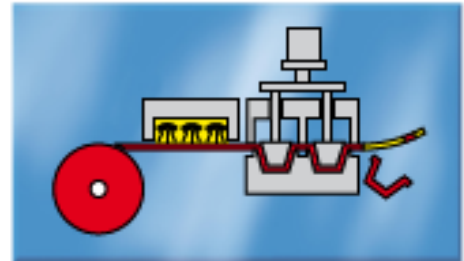
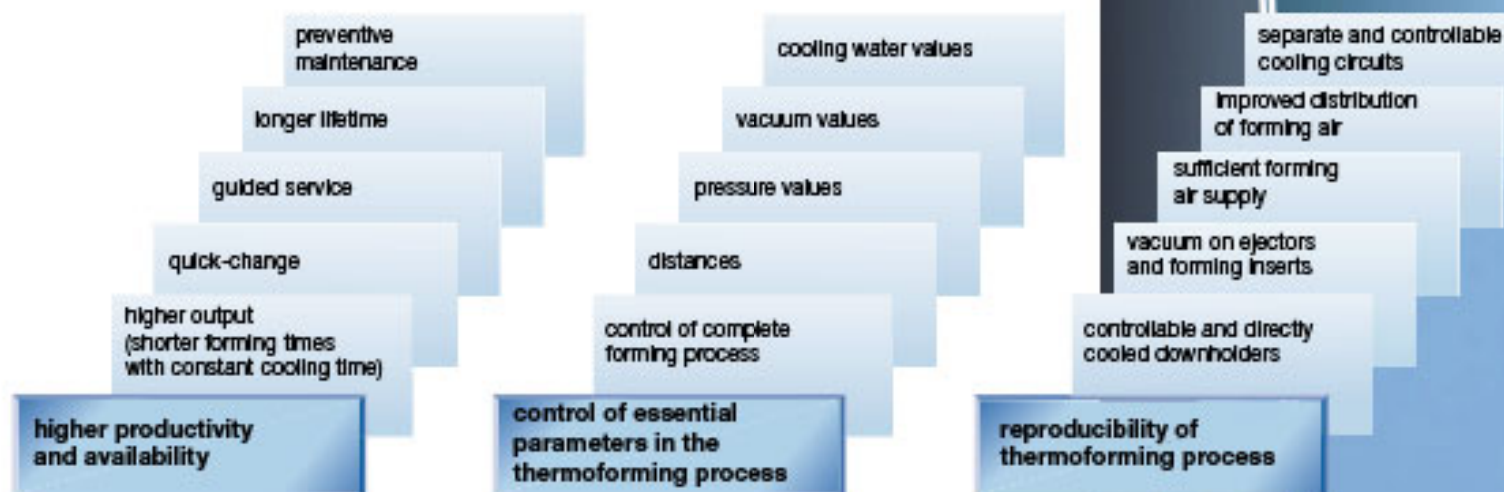


**illig®**



**Automatic Pressure Forming  
Machines  
RDM 70 K, RDM 78 K**

3<sup>rd</sup> Generation  
Thermoformers



## Increase in cycle speed and improvement of product quality with 3<sup>rd</sup> generation thermoformers

In order to secure long-term success to the processor, the machine must satisfy a broad range of criteria regarding customer benefit. Some of the essential prerequisites are: simple machine operability, flexible machine concept as well high reproducibility of all functional components involved in the process.

During the past few years machine lines were improved comprehensively in the thermoforming sector. It is possible for the first time to benefit to the full extent from the cost advantages resulting from the increase in output in combination with the energy savings.

With RDM 70 K and RDM 78 K, ILLIG presents two further 3<sup>rd</sup> generation thermoformers which set the standard with respect to increase in cycle speed and improvement of product quality.

A fresh impetus has been given especially to the production of thermoformed packs since the new machine generation meets latest demands made by the food industry.

Demands for dimensional stability and reproducibility of packs are connected very closely with the so-called forming/punching technology developed at ILLIG to an industrial standard.

Capabilities of the machine technology are consistently utilized by means of improved raw materials, films and newly developed thermoforming processes.

Substantially higher cycle speeds are achieved with 3<sup>rd</sup> generation thermoformers and tools. The part quality is clearly improved due to an optimized and considerably accelerated forming process.

Materials such as PP and APET call for new tool technologies with respect to:

- cooling performance
- smaller cutting gaps
- highly wear-resistant materials for cutting parts and
- highly heat-conducting special alloys to improve cooling of the products.

### 3<sup>rd</sup> Generation thermoforming

Customer benefit /  
Developmental priorities  
RDM 78 K and RDM 70 K

Stacking system variants  
RDM 78 K and RDM 70 K

3<sup>rd</sup> Generation tool technology  
Forming/punching tools



RDM 70 K and RDM 78 K machines feature: precise mechanical drives, high quality of products, performance and reliability. The customer can thus select from two machines with different forming areas and various equipment features.

Free potentials can be optimally utilized by optimizing the machine's sequencing during the forming and movement phase. This results in increased cycle speeds with optimum sequencing.

In practice the operator is guided through the different process sections in a safe and simplified way even though the process is very complex. In the Technical Processing Department developments are tested under conditions similar to production and adjusted for use on the customer's machine.

