



Creating the Perfect Filling and Sealing System for Nestlé's "Dolce Gusto" Range

In the final quarter of 2004, Rychiger AG was awarded a contract to develop a pilot plant line for the production of "Dolce Gusto" capsules for Nestlé's newest and, at that time, most important product launch. Within half a year, the company had firm orders to produce the filling & sealing machines for Nestlé's production facility, 12 months later the first custom-made machine was delivered and today more than 10 full production lines run 24/7. (By Axel Föerster)

While this in itself may not seem to be a particularly unusual situation, the task was complicated by the fact that during the engineering phase the design for the capsules themselves would change dramatically; the product design for the coffee brewer itself would have to be finalized; and neither the industrial filling system nor the final process definitions were fully known. Little did Rychiger know the impact this project would have on the company.

Nestlé's concept was to develop a single serve capsule in high-tech packaging which would deliver optimal consumer convenience combined with the highest levels of product quality.

The capsule itself is a 100% barrier package and beverage extraction technology is engineered into it. As a result, product flow does not touch any part of the machine, eliminating cross-contamina-

tion of flavors and allowing different drinks to be prepared without the need for cleaning or rinsing.

The intricately designed capsule holds dry beverage ingredients between plies of foil and barrier film. They contain a range of products including roast and ground coffee, chocolate powder and milk powder. The packaging line would not only fill the capsules, but also assemble the multilayer barrier structure in a single process and provide in-line quality control checks.

For Axel Föerster, Rychiger's managing director: "The key to success was achieved by Rychiger's close cooperation and proactive engagement with the client right from the start. Client needs and requirements were taken on board at the conception stage"

Complex Capsules

Once the customer places the capsule in the extraction machine and selects "hot"

or "cold" beverage, water is injected at high pressure (14bars/200psi) to extract the content. The volume of product filled into the capsule varies by beverage: For milk powder, the capsule is filled to the top to dissolve all product; whereas for coffee, the capsule fills to a mid point to allow for brewing and extraction within the capsule itself. As pressure builds within the capsule it forces the aluminum membrane at the base against the spiked distributor disk which punctures the foil and allows the beverage to be delivered directly into the cup. As this process is driven purely by water pressure, no additional mechanical device is involved in opening the capsule.

Capsule Design

By integrating most of the extraction technology into the capsule, the coffee flow does not come into contact with the machine, so that the consumer enjoys each drink without any cross contamination of beverages. The system also allows a wide variety of products to be offered.

Enabling Production

A main challenge of this project was the short project duration. The Rychiger team needed to design and construct a 100% custom-made machine which went far beyond conventional filling and sealing machine technologies. In addition, Rychiger were intimately involved in the design and construction of a complex capsule comprising of the capsule itself, an inserted brewing device and three seals which could cope with the high water pressure required for a top-quality brew.

Rychiger engineered a custom made assembly and filling machine for this package whilst the capsule and extraction method were still in the development phase. Throughout this phase they provided key-contribution to the design of the capsule from a manufacturing point of view to ensure cost and efficiency targets could be met. The filling machine uses three special sealing technologies since it is of key importance that the capsules open via the bottom membrane and not by a burst in the top membrane.

All this has been done in very close collaboration with our customer and under extreme time pressure, giving just 12 months from initial launch of the project to the delivery of the first custom made machine.

Managing Engineering

During the engineering phase, numerous modifications were made to the capsule design and its components including the design and evaluation of the ultrasound sealing of the distributor membrane. Due to the complex parallel nature of the project, Rychiger was also responsible for the selection, briefing and supervision of suppliers for the brewing device insertion system, the weighing technology, the ultrasound technology and, for timing reasons, the auger filler. A further degree of complexity was introduced as the machine programming had to be based on Rockwell's standard "Power-Programming" system despite the fact that several key modules and applications had not at the time been developed. The task was even more challenging since several completely different motion profiles for 28 servos had to be developed and the seamless integration of the sub-suppliers work had to be ensured. Rychiger and Rockwell responded to the challenge by working together on the project and developing the required program elements directly on Rychiger's machines. During the commissioning and initial production phases the engineering challenge continued as the teething troubles that arise in any entirely new custom built machines had to be solved on the fly while at the same time Rychiger was integrating lessons learned to modify the new lines which were in production and due to be delivered to the client. Despite all these potential pitfalls, the combination of Nestlé and Rychiger's expertise allowed all targets to be met.

