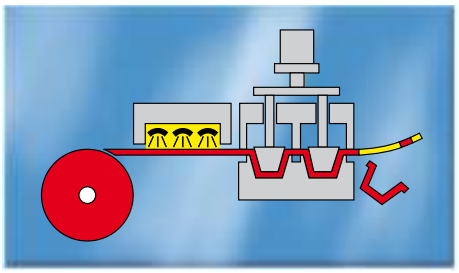
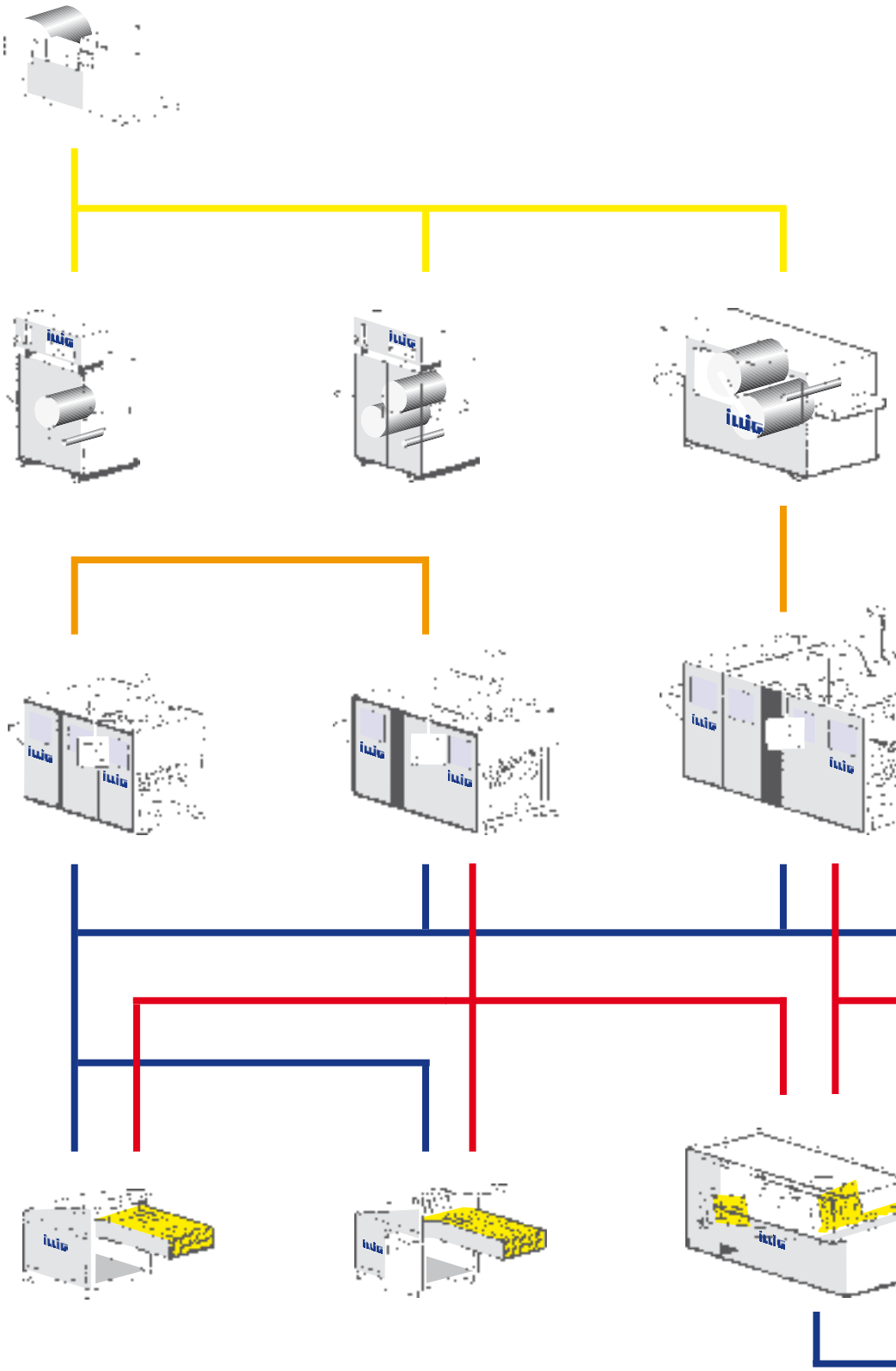


Automatic pressure forming machines RDM 50 K, RDM 54 K, RDM 70 K, RDM 75 K

The ILLIG RDM-K production system, setting the standard for an innovative, user-friendly thermoforming concept.