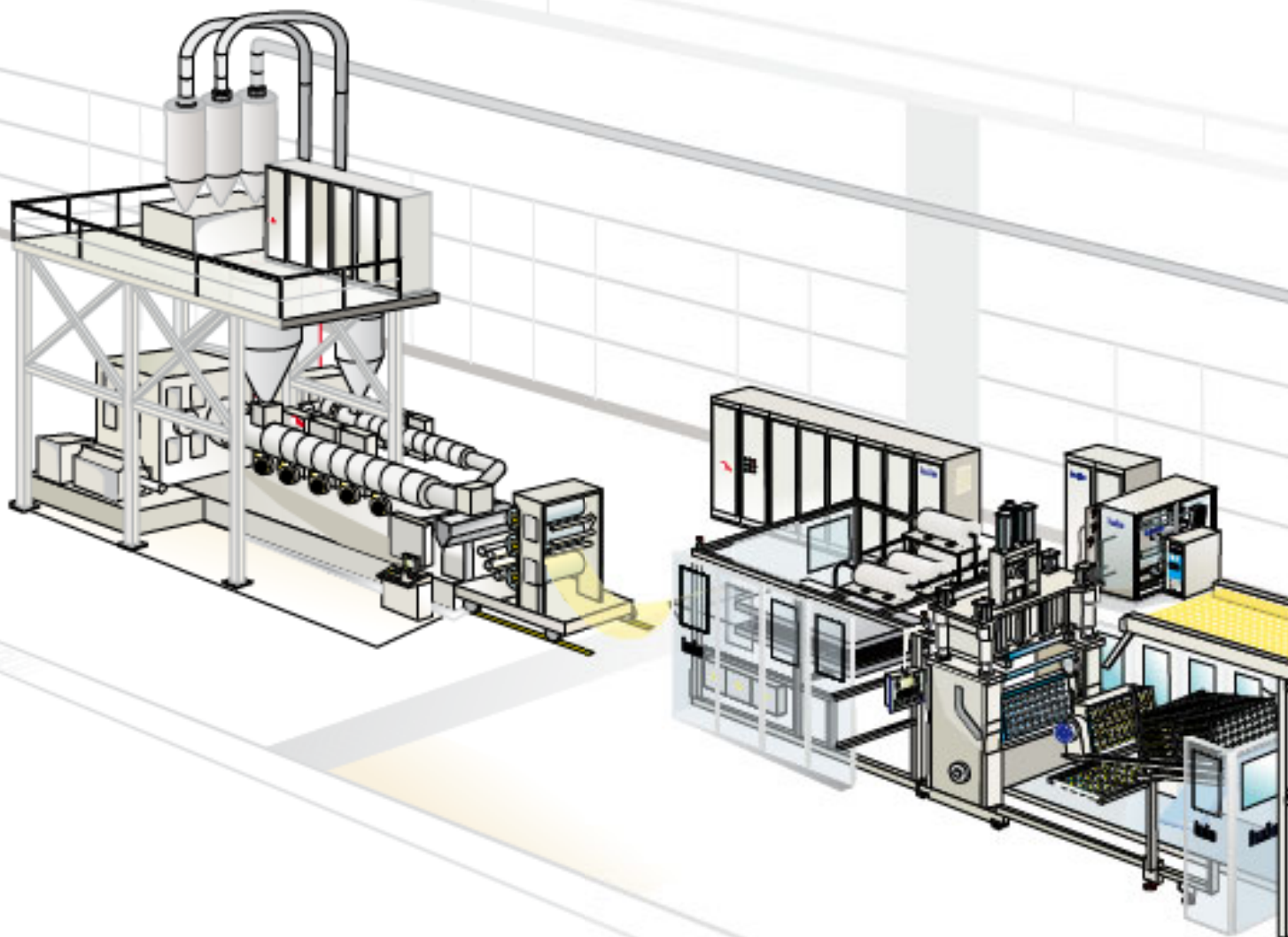
All types of machines are available at any time for presentations and customer tests.

Solutions are found in the development and design stage which take into account the future application range of the machine. State-of-the-art technologies suitable for reduction of energy consumption as well as for reduction of service and maintenance efforts are tested and are also checked for being economical.

Innovative products and tool designs are developed together with new machines or process engineering methods and the overall concept of the lines is taken into consideration.

Hygienic properties for pack manufacturing in the food industry can be improved by

using sterile air. Moreover, specific requirements with respect to tool change are considered in the machine design and also accessibility to all machine elements is improved for service and maintenance



RDM 78 K automatic pressure former for forming/punching technology

## Customer benefit / Main focus of development

### Simple machine operation

The complex process of forming, punching and stacking calls for a new type of control technology where several individual drives are controlled and optimized. Newly developed menus provide selective operator guidance through the individual process phases.

This means the alterable parameters are determined automatically by the control and provided to the operator in a selective way for optimization of the process. The number of alterable process parameters was reduced to a minimum. Consequences of the measures taken are displayed on the screen.

The selective display of required information and auxiliary functions in accordance with principles of professional industrial design is a major advantage of this type of menu.

