

# SAFETY – EFFICIENCY AND RELIABILITY

## Cooperativa Agrária Agroindustrial expands malt house

*Cooperativa Agrária started producing malt by means of a joint venture with Cervejaria Antártica under the “Agromalte” brand. In the eighties, Cooperativa Agrária bought the participation of Antártica and worked hard to become a leading supplier of high quality malt to most of the breweries in Brazil and Latin America. Hard work and dedication brought consistent growth to the malting operation. The demand for beer and long-term delivery contracts to large Brazilian breweries urged Cooperativa Agrária to expand and several technical and economical studies were made during the nineties and early 2000. It was only in 2007 that finally the necessary market and financial conditions came to be available, such that the eagerly awaited expansion project was launched by the Agrária management in a very professional manner.*



Fig. 1: View of the new tower and kiln building

Due to the fact that Agromalte was working at full capacity and the market expected considerable growth, Cooperativa Agrária decided that the expansion of its production capacity should be considerable. Consistent technical reviews of the available technologies were diligently performed, with special attention to those in the most productive European malting plants with whom Cooperativa Agrária has always maintained solid commercial alliances. Agrária's malt and industrial engineering specialists worked out a best-in-class conceptual engineering project for the malting plant.

The approval of this concept by the Board determined that traditional equipment suppliers should present their technical and commercial proposals, following their strict conceptual specifications, but also including state of the art operational and technological innovation features. Among the traditional invited suppliers for malthouse equipment, JMB Zeppelin, the São Paulo based 100 per cent daughter company of the centenary Zeppelin Luftschiffbau, a Friedrichshafen based company, was the only Brazilian company invited to bid.

### The development to a malt-handling quality supplier

JMB Zeppelin has been a traditional equipment supplier to the process industry in Brazil. As of 2001, when a major German leading malthouse and beer industry equipment supplier in Latin American decided to leave the malting equipment business, JMB Zeppelin hired most of their engineering and service team.

#### Ricardo B. Santos

General Manager,  
JMB Zeppelin Equip. Inds. Ltda., Brasil  
([www.jmbzeppelin.com.br/malt](http://www.jmbzeppelin.com.br/malt))

#### José Grings

Engineering Manager,  
JMB ZEPPELIN Equip. Inds. Ltda., Brasil

#### Michael Baumgärtner

Vice-President, Zeppelin Silos & Systems  
([www.zeppelin-industry.com](http://www.zeppelin-industry.com))

The expertise of this team was evidenced by the fact that it had successfully been the major supplier of malt handling equipment to breweries and malting plants in Latin America.

Within the Zeppelin family, this team, backed with the process and fabrication knowledge of the Zeppelin culture, developed, on a step-by-step manner, the necessary conveying, sorting, germinating and kiln components and equipment. During five years as of 2003, JMB Zeppelin strengthened its position as a malt-handling quality supplier, providing engineering and plants to major breweries such as Itaipava and Kaiser.

The expertise of the Zeppelin team included the fact that it is the only team in Latin America with experience in the supply of different types of complete malthouses, in particular tower-type with round boxes. The large experience in supplying bulk handling installations of different dry solids and the certified quality according to ISO 9001:2007 by BVQI, made it possible to:

- Offer the best-tailored solutions to the specific requirements, not only equipment and technology related but also considering the specific site and geographical characteristics of each client,
- Select and design systems and equipment for the optimum operational budgets as well as the lowest life cycle costs, following the most stringent international food grade standards,
- Manufacture or acquire, in optimised conditions, components and secondary sub-assemblies, including all utilities, environmental and electrical protection sub-systems,
- Coordinate, transport and assemble, in an effective manner, all equipment that integrates the plant, including complete automation system,
- Supervise the assembly, perform dry run of each individual sub-system, start-up and fine tuning of all sub systems in close cooperation with the malt-master and client's specialised personnel in a turn-key or semi turn-key basis,

- Perform after-sales routine checks or services, including training, spare parts and technical assistance in a professional and prompt manner.

With these capabilities, JMB Zeppelin was awarded in September 2007 the very important mission of expanding the Cooperativa Agrária Malting Plant. Safety – Efficiency and Reliability was the keynote for the supply. This led to an optimised cost-benefit ratio in the initial equipment investment as well as the civil works total costs.