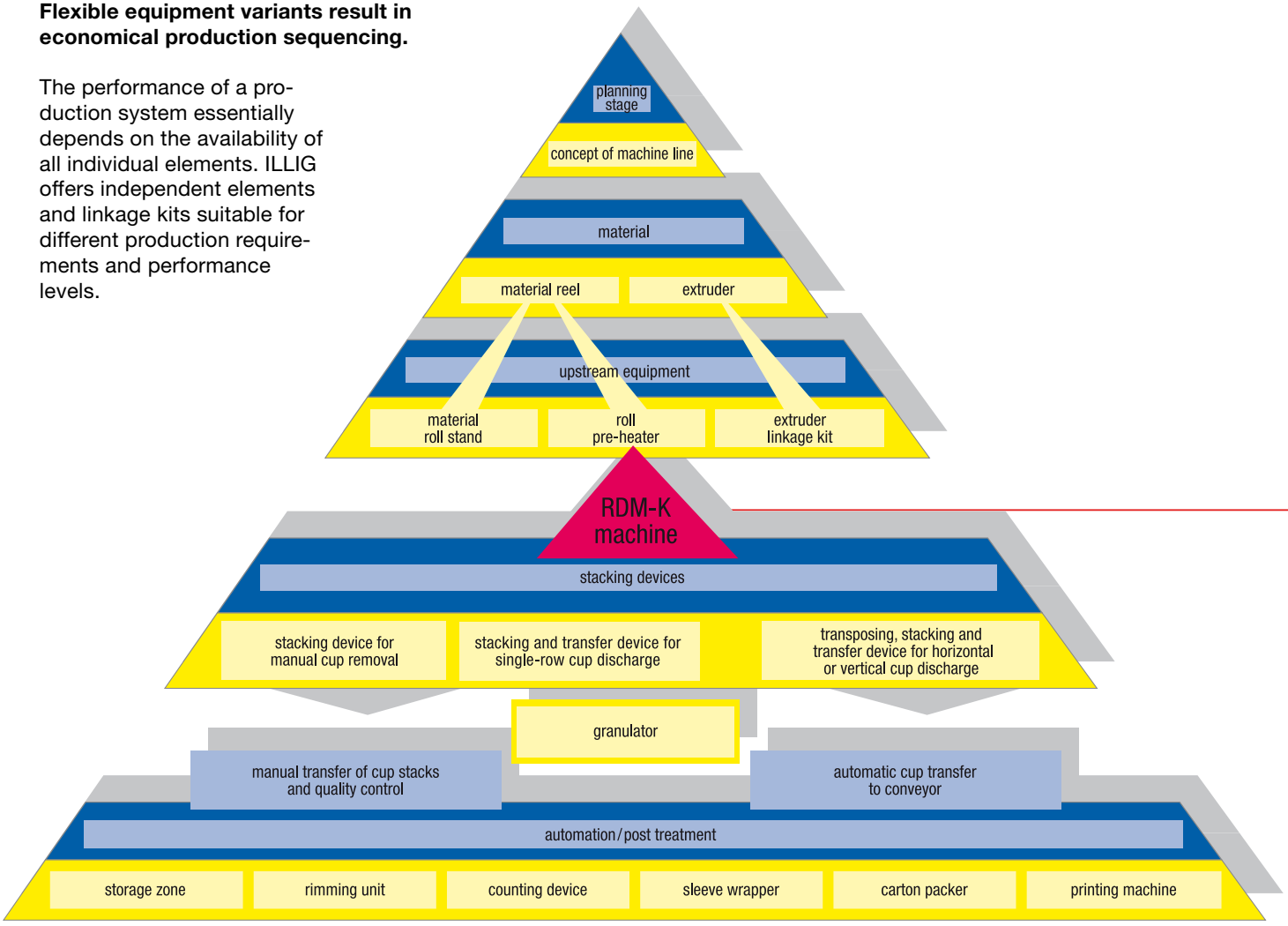
How to achieve formings of superior quality.

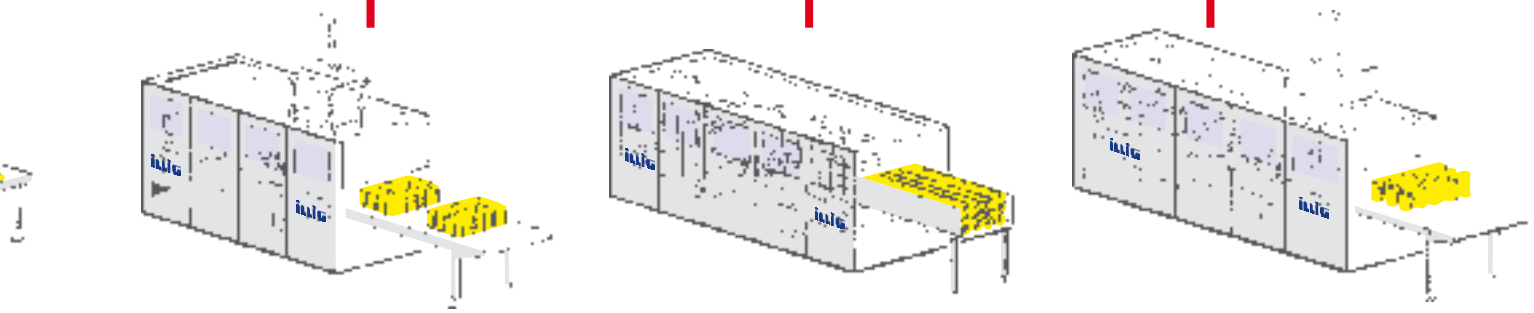
Based on customer requirements, ILLIG manufactures technically sophisticated and economical production systems providing optimum solutions for products. The consistent use of thermoforming and the expansion of its applications require consideration of:

- **product design**
- **material selection**
- **material production**
- **forming**
- **stacking**
- **handling**
- **printing and packing**