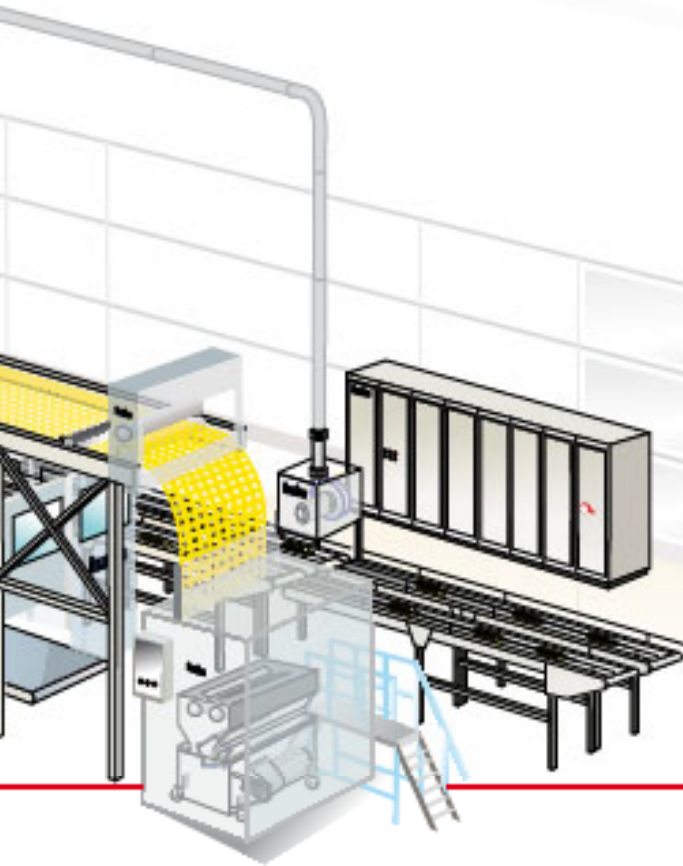
Diagnostic routines and/or monitoring of limit values are supportive elements provided for setting of machine and processes as well as for monitoring and quality assurance. Suitable sensor systems and evaluation technology in the control are employed for control and display of the process.

Theoretically established performance data are transformed into simple operation concepts in practice.

Consistent operator guidance on the screen and optimization of machine operation result in an increase in performance and improved product quality.

Experience and requests by our customers are also incorporated in all new developments.

The resulting tried and tested serial machines and custom-made solutions ensure cost-effective production.



*RDM 78 K in-line system with PH 78 stacking and turning device, TKS cooling system intertwined with RS 01 skeletal granulator*

### Higher productivity and availability

At ILLIG synergetic effects between customer benefit and development of 3<sup>rd</sup> generation thermoformers and tools have resulted in considerable improvement of the quality of formed articles. Substantially higher cycle speeds are achieved in an optimized and accelerated forming process with machines featuring forming areas within tested limits.

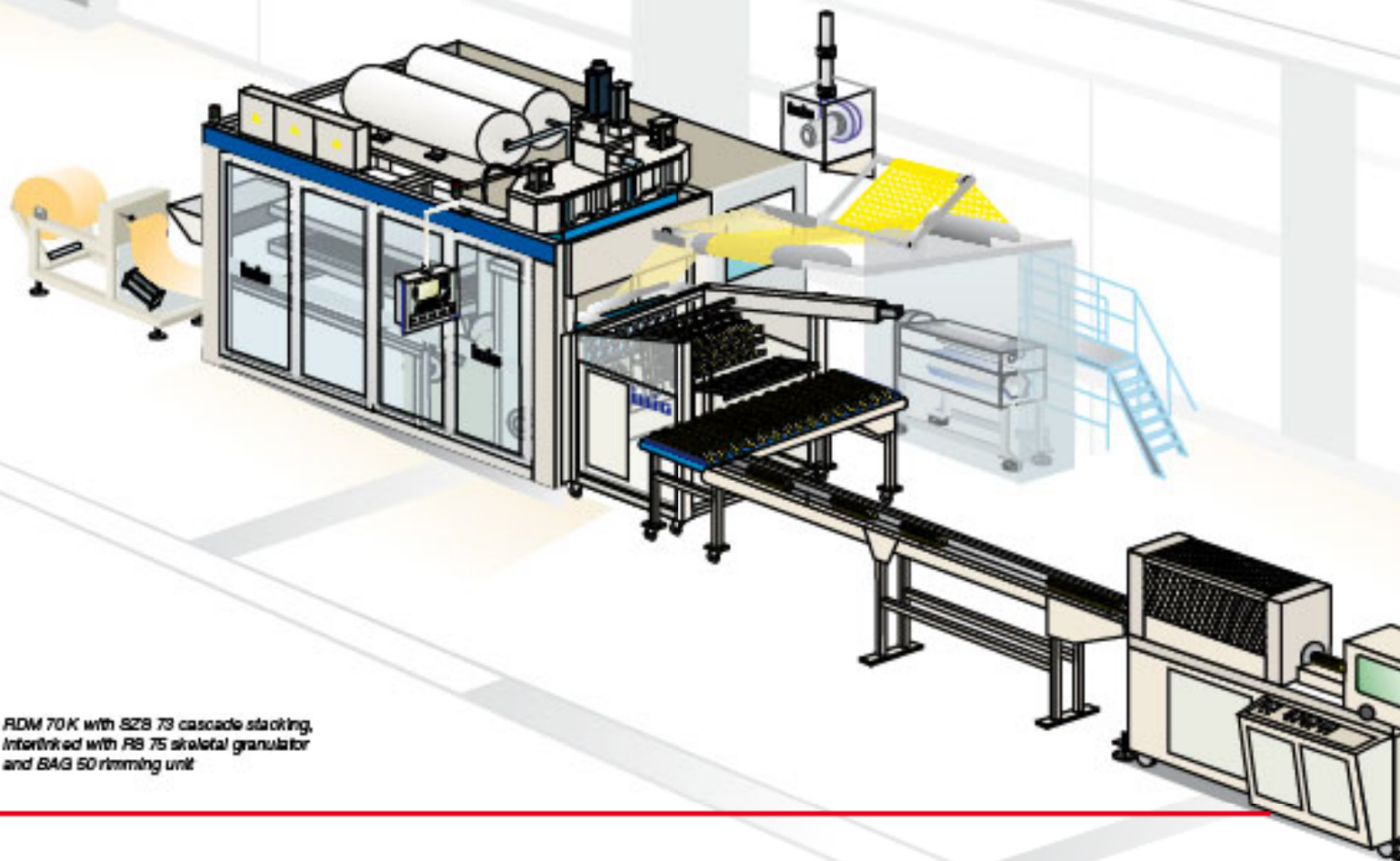
Different process steps are carried out during the actual forming process (pre-punching, pre-stretcher down, build-up of forming pressure, punching, etc.). The quality of the formed part is subject to the precision of these process steps. Acceleration of the individual process steps can be used to extend the cooling time or to further increase the performance of the line.