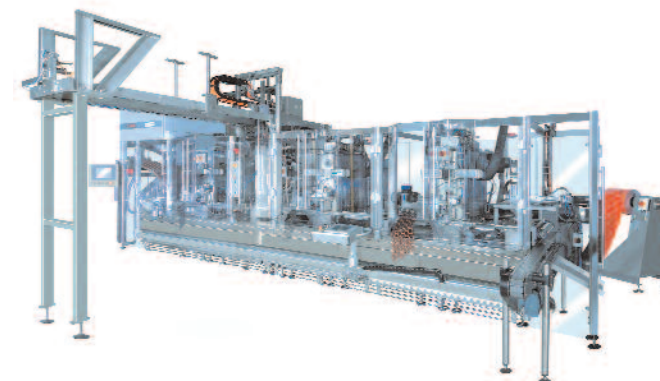
Ensuring Excellence

Rychiger's massive experience in the filling and sealing industry, combined with its flexible working practices and commitment to the client, partners and suppliers enabled the design, construction, delivery and commissioning of a completely new machine at the limits of current technical knowledge within a remarkably short timescale.

The machine assembles the complex capsule including the brewing device and three seals and fills the product into it. And inline-tests no less than six different quality criteria's of each capsule produced and automatically adjusts the machine parameters or rejects capsules where this is not possible.

An extremely strong and ultra-precise sealing station is at the heart of Rychiger's machines. The combination of a mechanical seal stroke and preloaded individual air-springs on every lane guarantees very precise and short dwell times at high seal forces. The temperature of each heat-seal head is constantly monitored.

As Föerster explains: "To preserve the contents, the entire filling and sealing operation on Rychiger machines, from the grinder to the final lid sealing, takes place under a carefully modified atmosphere. This allows minimum residual oxygen levels inside the capsules to be achieved. A correct weight and thus a consistent extraction time and beverage quality is ensured by check weighing each individual capsule inline on the filling machine, and the data obtained is used



The Rychiger FS 610.

to adjust the filling heads automatically or to reject over/under fills."

Specialist knowledge is required to ensure that the seals remain absolutely tight over a long period of time and also to allow them to withstand pressure differences when the capsules are sealed on the filling machine. Due to a desired partial degassing of coffee, some capsules can reach high internal overpressures without losing seal integrity.

Shared Success

Gio Catena, Nestle UK Group packaging engineering specialist explains: "Rychiger has done an excellent job in supplying us with a number of entirely custom built state of the art machines to produce our new range of beverage products. The delivery

program required for product launch whilst critical to the project success was extremely challenging, here again Rychiger did not let us down, enabling us to successfully launch and fully meet our commitments to the trade. What though we appreciate most of all from Rychiger is their continuing support and commitment demonstrated to make and sustain the high performance and reliability of these lines."

Rychiger has also benefited handsomely from the project. Not only can they boast of having been at the very forefront of global filling and sealing technology for decades (in the early 1960s they were the first company to commercially build filling & sealing machines for hot-fill and retortable products, this was, when the sealing window defined by the available materials and sealants was narrow), the economic and business benefits for the company have been significant. Rychiger has responded to the challenge of rapid growth by upgrading operations, investing in people and training and ensuring they are fit and ready to offer their unrivalled service and technology to even more partners in the future.

Rychiger's commitment to trust-based relationships with its client, partners and suppliers has certainly paid off for all concerned. 7

Axel Föerster joined Rychiger in 2001 as managing director. In 2007 he bought out the company together with his management team from the previous owners and became president and majority owner of the company. He has a broad experience in coffee & tea portion packaging which is one of Rychiger's main businesses since almost 20 years.



Q9

GRINDER NOT SHIFT ENOUGH?
TIRED OF QUEUES?
DOSE ON DEMAND: freshly ground coffee, ready to use, without mixing your ingredients. Two doses or one, individually at the touch of your finger's tip.

QUALITY ESPRESSO

QUALITY ESPRESSO S.p.A. - C/LEONARDO DA VINCI 100 - 20139 MILANO - ITALY
Tel: +39 02 7611 7611 - Fax: +39 02 7611 7611
www.qualityespresso.com

as a matter of fact
LOOKS ARE EVERYTHING

Yuban
FRESH GROUND COLOMBIAN BLEND
Stock
ETHIOPIAN HARRAR

pumpSkins
RELIEVE STRESS

Make a good first impression with pumpSkins!
We're trading experts offering all POP materials including equipment, overlays, rack signage, flavor labels, window decals, signs and more.

1-877-994-4800 • www.pumpskins.com

OXALIS
TEA & COFFEE

The finest in tea and coffee...

Direct import
Manufacture
Wholesale
Retail network
Export worldwide
Original recipes
Custom blends
Unique designs
Gift packs

Tel +420 577 127 111
Fax +420 577 127 116
Email oxalis@oxalis.cz

www.oxalis.cz