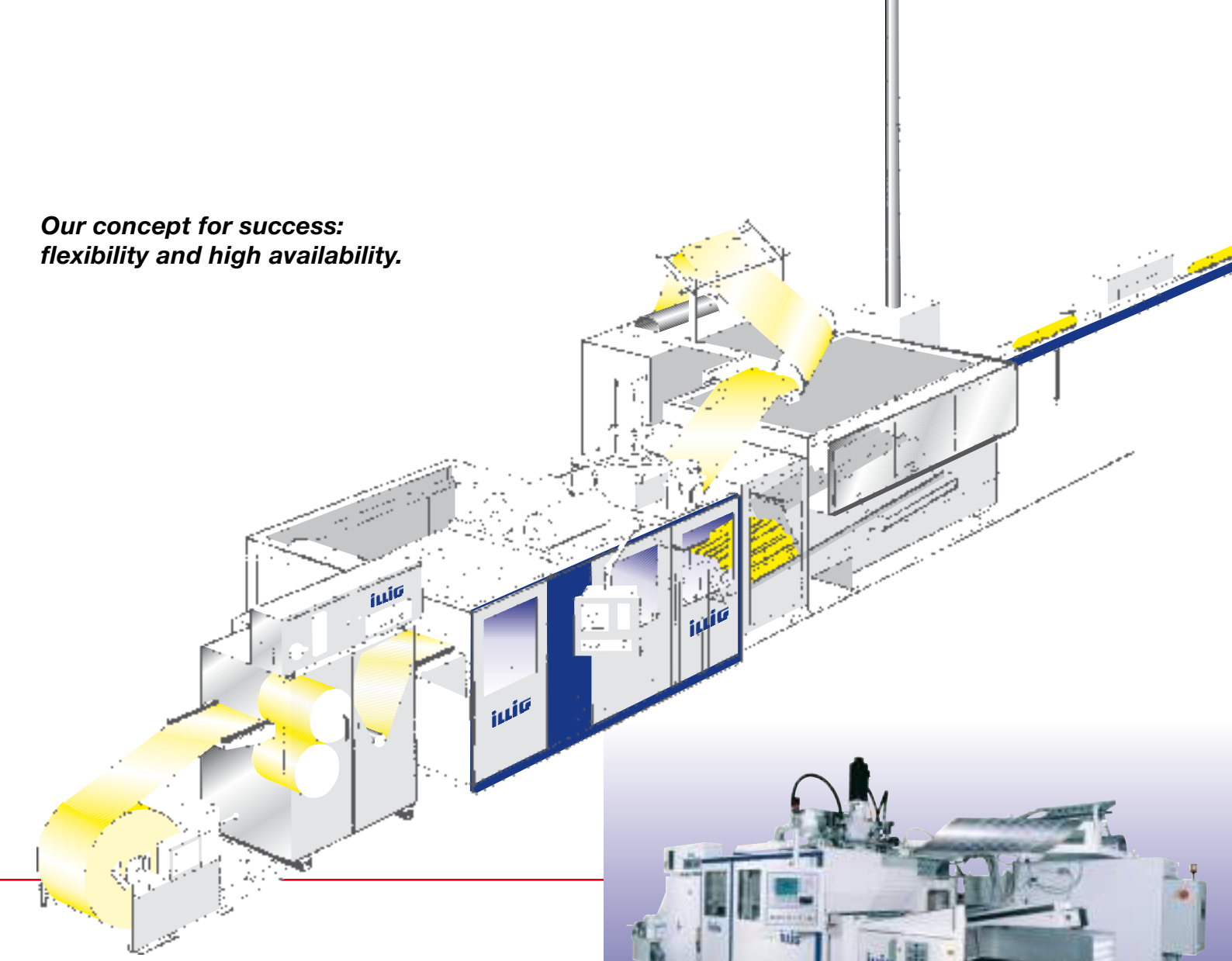
Flexible equipment variants result in economical production sequencing.

The performance of a production system essentially depends on the availability of all individual elements. ILLIG offers independent elements and linkage kits suitable for different production requirements and performance levels.





Our concept for success: flexibility and high availability.



RDM 70 K line with stacking device ÜG 75, interlinked with a granulator RS 75 b

automatic forming/punching machine RDM 54 K

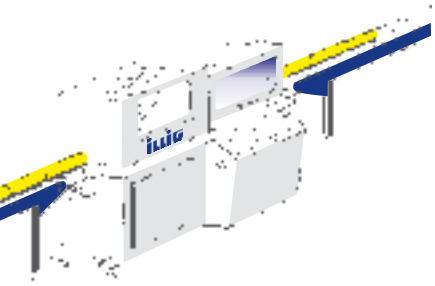
New ideas create new markets. Precision and flexibility being essential requisites.

RDM-K machines with forming/punching technology stand for: precise mechanical drive systems, high quality of thermoformed articles, performance and reliability. The customer can select from a comprehensive group of product ranges with various forming areas and different equipment levels.

The forming device with the cam-controlled toggle lever system ensures high forming and punching forces. The forming table movements are not limited to upward and downward direction. After the forming process it is tilted in the feed direction through an angle of 80°. From this position the ejectors push the cups into the stacking device. The tilting movement of the forming table permits controlled discharging and stacking of the thermoformed articles even if multiple-row tools are employed.

Free potentials can be best utilized by optimizing the machine's sequencing during the forming and movement phase resulting in higher cycle speeds and optimum sequencing. Hygienic conditions for the production of food packs are improved by using non-lubricated air for cylinders and seals.

Specifications with regard to tool changing were considered in the RDM-K concept. Moreover, the accessibility of all machine elements for service and maintenance was improved.



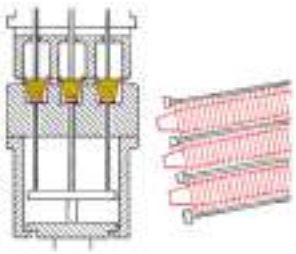
transparent PP cups

RDM-K technology, based on research and development.

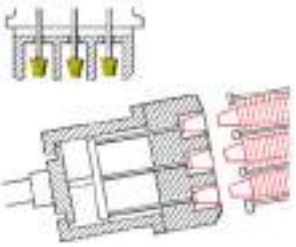
At ILLIG, basic research is used to gather all parameters essential for thermoforming. Supported by calculation programs, optimizing of the machines can be achieved by overlapping mechanical and electronic drive systems.

Consistent operator guidance is the key to practical utilization of the complex process as well as the variable over-crossing effects of individual process sections. In the department for applied technology, developments are tested under conditions similar to actual production and adjusted for application in the customer's machine. All types of machines are available at any time for presentation and customer testing.