The high availability of the lines is consistently assured by improving the range of quick-change elements (tool and format parts), service, maintenance as well as by an extension of the service life of tool and machine components.

### Control of essential parameters involved in the thermoforming process

Realization of the requirements calls for a new control technology where several individual drives are controlled and optimized by a virtual main shaft (master).

This way all operating conditions can be separately optimized and all process parameters can be precisely allocated to the individual phases of the forming process. Start and end points as well as absolute values for pressure, vacuum, cooling water etc. can be precisely established and documented so they can be recalled for repeat orders.



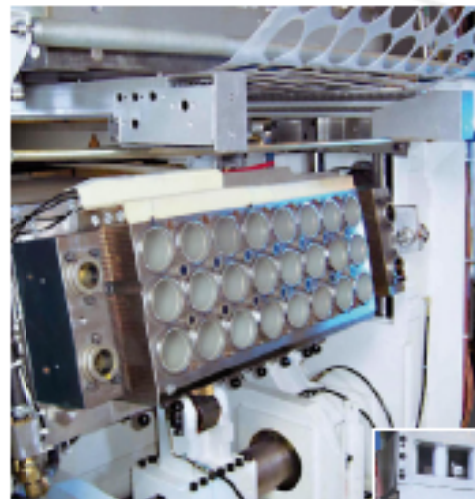
*RDM 70 K with S28 73 cascade stacking,  
interlinked with RS 75 skeletal granulator  
and BAG 50 rimming unit*

### Cost reduction / Process optimization

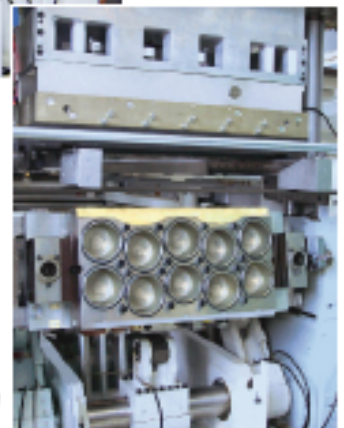
Reduction of forming air requirement (energy saving) initially was an important issue promoted under the slogan "forming air reduction". If applied consistently, however, this technology is suitable for an increase in performance since the reduced mold filling time directly affects the cycle time. With the locking unit on the servo-driven pre-stretcher developed at ILLIG, a solution was found which does not restrict the dynamics of the pre-stretcher required for some other reasons.

A further essential step is the newly developed automatic start of 3<sup>rd</sup> generation thermoformers. This might be especially interesting for processors working with in-line systems. The process of

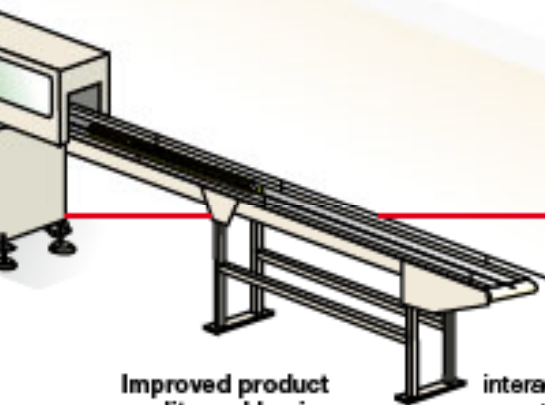
controlled material heating known so far is now followed by a process of controlled heating of all tool elements involved in the forming process. The actual forming process only starts after all tool parts have been heated up to the required "operation temperature". The very first punched articles can be stacked and, as a rule, they already meet the demanded product specifications.



*RDM 70 K forming unit  
forming/punching tool with new  
tool technology or\**



*\*with conventional  
tool technology*



### Improved product quality and hygiene

The symmetrical arrangement of all media (forming air, vacuum, venting, cooling) is an essential feature which considerably affects the uniform quality of the products formed in all cavities in one cycle.

Symmetry of the media, however, not only has to be realized in the tool but also in the machine. Too long distances will result in unacceptable deviations on the products even if the arrangement is symmetrical and also the process time may be affected adversely; i.e. filling or evacuating times are being unnecessarily extended.

Forming of sealing rim, stacking edge as well as wall thickness distribution in the side wall can be affected in a reproducible manner by

interaction of downholder, pre-stretcher and forming air. The result is a considerably accelerated thermoforming process entailing higher cycle speeds on one hand and a lasting improvement of the product quality on the other hand.

The most important result of the developments is the elimination of the bead on the sealing rim which, as a rule, adversely affects the cup's stacking height. During the forming process the material from within the bead moves downward and finally can be employed to increase the thickness of the side wall.

