Union and the NAFTA states. For packaging machines, pneumatic products are available with a compact space-saving design which meet the demands of the industry for high performance in a minimum of space.

It's coffee time: Instant coffee bags – just as easy to use as teabags.

By the way: It is not only in Great Britain that coffee bags are becoming ever more popular. The new Senseo coffee maker from the Dutch electrical engineering group Philips uses so-called coffee pads to prepare its brew, and Illy also installs coffee machines in canteens or other high-consumption locations which work with pre-portioned coffee packs.

www.cafusa.net
www.senseo.com

www.festo.com/food


CDVI “Clean Design” valve terminal
HACCP-certified


CDN standard cylinders
HACCP-certified

infoservice
0201
Food and packaging industry manual