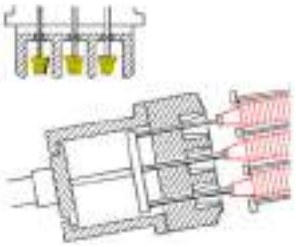
Solutions found in the development and design stage take into account the future application range of the machine. State-of-the-art technologies are tested aiming at a reduction of energy consumption as well as service and maintenance efforts and checked for being economical. Innovative products and tool designs are developed together with new machines or process engineering elements. The overall concept of the machines is always taken into consideration.



forming and punching



tilting

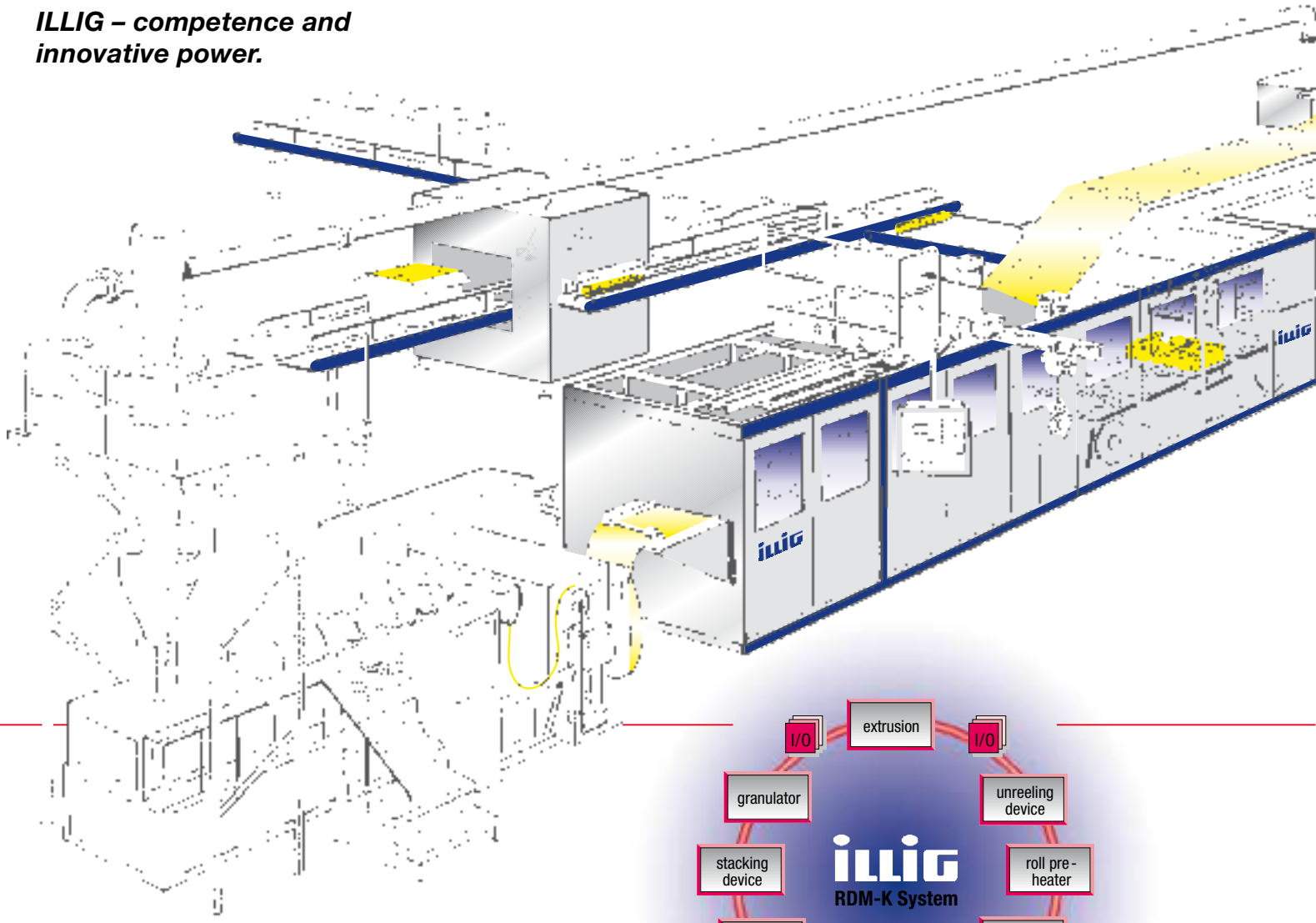


stacking

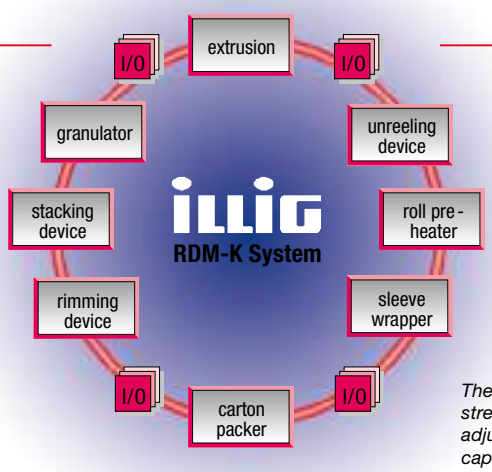
Theoretically found performance data are transferred into simple operation concepts in practice. Consistent operator guidance on the screen, computer-aided basic setting and optimizing of machine operation result in an increase of performance as well as improved product quality.

Experience and requirements of our customers are also incorporated in all new ILLIG developments. The resulting tried and tested serial machines and custom-made solutions ensure economical production.

ILLIG – competence and innovative power.



RDM 75 K in-line system with stacking device and interlinked with a granulator



The speeds of the down-stream equipment are adjusted to the performance capacity of the forming machine.

Market advantages by matching different performance levels with suitable technology.

To achieve optimum production, every molded article calls for a specific solution. Know-how and innovative technology are required for planning complete machine lines, from material pre-heating through to cup decoration, stacking, counting, feeding and packing into sealed plastic bags.

For decades, our machines and process engineering aspects have been continually setting the standard for flexible and economical solutions.

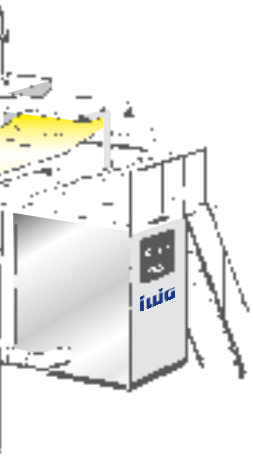
Product-oriented high-performance lines can be assembled from comprehensive standard equipment. These custom-made production systems result in competitive advantages especially when narrow deadlines and high quality demands are concerned.

Since all components are tested and delivered from one source, smooth operation is ensured even for complex machine lines.