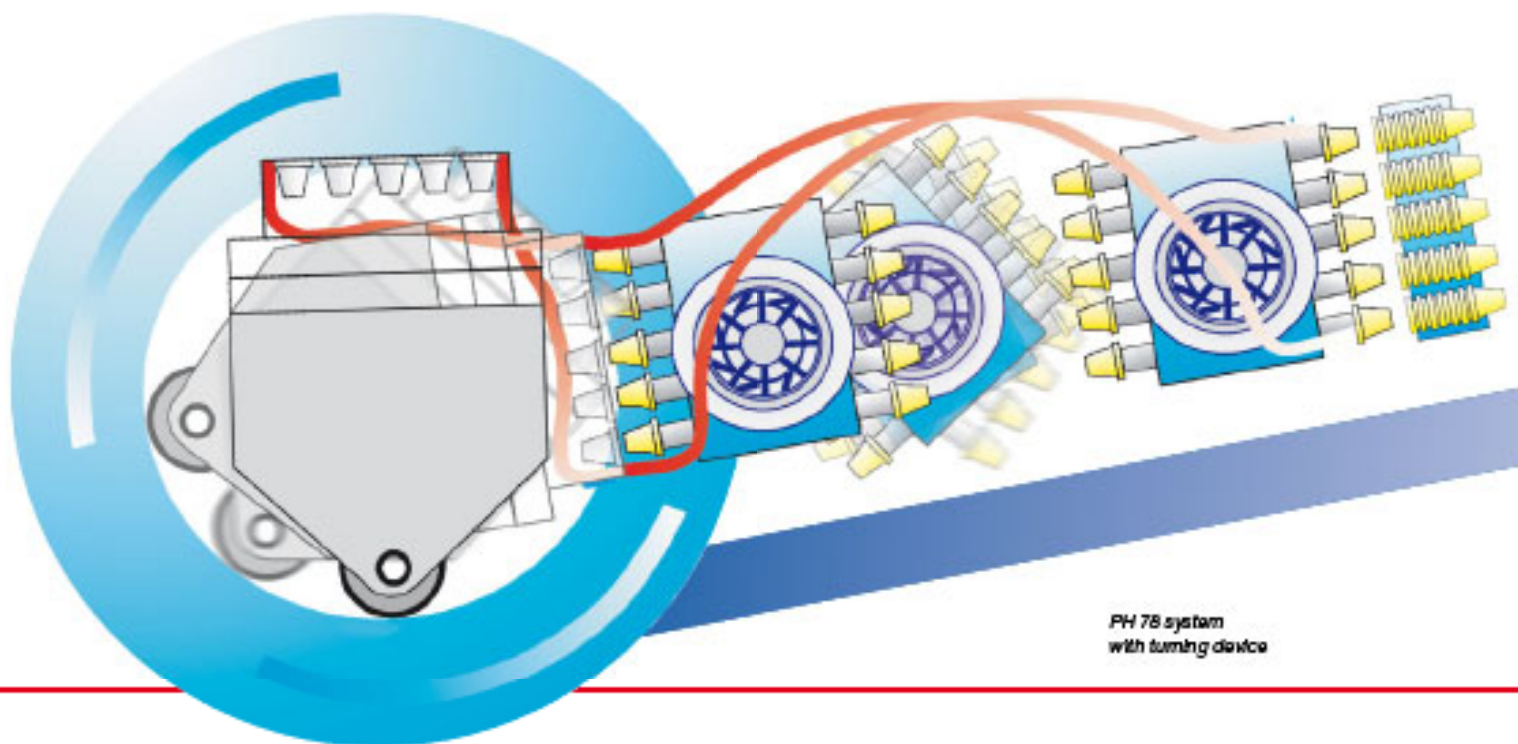
The material distribution in the stacking rim is reproducible. This way the required stacking height can be kept within very narrow tolerances. By eliminating the bead cooling time can be reduced and angular



RDM 70 K with new tool technology

position of the sealing rim as well as stacking height can be kept within narrower tolerances.

The material shifted from within the bead into the side wall can either be used for reinforcement purposes or for a reduction of the cup weight.



PH 78 system  
with turning device

### Process optimization by different stacking system variants

Last but not least the properties of the product are subject to quality and reliability of the downstream equipment. ILLIG therefore offers a reliable range of stacking systems and downstream equipment adjusted to:

- automation level
- output
- further processing

The corresponding stacking system variant is subject to the above. Safe and reliable product stacking is assured by employing the predominantly used servo drive technology suitable for synchronization and precision adjustment of the stacking movements.

Consequently, the stacking system can be adjusted to the output of the thermoformer at any cycle speed.

### PH 78 with turning device for RDM 78 K

The limitations of the stacking systems available on the market become obvious very quickly when cycle speeds over 35 cycles per minute are concerned and also with respect to their behavior during start-up of an inline system. Here, too, ILLIG had to open up a totally new path resulting in the development of PH78 with turning device.

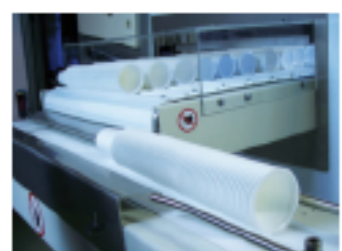
The PH78 with turning device picks up the cups from the forming machine by means of arbors and forwards them to a stacking cage. The arbors are located on both sides of a

low-vacuum suction box. There is sufficient vacuum to hold the products on the arbors.

Linear and turning movements are synchronized with the drives for the table movements of the RDM 78 K by a virtual shaft.

