

Reliable and efficient concept

Air supplies tailored to PET container production

It's immediately obvious from a glance in the beverages section of any supermarket - the containers and bottles of polyethylene terephthalate, better known as PET, are competing strongly with conventional glass containers and bottles. And there's a good reason; PET offers both the beverage industry and the consumer immense advantages. Compressed air plays a central role in the production of modern packaging mediums. In this particular field of operations, tailor-made system solutions can increase efficiency significantly.

The development of the PET market is impressive; whereas in 1998 around a milliard litres of non-alcoholic beverages were filled in PET containers, this volume has increased in the meantime to approximately 2.6 milliard litres. But there isn't even a hint of saturation yet. Market researchers reckon with an annual growth in the field of plastic in the foodstuff and beverage packaging industry of between eight and nine percent up until 2007. And the rising sales of fruit juices in PET containers will account for a strong impulse in this sector. There are several reasons for the increasing acceptance of PET; it is highly durable, resistant to pressure, break proof and much lighter than glass. It is odourless and tasteless, non-reactive to oxygen and carbon dioxide, has a high degree of purity and can be recycled just like glass. In addition, the material is easily moulded in any form imaginable.



Fig. 1:
A multiplicity of form and size is possible for PET containers and bottles.
(Krones works photo)

In the meantime, the barrier properties of PET have been developed to such an extent that, in contrast to a few years ago, it is suitable for products that have to be filled warm, or even hot, such as fruit juices or other pasteurised beverages and food-stuffs. There are other advantages, as well - to make PET bottles and containers or the material recyclable, only relatively small amounts of energy are required.

With the expansion of PET container production, compressed air supplies and their efficiency in this field of application are gaining in significance.

Specialised production process

PET containers are manufactured in bi-axial blow moulding machines. The plastic blanks called "preforms", (fig. 2) are blown up bi-axially in these machines, i. e. stretched in both



Fig. 2:
The "preforms" are blown up to size as finished PET bottles in the blow mould machines.
(Krones works photo)

their width and length. This bi-axial stretching introduces higher strength in comparison with other materials. A blow-moulding machine generally consists of the following units assembled as a production system: preform feed line; preform loading; heating; blow moulding; bottle removal (fig. 3).

Compressed air system solutions increase efficiency

a) Blow air and working air at different pressures

First, air is needed during the manufacture of PET containers to blow (stretch) the preheated preforms. The blank is firstly stretched in length and, at the same time, charged with an initial blow pressure of 12 to 25 bar. Finally, the bottle is completely formed at an end pressure of 40 bar (fig. 4). The blow pressure is related to the physical peculiarities of the container concerned, i.e. its form and wall thickness. Higher pressures are needed for a higher wall thickness and sharper edges, lower pressures being sufficient for simpler forms.



Fig. 3:
Blow mould machines with preform feed lines and blow mould units.

(Krones works photo)

In addition, working air at a pressure of between 7 and 10 bar is needed for the activation of pneumatic cylinders, such as the blow moulding cylinders and various feed systems.

b) Air supplies tailored to requirements

Kaeser has created a specific system solution to satisfy the requirement for working and blow-moulding air at different pressures with its "Sigma PET Air" system, which generally consists

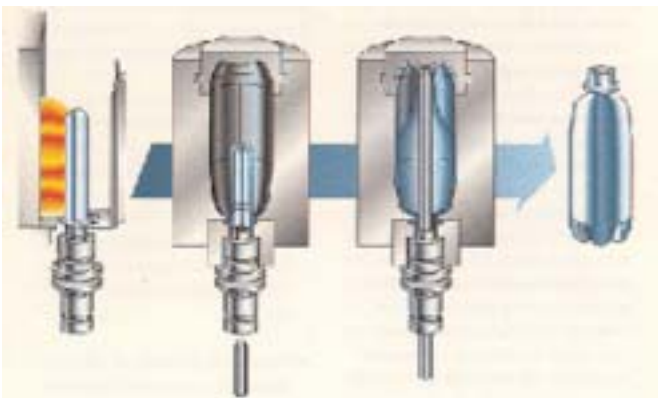


Fig. 4:
The preforms are simultaneously "stretched" and blown and brought into their final shape.

(Krones works photo)

of a so-called low pressure stage, i.e. at least one fluid-cooled rotary screw compressor, a refrigeration dryer for control air, a high pressure stage with at least one booster, a high pressure refrigeration dryer, filters and condensate treatment equipment (fig. 5). Of course, several rotary screw compressors and boosters can be combined to satisfy the compressed air requirement.

Air at a working pressure of between 9 and 14 bar, depending on the system, is available at the outlet of the low-pressure stage. The screw compressors are fitted with modulating control, a method of control that ensures that the air delivery of the compressor is always matched to the air demand from the blow mould machine. A partial flow of compressed air tapped off downstream of the low-pressure air receiver is dried in a refrigeration dryer, filtered by a microfilter combination and used for

control air purposes. A pressure regulator determines the required pressure for the working pressure and control air.

The major portion of the compressed air supplied by the rotary screw compressors is fed to the boosters via prefilters. The booster compressors are single-stage, oil-lubricated reciprocating compressors with a low compression ratio. The final, achievable pressure can be as high as 45 bar. A speciality of the boosters and rotary screw compressors in the Sigma PET Air systems is that they are not only available as water-cooled versions but also as economical air-cooled versions. The highly compressed blow air is also fed through a refrigeration dryer that reduces the pressure dew point to +3 to +5 °C, reliably preventing condensate forming in the blow mould equipment. Any existing oil aerosols, oil vapours and solid particles are efficiently retained by a microfilter combination.



Fig. 5:
A compressed air package supplying air to the blow mould machines. The package illustrated consists of a rotary screw compressor (low-pressure stage, rear left), a booster (high-pressure stage, front right), an air receiver (centre rear), control cabinet (rear right), and an Aquamat condensate treatment unit (centre front). The package can be made up of correspondingly more compressors, depending on requirements.

(Kaeser works photo)

A control cabinet directs the complete Sigma PET Air system. The booster, high-pressure air receiver and control cabinet are all mounted on a base frame and fully piped and wired. Sigma PET Air systems are also available as turnkey systems enclosed in a container.

c) Reliably high air quality

The Sigma PET Air system achieves the following air qualities at both pressures: pressure dew point approx. +3 °C (class 4 to ISO 8573-1), oil content <0.003 mg/m³ (class 1 to ISO 8573-1), and solid particle content <0.01 mg/m³ (class 1 to ISO 8573-1). This quality level exceeds the purity demanded by the Norm for this particular application, a fact that is certified by a TÜV certificate.

In contrast to air supplies with oil-free multi-stage compressors

that were normally used in the past, the tailor-made system solution described above offers high energy-efficiency and maximum possible operational reliability at low cost for investment, operation and maintenance.

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