Performance and speed of the modular parts must be synchronized within thew hole system as much as possible. Sensors or bus systems are employed for connecting the various functions.

The thermoformer's skeletal waste is led directly into a noise-reduced granulator. Various arrangements are possible, such as linear or 90° arrangement behind the machine. Noise-reduced skeletal feed and automatic threading systems are available.

The regrind can either be filled into bags or conveyed to existing silos. In case of extruder linkage, the skeletal granulator is integrated in the in-line process and the regrind is conveyed back to the extruder.



PP samples

High-performance thermoforming – high performance and consistent product quality.

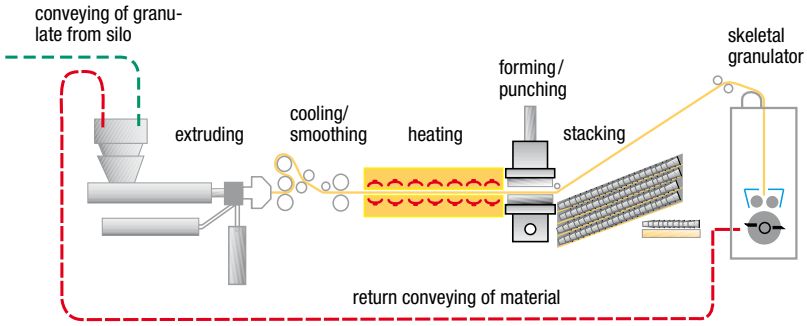
forming station RDM 75 K with 40-cavity forming/punching tool

In-line production stands for cost-effective production of large quantities of cups in multiple-shift operation.

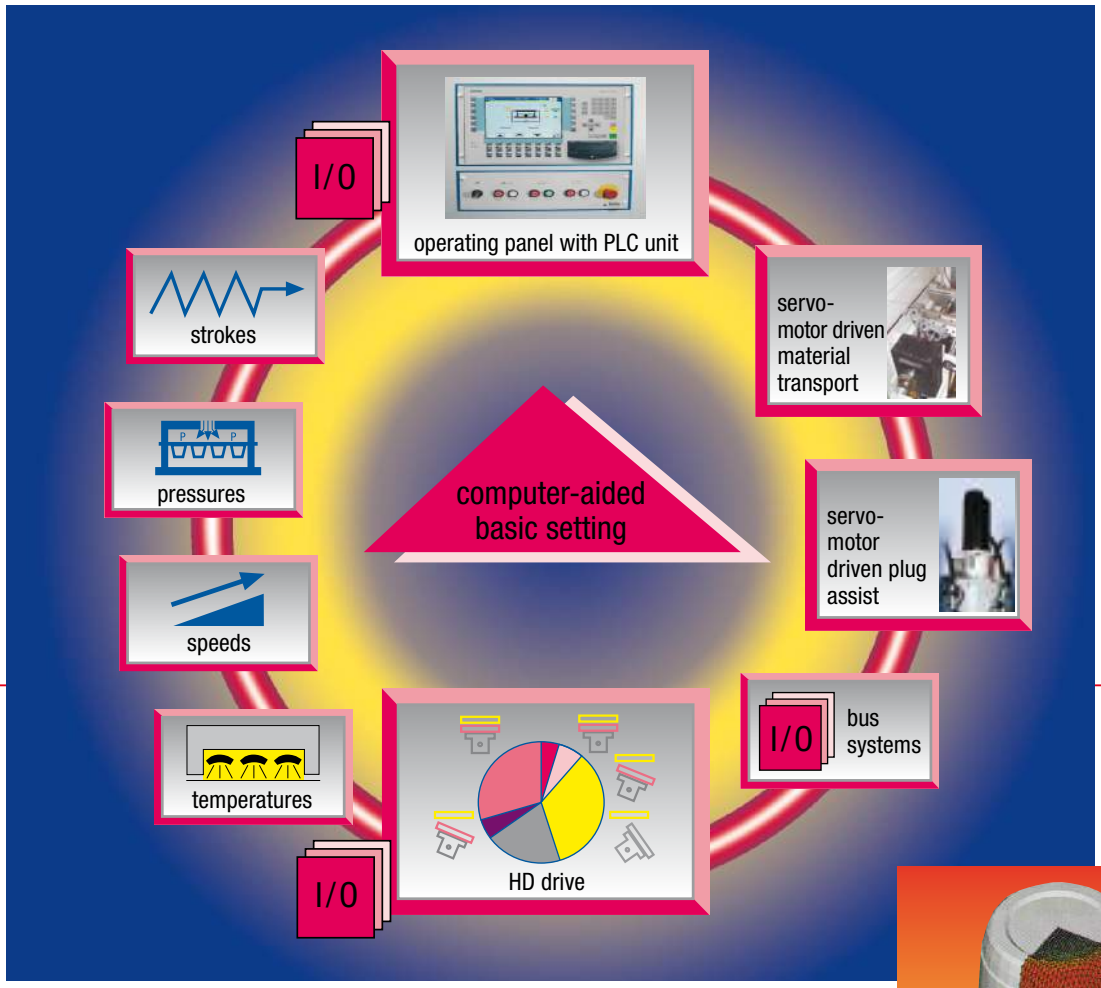
High availability of individual machine components is an essential factor for in-line operation. Reliability is a basic element.

Reliability and economy are benefits for our customers. Especially with PP processing, where the heat of the extruder within the material can be used in the forming process thereby reducing the heat requirement in the forming machine. One of the main advantages of this working method is the fact that the extruded material can be fed directly into the forming machine and the regrind can be processed in the extruder right away.

The thermoformer is linked with an extruder by a linkage kit. The material reaches the forming machine by buffer loop, between continuous and discontinuous process. The production capacity of the forming machine is adapted to the material quantity which is produced. Moreover, with this linkage kit just one operator can start the machine.



The digitalized machine features practical operation and computer-aided basic setting.



simulation – optimum wall thickness distribution

Easy operation and computer-aided basic setting are based on research and development.