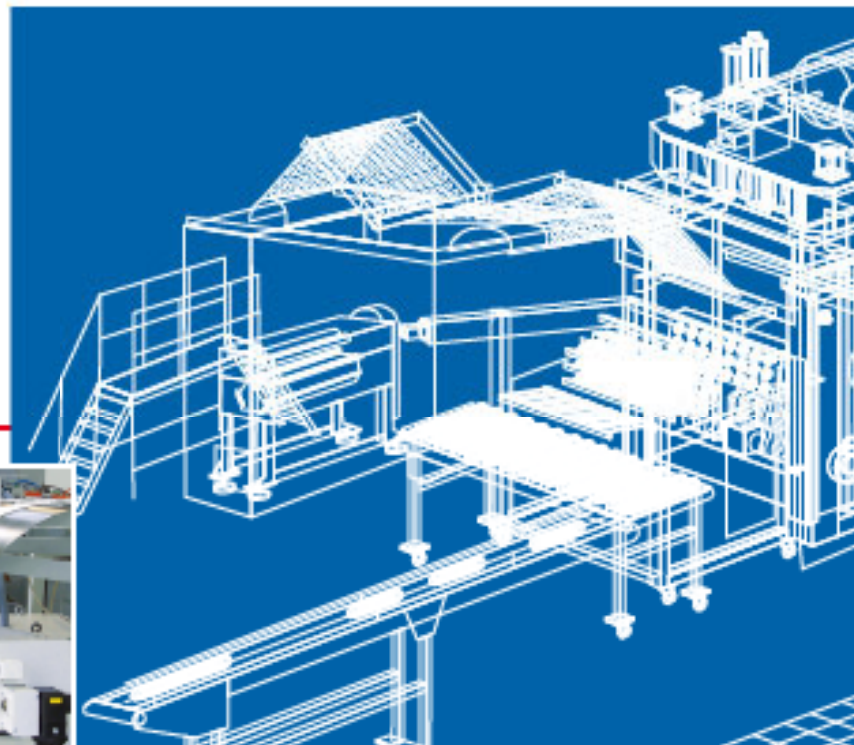
Before the cups reach the stacking cage the products remain on the format-dependent arbors for a longer cooling time due to the sequencing of the turning unit, this way deformations are prevented.

Furthermore, the products are stacked by means of the stable product rim. Hygienic requirements are thus met and damage to the cup rim is prevented that might be caused by retaining systems.



stacking station with PH 78  
turning device





SZS 73 stacking station

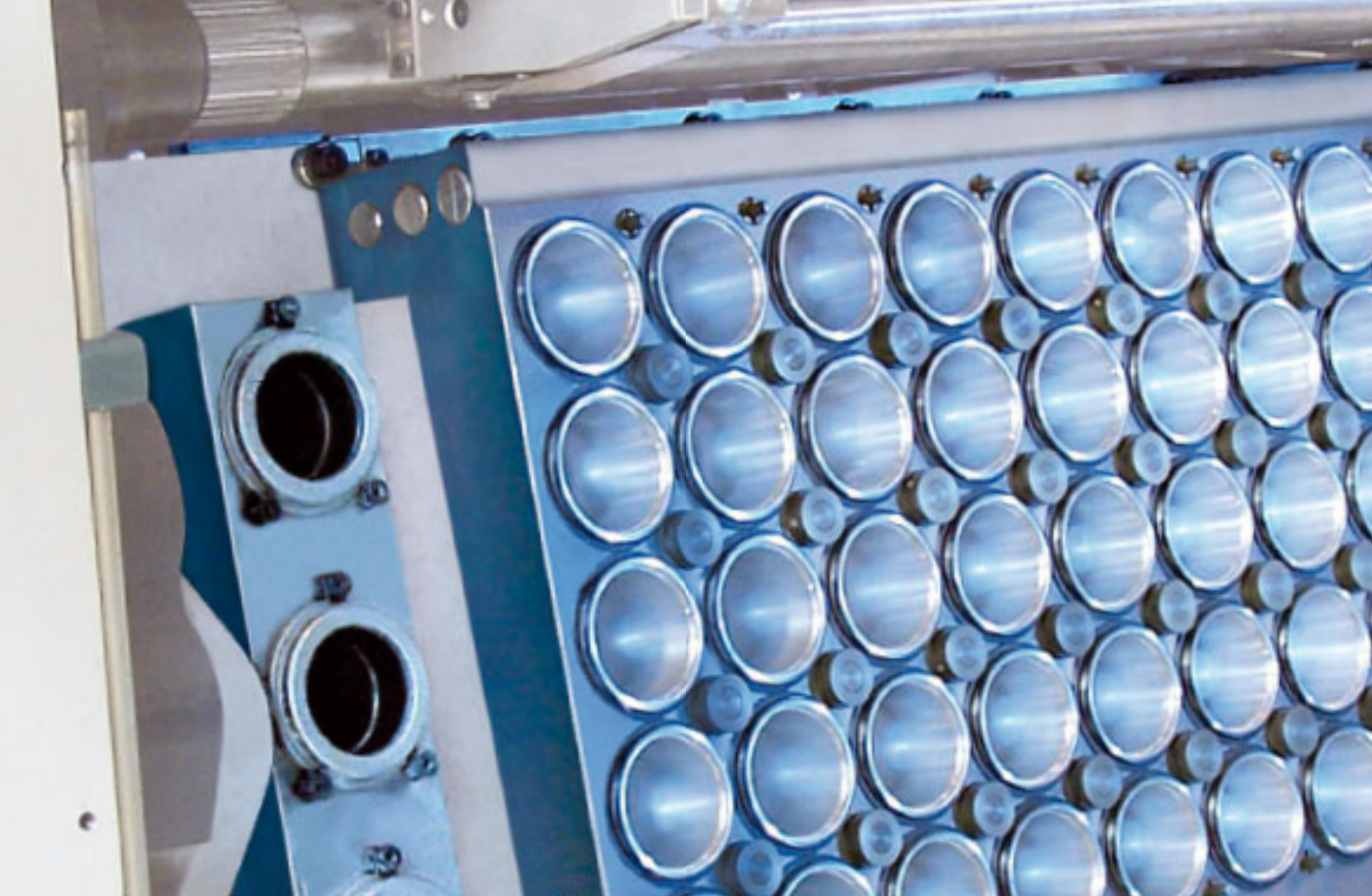
### **SZS 73 with latch stacking and/or latch and cascade stacking for RDM 70 K**