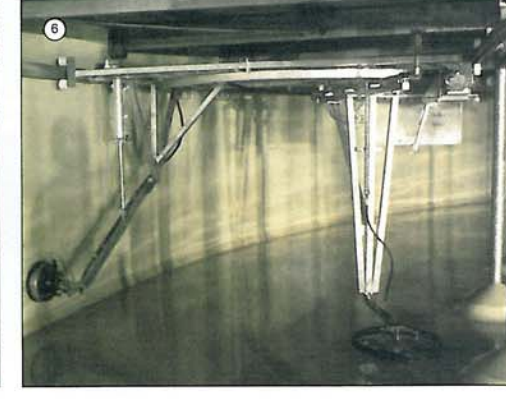
### The project in detail

During the initial project phase, soil conditions of the area for the expansion were checked. As the results confirmed good support capacity only few meters deep, decision to build a tower plant was taken. Steeping and germination equipment are installed in an impressive 60 m high tower. The kiln is installed in a nearby building (see fig. 1).

The tower weighs approx. 15 thousand tons, supported on approximately 280 piles; each pile was designed to support 60 tons on average. The civil foundations and superstructure were carried out in an expedite manner and the construction used a total of about 5.200 m<sup>3</sup> of concrete and 840 tons of steel. Additionally, considerable attention was dedicated to the design of the equipment such that the operation personnel had comfortable ergonomic conditions.

The future extension of the site to encompass a second tower was always considered in the planning. The scope of supply from JMB Zeppelin included all mechanical barley receiving, conveying and thermal processing equipment, as well as environmental and automation systems.

The different sub-systems required different conveying system solutions. JMB Zeppelin used different technological bases to reach optimised results including mechanical conveying, such as bucket elevators, chain and belt conveyors for barley, green malt and malt with roots; pneumatic and hydraulic, such as for the barley transfer systems using water pumps to the steeping plant.



The steeping sub-system was designed for intensive cleaning of the barley with four cylindro-conical tanks with a capacity of 65 tons barley each. The tanks were totally made in stainless steel and placed at the top of the germination tower and considered special aeration and barley washing features (see fig. 2).

Four fully automatic round germination boxes with stainless steel turning machines with a diameter of almost 25 m provide a germinating capacity of 260 tons barley each with the utmost reliability and close to no human intervention (see fig. 3). The central discharge high performance round kiln with a diameter of 30 m is able to dry a total of 260 tons barley every 24 hours, thus delivering a best-in-class performance (see fig. 4). The discharge of the final dry malt is achieved through the

screw conveyor of the charging/discharging machine and a pneumatic actuated central gate (see fig. 5).

Furthermore, several other subsystems such as weighing systems, day silo for malt with roots, screens, press and silo with truck loading system for floating barley along with its integrated conveyors provide a high speed, high output malt production with full control. The specially designed control and supervision system guarantees that all stages of production are fully under stringent control with respect to temperature, pressure and humidity, yet with full flexibility under consistent performance.

The automation concept included a logging system such that any stage of the process is recorded following the state-of-the-art requirements of full traceability.

- ② Fig. 2: One of the four specially designed stainless steel steeping tanks
- ③ Fig. 3: One of the four stainless steel fully automatic germination boxes and turning machine
- ④ Fig. 4: Kiln dry malt turning machine in the 30 m diameter box
- ⑤ Fig. 5: Final dry malt discharge tunnel
- ⑥ Fig. 6: Perforated floor – high pressure cleaning machine

Due to this highly interactive supervisory and logging system, the final malt produced can be effectively traced back to the barley silos it came from.

### Special attention

During the development of the complete automation system for the plant, special attention

was given to the operational and sanitation features, including easy to use dedicated cleaning apparatus and systems. These sub-systems and the corresponding auxiliary equipment allow for a daily production of 260 tons, with minimum manpower and full reliability.

From a total of 16 months, as of the beginning of foundation works to the malting equipment start-up, eight months were dedicated to mechanical assembling works, dry run of individual unit, cabling and utilities, start-up, including equipment fine tuning, quality assurance checks, con-formity, start up and as built documentation and initial operator training.

The supplied installation with cylindro-conical steeping tanks is basically focused on the processing of national barley, which due to the climatic conditions usually needs more intensive washing, only feasible by using that kind of equipment.

The use of round germination boxes in a tower minimises conveying distances and simplifies the loading and unloading proce-

dures while practically avoiding all possible deposit points of humid residues. Residues accumulations have the inconvenient that they must constantly be cleaned.

To further reduce any chance of residue accumulation, the germination boxes were equipped with automatic hot water washing systems to clean the full area of both sides of the floor, upper and lower. This innovative concept uses pressures up to 150 bar and is the first such equipment installed in malthouse in Latin America (see fig. 6).

When designing the layout of the plant, the objective was not to install equipment underneath the ground level. The idea was to obtain a clean solution, without the traditional cavities for elevators and other equipment, which are neither safe nor hygienic and represent a high contamination risk for the products. Pulley and belt drives were totally avoided, because those items always need maintenance.