Process engineering and application technology in conjunction with comprehensive material knowledge result in an optimum machine program incorporating the parameters for forming, punching and stacking.

Optimum setting data and process times for new tools can be calculated depending on material, part geometry and tool design. In all ILLIG machines, calculation is carried out supported by computer-aided basic setting and in conjunction with servo-motor drives.

The RDM-K sets a new standard regarding facilitated operation. A total reproducibility of production data is a major element for maximum availability especially for high automation levels and frequent product changes. All relevant process data are entered on the operation panel and displayed as set point/actual comparison.

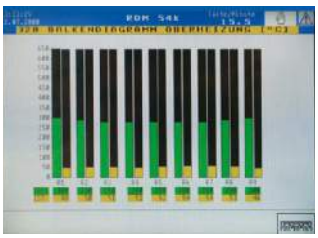
The optimized data can be stored and they are available right away for repeat orders. All major operation data are continuously available to check the ongoing production.

consistent product quality by optimum machine equipment

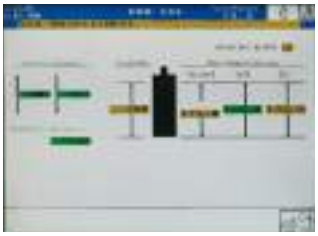
Consistent product quality – essential requisite for industrial production.

Optimum machine equipment is the basis.

forming program



heater setting

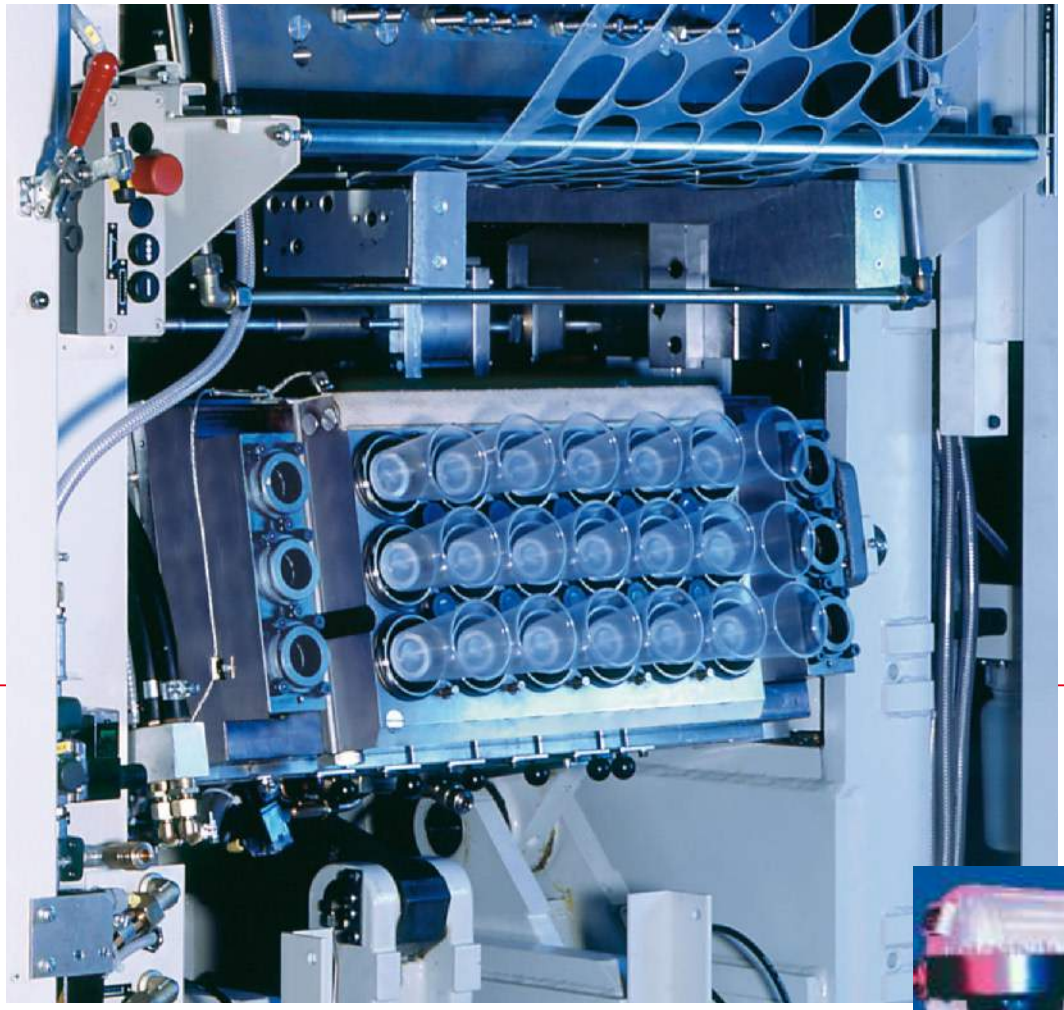


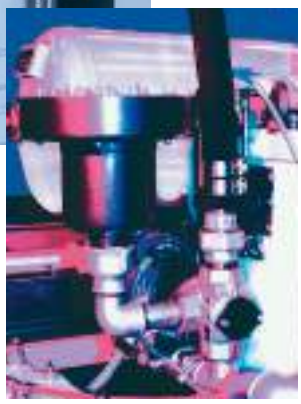
plug assist data

- Siemens S7 control with screen operating panel OP 37
- digital setting and storage of machine parameters, hence reproducible forming process
- servo-motor driven material transport and central width adjustment
- optimum material heating
- large forming air tanks with digital setting of pressure for quicker forming
- HD drive combined with regulation of main drive

operating panel OP 37 and PLC unit

Development of machine and tool from one source results in optimized thermoforming process.





improved distribution of forming air for better contour definition

The required performance, part quality and availability can only be achieved by optimizing the thermoforming process.

This process consists of a multitude of detail solutions including the whole sequencing as well as the tool technology.

Reproducible material heating as a function of the index length is a requisite for high part quality. ILLIG uses ceramic IR elements with exact temperature regulation (+/– 1°C regulation accuracy).