The cups are positioned directly in the retaining plate and stacked into the stacking mask in sequence. This way cup deformation is prevented and cooling is improved. From this point on cup stacks can either be removed manually or automatic singularization is possible.

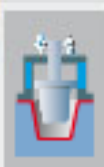
With horizontal cup discharge the stacks form a continuous column which can be forwarded to a printing machine or, if drinking cup lines are concerned, to a rimming device.

SZS 73 latch and  
cascade stacking

At ILLIG different stacking devices are available, from manual cup removal through to fully automatic stacking systems with feeding devices to downstream equipment.



controllable cooling circuits



directly cooled downholder



downholder lifting



downholder pressure levels



reduced forming air consumption

## Tool technology for forming/punching tools

Comprehensive expertise from one single source at ILLIG based on integrated development of both components, machine and tools. In addition there are optimized process engineering methods for optimum use of the complete system.

### Customer benefit:

- less maintenance effort required for tool repairs
- short standstill periods due to quick-change technology
- optimum cutting results on product due to new cutting technology and
- longer lifetimes due to highly wear-resistant materials and new guiding elements.

Tool tests carried out on the original machine provide data suitable for practical operation and result in minimum commissioning times at customer. Our technological expertise is secured by decades-long experience in designing forming/punching tools and based on a multitude of national and international industrial property rights.

Most part contours of products can be realized by applying state-of-the-art production technologies, i. e. a broad range of marketing demands can be met.

3<sup>rd</sup> generation tools are equipped with different features to achieve uniform product quality in all cavities. The features include:

### Controllable cooling circuits

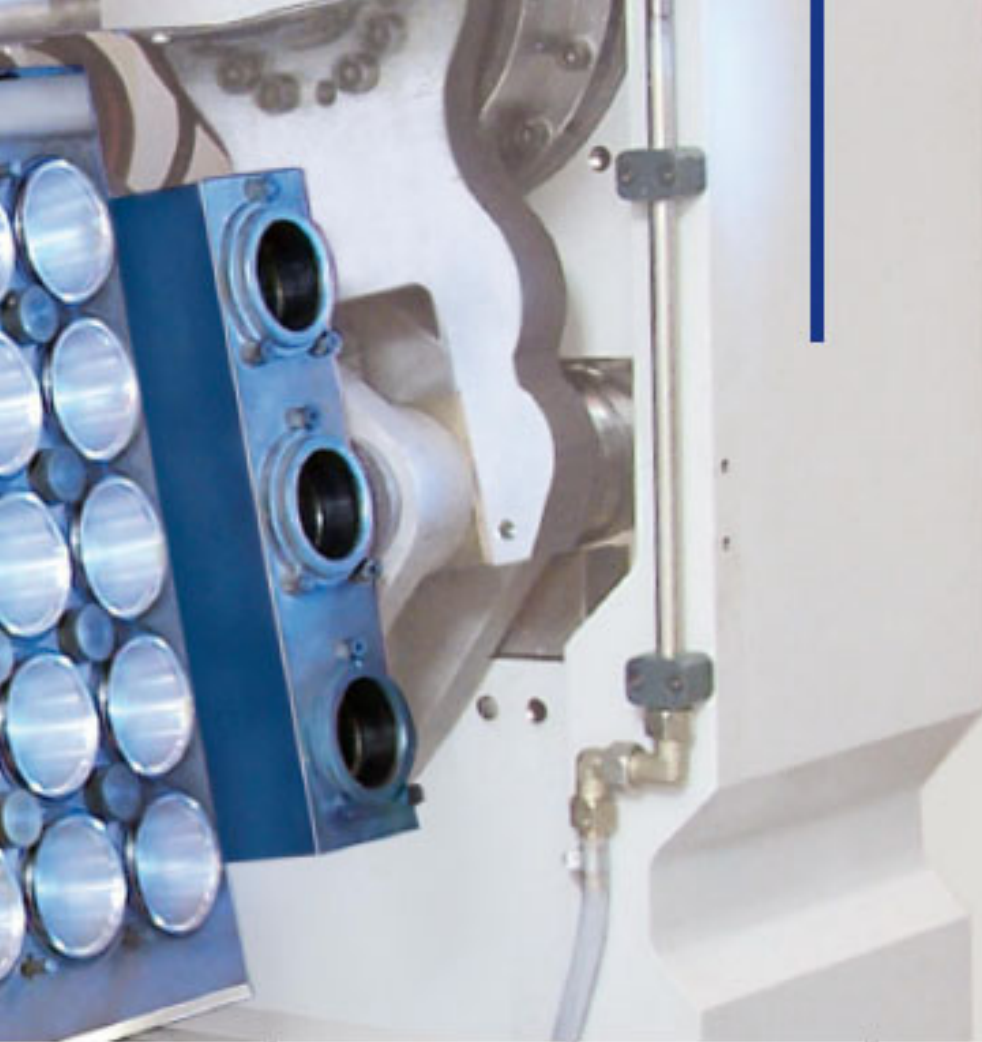
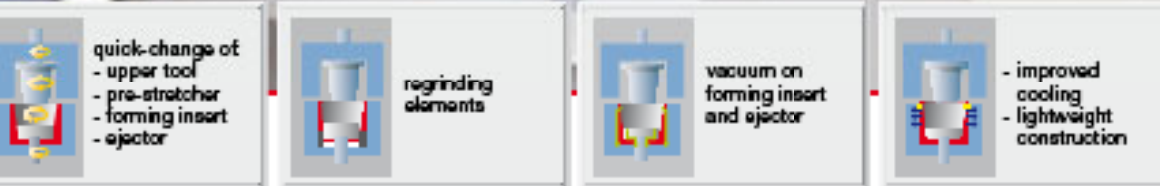
The temperature profile in the process is a decisive element for a very low number of rejects.