The layout foresees the duplication of the project. Areas like staircases, passenger elevators, etc. will suit the future expansion

with no additional changes. The design of the kiln also considers a future expansion.

Heat, mainly from a biomass boiler, can be coupled dynamically to heat and power sinks in the new unit so that energy consumption can be reduced considerably. The scheme (see fig. 7) shows some details of this concept. Due to the somewhat higher average temperature in Brazil as compared to other countries, heat recovery equipment for the kilns are economically not feasible and, thus, not part of the project.

Automation has been fully implemented by JMB ZEPPELIN on Siemens PLCs, supervisory WinCC and net Profibus, using optic fibre for some circuits, covering all plant areas. The complete automation system was supplied redundantly. Care was taken to lay redundant lines through different paths. All environmental protection equipment was also addressed.

### Conclusion

JMB Zeppelin is proud of being a part of this important project and congratulates Cooperativa Agrária for starting operations at Agromalte's expansion. This successful investment, once again, confirms the Danube-Swabians and their descendants love for planning, doing things well and dedication to improvements, while providing jobs, income and prosperity for thousands of Brazilians and offering us the malt for our best beers. Zeppelin is very proud of being selected and having provided this state-of-the-art malting plant □

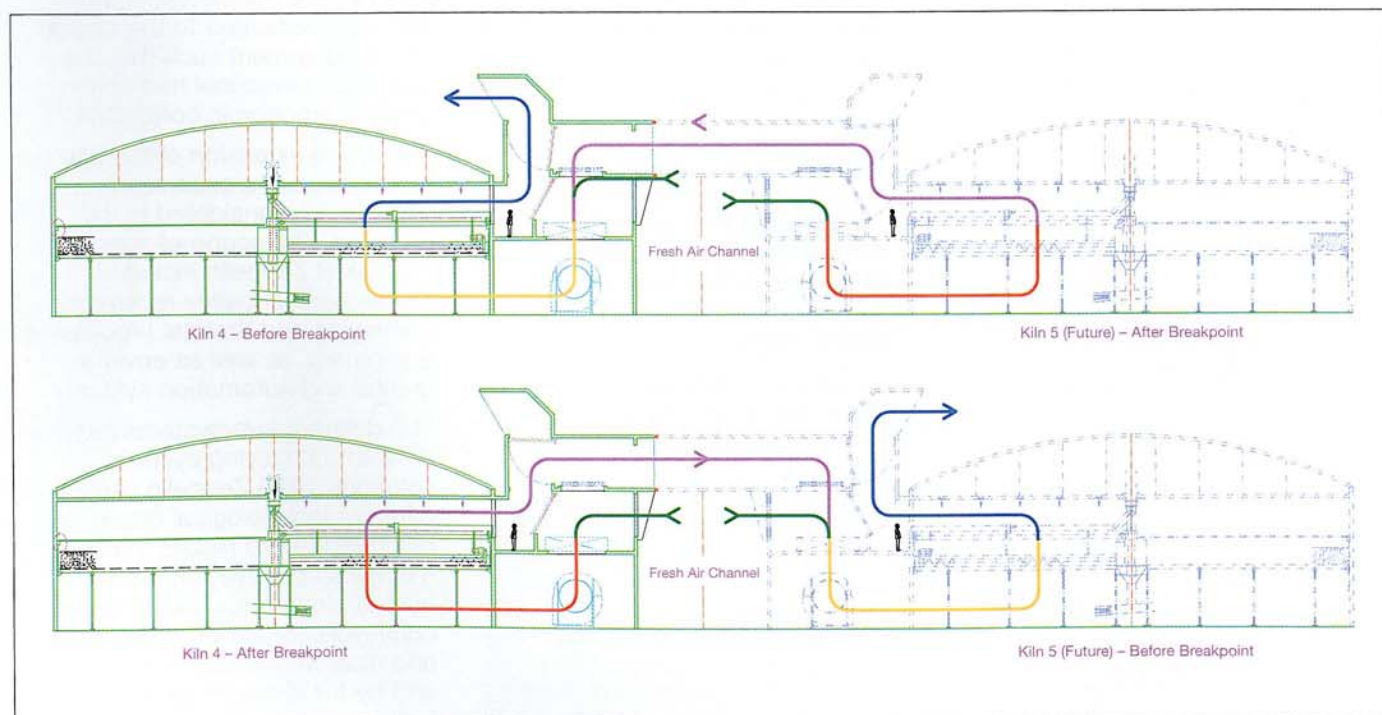


Fig. 7: Heat recovery concept for heat coupled kilns