All RDM-K machines are equipped with upper and lower heating. The upper heater is regulated in longitudinal rows, the lower heater features full area control by pilots.

The servo-motor driven transport drive ensure exact positioning at high transport speeds and reduces index length tolerance to +/– 0.1 mm. Exact setting of the transport system reduces material consumption.

For PP processing, the material transport is pneumatically moved apart by the spreading device. The material is tensioned, thus preventing webbing during the forming process. A central width adjustment makes operation easy.

course of speed
pneumatic plug assist
servo-motor driven plug assist

The thermoforming process can be optimized by using customer-specific equipment.

The servo-motor driven plug assist ensures even material distribution in the cup. The basic material thickness can be reduced by up to 15 % without jeopardizing the stability of the formed part. Side wall marks are reduced, especially in crystal clear materials such as PP and APET. There is an improvement of the products' optical quality and printing on high-performance machines will show best results.

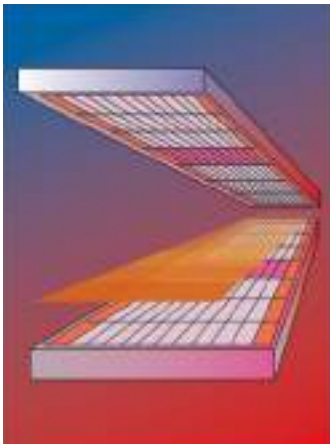
Benefits:

- consistent speed
- digital setting of start, return movement and speed of plug assist
- energy costs saving of approx. 75 % compared to pneumatic plug assist

New forming air valves are used for improving the contour definition. The fastest possible mold filling is achieved in combination with the large pressure air tank. The forming pressure remains on a constant level. This results in higher output capacity.

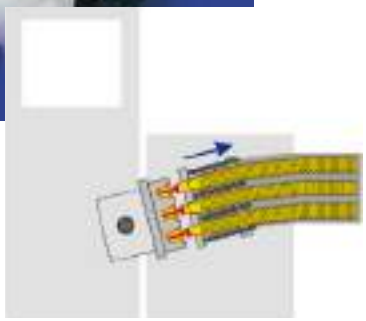
Customer-specific equipment results in:

- an increase in availability
- digital feed-back control of all process parameters
- recording of operation data and diagnostic aid
- minimized service and maintenance efforts
- reduction of energy consumption
- increase in cycle speeds
- reduction of start-up waste
- optimized overall process from raw material through to packing and including tool change



Heater equipment of RDM-K machines. Upper heater with longitudinal row control. Lower heater with full area control.

Flexible equipment variants for economical sequencing and safe production.



stacking device SE 73, SZA 73, SZS for manual cup removal

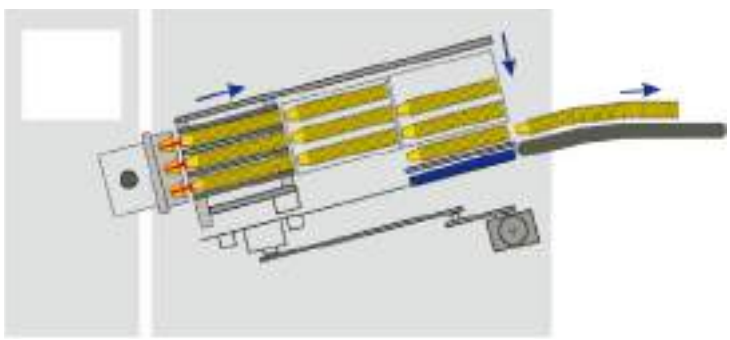
Stacking matched with the performance of forming machines by using various stacking systems and resulting in economical production.

Product properties essentially depend on the quality and reliability of the downstream equipment.

We therefore offer a reliable range of stacking systems and downstream equipment adjusted to:

- automation level
- output capacity
- further processing

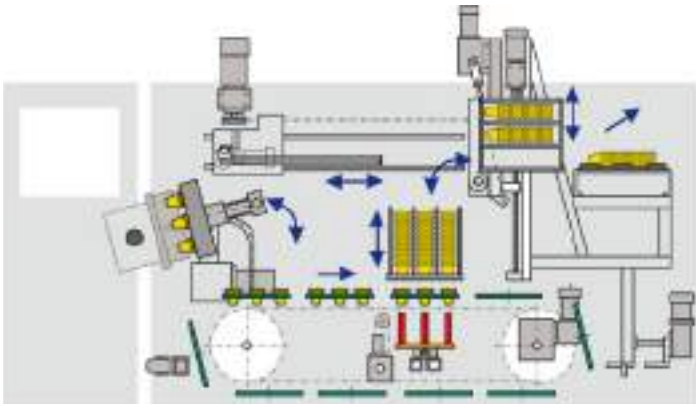
Based on the above is the function principle of the stacking system where the output capacity of the forming machine is considered and also subsequent production steps. ILLIG offers different stacking systems. The range covers manual cup removal through to fully automatic stacking systems with loading devices for downstream equipment.



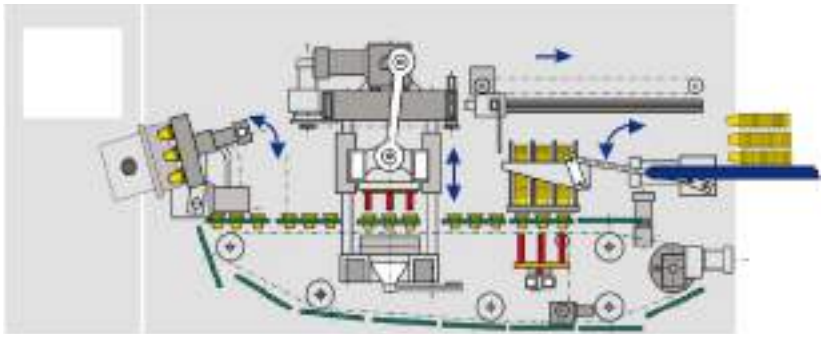
stacking device SUG 73, SUG 75, can be linked with downstream equipment

vertical cup discharge

Flexible equipment variants for economical production sequencing. All individual components decisive for the process are ILLIG-produced.

