
*Stefan Zick*

***For a company that produces purely plant-based food additives from the seeds of the blue sweet lupin, cleanliness in production is an absolute priority. And the same applies to compressed air generation because oil in the compressed air would immediately contaminate its own products and inevitably the follow-on products too. Absolutely oil-free compressed air according to ISO 8573-1, class 0, is therefore essential.***

# Lupins need to be free of oil

## Water-injected screw compressor ensures compressed air quality

Because we can take no chances in the generation of the absolutely oil-free compressed air that we need, we didn't hesitate in choosing a water-injected screw compressor from Almig's Lento series," explains Marc Zillmann, head of production and product development at Grimmen-based Prolupin GmbH. „To improve the emulsifying properties and gel bonding in our purely plant-based products, for a number of foodstuffs we replace imported soya with a home-grown product: lupin seed. If our products were contaminated by residual oil from compressed air, this would inevitably trigger a serious negative chain reaction in the further processing of our products by our customers."

**Dipl.-Ing. Stefan Zick,** *Regional Sales Manager at Almig Kompressoren in Köngen*

### Compressed air comes into direct contact with products

The lupin seeds harvested by the farmers are shelled, flaked and de-oiled. The lupin flakes, which look something like oat flakes, are then the raw material for Prolupin's entire product range. They then undergo several stages of processing to form the valuable lupin protein isolate, used by producers of amongst other things bakery products, low-fat or meat-free sausages, delicatessen and diet foods.

Prolupin needs compressed air for three purposes:

- to control valves on the production plants,
- to lubricate decanters and sedicanters, where the lubricant required is finely metered to the points of lubrication via a pipeline using compressed air,
- as conveying air to help remove the sluggish solid protein substance from the sedicanter, a drum rotating at high speed where the water and solids are separated, into the pipeline.

### Absolutely oil-free conveying air according to ISO 8573-1, class 0

The conveying air must be absolutely oil-free because it comes into direct contact with the protein. Prolupin generates this compressed air in its new factory in Grimmen with a compressing Lento screw compressor from Köngen-based Almig Kompressoren that instantly delivers oil-free air. And Prolupin even goes one step further. Because the air drawn in from the atmosphere for compression may already contain particles of oil, e.g. from vehicles on site or adjacent roads, the absolutely oil-free compressed air generated by the Lento screw compressor is also put through a particle filter.

The solution at the Grimmen site follows a pilot project in Neubrandenburg, where all system controls were however performed manually. Also no compressed air was needed to remove the protein from the significantly smaller sedicanter. „But from the project in Neubrandenburg, we knew that we would need a compressor for fully automatic industrial production. Since the test stage in 2011, we were in contact with Almig and

other manufacturers. Ultimately we were won over by the technical concept of the water-injected, compressing Almig screw compressor from the Lento series and its ability to generate absolutely oil-free compressed air from the outset. We were also impressed by the competent advice we received from Almig dealer Roger Schulz in Rostock and in the summer of 2013 installed a compressor from this series in Grimmen," says Zillmann.

The Lento 22 model selected is designed for a maximum pressure of 10 bar and a performance bandwidth of 0.96 to 3.13 $m^3$/min (relating to an operating overpressure of 8 bar at 50 Hz; rated motor power of 22 kW). At Prolupin, the system operates at a constant maximum pressure of 9 bar and supplies the operating network via the particle filter and an interconnected storage tank. The air-cooled compressor is located in a side room separated from production by a door. The air needed for compression is taken from the room and the warm waste air extracted via a time-controlled fan.

**02** **Prolupin takes lupin seeds and turns them into the valuable lupin protein isolate, used by producers of amongst other things bakery products, low-fat or meat-free sausages, delicatessen and diet foods**


**03** **Prolupin, based in Grimmen, northern Germany, generates the compressed air needed for various stages of production with a compressing Lento screw compressor which is absolutely oil-free right from the outset**

## Absolutely oil-free is better than technically oil-free

**If compressed air is generated using oil-injected screw or piston compressors, as a result of internal treatment, it leaves the systems with a residual oil content of approx. 2 to 4 mg/$m^3$. If then treated, at great cost, to produce technically oil-free compressed air according to ISO 8573-1, class 1, a residual oil content of max. 0.01 mg/$m^3$ is still permitted – and this is too much for exacting requirements. What are known as dry-running screw or piston compressors use oil-free compression chambers so are able to deliver absolutely oil-free compressed air from the outset – although the process is very costly in terms of spare parts and maintenance. But there is a better way to generate compressed air that is absolutely oil-free right from the start. This involves water-injected screw compressors, which also offer maximum cost-effectiveness and safety and the same long service lives as oil-injected systems. This absolutely oil-free compressed air instantly meets ISO 8573-1, class 0, as it uses water rather than oil for the tasks of lubrication, sealing and cooling. And if oil isn't added, it doesn't have to be removed either.**

## Impressive technology

Almig produces the speed-controlled, water-injected screw compressors of the Lento series for delivery volumes of 0.86 to 19.26 $m^3$/min (relating to an operating overpressure of 8 bar at 50 Hz), continuously variable pressure levels of 5 to 10 or 13 bar and input ratings of 15 to 110 kW. The compressor stages produced to high levels of precision were developed using the latest research findings and achieve a service life comparable to that of oil-injected compressor stages. For maximum operating safety, Almig mounts the high-strength plastic compound rotors in cylinder roller bearings and self-aligning bearings lubricated with grease and has not experimented with water-lubricated slide bearings. Mechanical seals and additional atmospheric gaps between the compression chamber and bearings ensure perfect sealing. The systems run with a closed coolant circuit and integrated treatment. Most of the compressed air and water are separated in a cyclone pre-separator made of stainless steel. The compressed air, saturated up to 100 %, is then effectively recooled in an integrated refrigeration dryer. The condensate produced here is returned to the internal water circuit as fresh water. This concept provides the following benefits:

- There is no need for a continuous supply of fresh water via a connected water pipe.
- In most cases, an extra compressed air refrigeration dryer is not needed.
- Quick water changes in the system using the continuously produced condensate ensures optimum water quality at all times.

The integrated, fully electronic Air Control 3 Almig sensor control unit runs the systems at high energy efficiency and a switch point difference of just 0.1 bar. The speed-controlled Lento systems start up in an energy-saving manner without peaks in current and are accurately adapted to the current compressed air demand without switching cycles or expensive load/idle times.

## Compressed air of the best possible quality

„We may only have been using the water-injected Lento compressor for a few months but we already know that we made the right choice. The compressed air we generate is absolutely oil-free from the outset and by also eliminating the risk of oil entering our system with the air drawn in, we generate compressed air of the best possible quality, which is key to smooth production and high-quality product," explains Zillmann.

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