With a newly developed cooling technology, at an inlet temperature of 16–18°C, the outlet temperature is monitored and, if required, the volume of cooling water is adapted.

This results in an almost constant tool temperature in all operating states, in fact, close to the manufacturing temperature of the tool. With up to 4 control circuits it is possible to meet requirements of sophisticated products without problem.

### Directly cooled downholder, downholder lifting and downholder pressure levels

The quality of the products can be additionally affected by employing directly cooled downholders and the innovative downholder control. Forming of sealing rim, stacking edge as well as wall thickness distribution in the side wall can be affected in a reproducible way by interaction of pre-stretcher and forming air and by means of downholder lifting and pressure level.

45-up forming/punching tool  
for RDM 78 K

quick-change of  
- upper tool  
- pre-stretcher  
- forming insert  
- ejector

regrinding  
elements

vacuum on  
forming insert  
and ejector

- improved  
cooling  
- lightweight  
construction

### Reduced forming air consumption and symmetry of all media

A considerable reduction of mold filling times is achieved by innovative forming air valves and their arrangement on the tool.

A further major element is the symmetrical arrangement of all media (forming air, vacuum, venting, cooling) which considerably affects the uniform quality of the products formed in all cavities.

Moreover, the quality of the products can be additionally improved by using directly cooled downholders with innovative downholder control.

### Quick-change technology

The tool quick-change technology helps to keep conversion times as short as possible during format changes. Quick-change systems are available for pre-stretchers, bottoms and forming inserts. The tool stays in the machine while these changes are carried out.

Complete forming/punching tools can be changed by one single operator using certain devices on the machine. Already during the tool installation the lines for forming air and water are fixed as a result. Existing tools can be used with suitable adapter sets.

### Regrinding elements

The difference in height resulting from the ground punch can be offset by reworking the regrinding element. This way forming inserts no longer have to be adjusted in height.

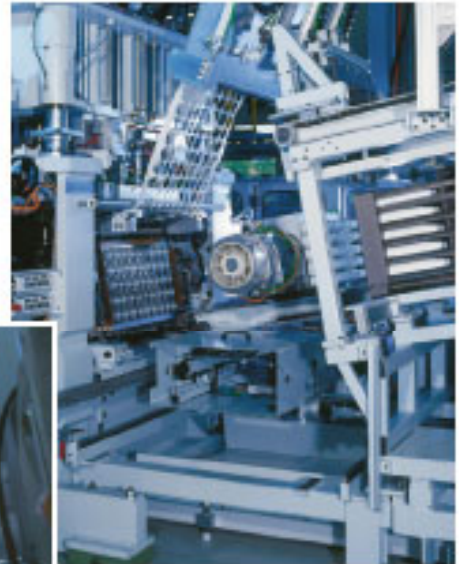
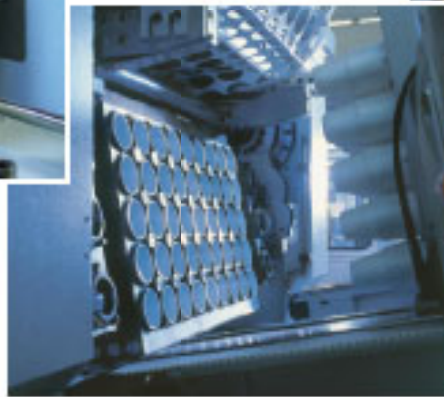
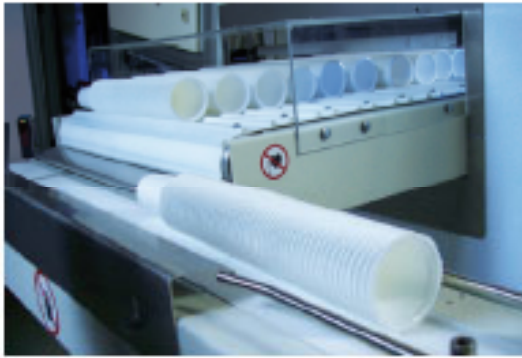
### Vacuum on forming insert and ejector

The forming/punching tool can be equipped with a vacuum tension function to extend the effective cooling time. During the cooling time the cup is held by vacuum, heat transition is improved, cooling performance is optimized. Consequently the residual heat in the cup is reduced resulting in improved product quality.

### Lightweight tools

In order to be able to benefit from the possibilities provided by the machine to the full extent, the machine technology with tilting mechanism calls for lighter tools made of high-strength aluminium. Cooling of the lower tool was considerably improved. By launching the currently largest tilting machine for forming/punching tools on the market, ILLIG also set the standard in tool making.

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