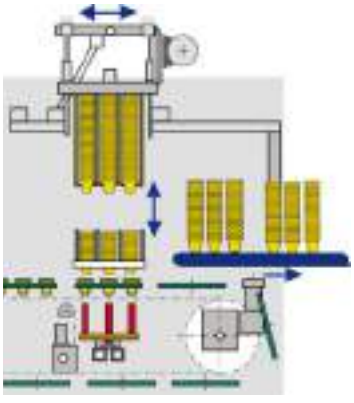


stacking device STP 75 for single row cup discharge or STPM 75 for manual cup removal



transposing, stacking and transfer device with hole punch unit PLS 75b

The cups are positioned directly into the recesses of the stacking pallets. They are stacked into stacking cages in sequence. This way cup deformations are prevented and cooling is improved. Now the cup stacks can either be removed manually or they can be automatically separated. Horizontal or vertical discharge is possible. With horizontal cup discharge the stacks form a continuous column which can be led into a printing machine or, if drinking cup lines are concerned, into a rimming device.
The stacking system can be supplied with a hole punch unit for the production of products which require hole punching in the bottom, such as plant pots.



stacking device STPV 75 for vertical cup discharge

ILLIG tool technology, precision for long service lives.

3-zone cooling

Development of machine and tooling from one source means in practice high-tech equipment of highest availability.

As early as in the planning stage, tool design know-how is integrated in the whole concept.

Additional equipment can be used, such as servo-motor driven plug assists for even material pre-stretching, devices for hollow bottom and inverted-bottom tools, or directly cooled high-pressure downholders for embossing of sealing rims.

Systems to monitor the tool temperature or an exceeding of the punching force help prevent damage to the production system.

The tool can be exchanged completely, or just the forming inserts.

The tool quick-change technology helps to keep conversion times as short as possible. Mechanical devices enable only one operating person to exchange the forming tool.

The tool is installed and by fixing it, connections for forming air and water are established at the same time.

standardized construction
product development
quality

low wear and tear
long service lives
commercial efficiency

optimum utilization of forming area
optimum production system
technology

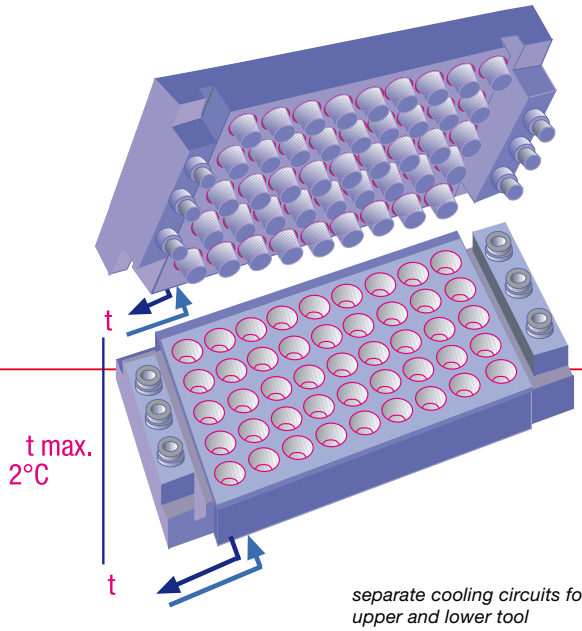
servicing, maintenance
production quality
availability

quick-change technology for plug assists, bottoms and forming inserts

ejector bottom with engraving

forming insert menu tray

Forming inserts, ejector bottoms and pre-stretching plugs can be exchanged if contours differ but punching diameters are the same.



separate cooling circuits for upper and lower tool

The tool remains in the machine, consequently the set-up time is considerably reduced. Tool costs are also reduced since only one basic tool is required for several forming inserts.

The arrangement of cooling connections as well as the flow rate of the coolant are also major elements. A uniform cooling of all cavities in the tool and therefore a controlled expansion can be achieved by applying certain measures.

Sufficient corrosion protection of the tools is very important to maintain their quality level. Some examples are: the use of corrosion-proof tool steels, optimum water qualities and closed-loop cooling circuits as well as the use of galvanic corrosion protection in the tool.

Cooling time is a decisive factor for the duration of the process and consequently for the cycle speed of the machine.

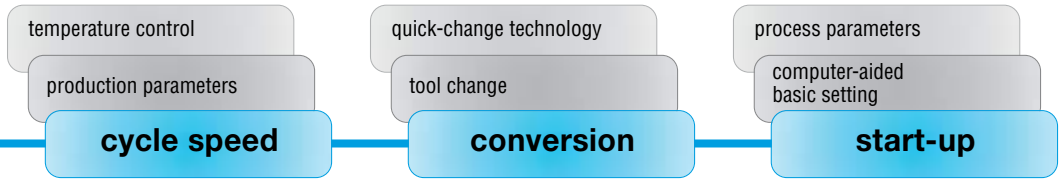
With increasing material thickness, more heat will have to be dissipated in the shortest possible time. Therefore the punches are equipped with a cooling jacket which provides the necessary cooling.

For an extension of the effective cooling time, the forming/punching tool can be equipped with a vacuum clamping. Thanks to this vacuum clamping, the cup is held during the cooling time. This improves the passage of heat, i.e. the cooling capacity.

Various cooling circuits for intensive cooling of critical areas of the forming tool result in an increase in output capacity of up to 20 %.

The extremely low quota of rejects can also be attributed to the temperature profile in the process. Upper and lower tool halves must be precisely temperature-controlled. The high precision of the tool parts is being monitored by state-of-the-art measuring technology. Consequently, punches and die plates can be exchanged, and also punches can be interchanged within the cavities.

Moreover, the forming tools at ILLIG are tested on original machines to stand the practical test. The customer receives optimum setting data together with the tool resulting in shortest possible start-up times. This way the stated performance and quality specifications will be met.



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