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Welcome to Bucher Emhart Glass

In 2016, we introduced “End to End” with a promise to deliver new glassmaking solutions that make production easier, safer and more efficient. Today, we are pleased to report on our success in uniting the hot and cold end processes, and offer an update on our continuing efforts to help our customers make glass the preferred premium packaging.

“End to End” is achieving our goals of maximizing production efficiencies and reducing dependency on skilled operators. We are continuing to develop products to help glassmakers achieve full glass plant automation and centralized control, and you will read about this progress.

Through this process we identified five areas where we support our customers with machines, processes, controls, performance and knowledge. All are essential factors in achieving consistent and reliable glass production and have always been the “pillars” of our support for our customers. These resources now have new names and identifying graphics designed to convey them in a clear and concise manner:

Equipment from gob forming through final container delivery and inspection

Automation controls to ensure reliability and reduce human intervention

Care to keep equipment running at top production

Empower to help customers optimize plant and process performance

Academy to convey the skills to operate and maintain equipment at top efficiency

Our work and our progress is ongoing and as always, your needs will be our first priority. We look forward to working with you.



Martin Jetter
President





EQUIPMENT



AUTOMATION



CARE



EMPOWER



ACADEMY

End to End closes the loop between the hot and cold end container glass processes by giving glassmakers the tools to read, analyze, and automatically react to data – to ensure product quality and optimize operation. Products will be immediately traceable. Employees will be safer and more productive. And plant operations will run at peak efficiency to achieve optimum productivity and result in increased profitability.

Technology

Equipment Across the hot end and cold end, our equipment is where we made our name. And now we continue to lead the industry by bringing both processes together. Providing every plant with the optimum configuration to take them to new levels of efficiency.

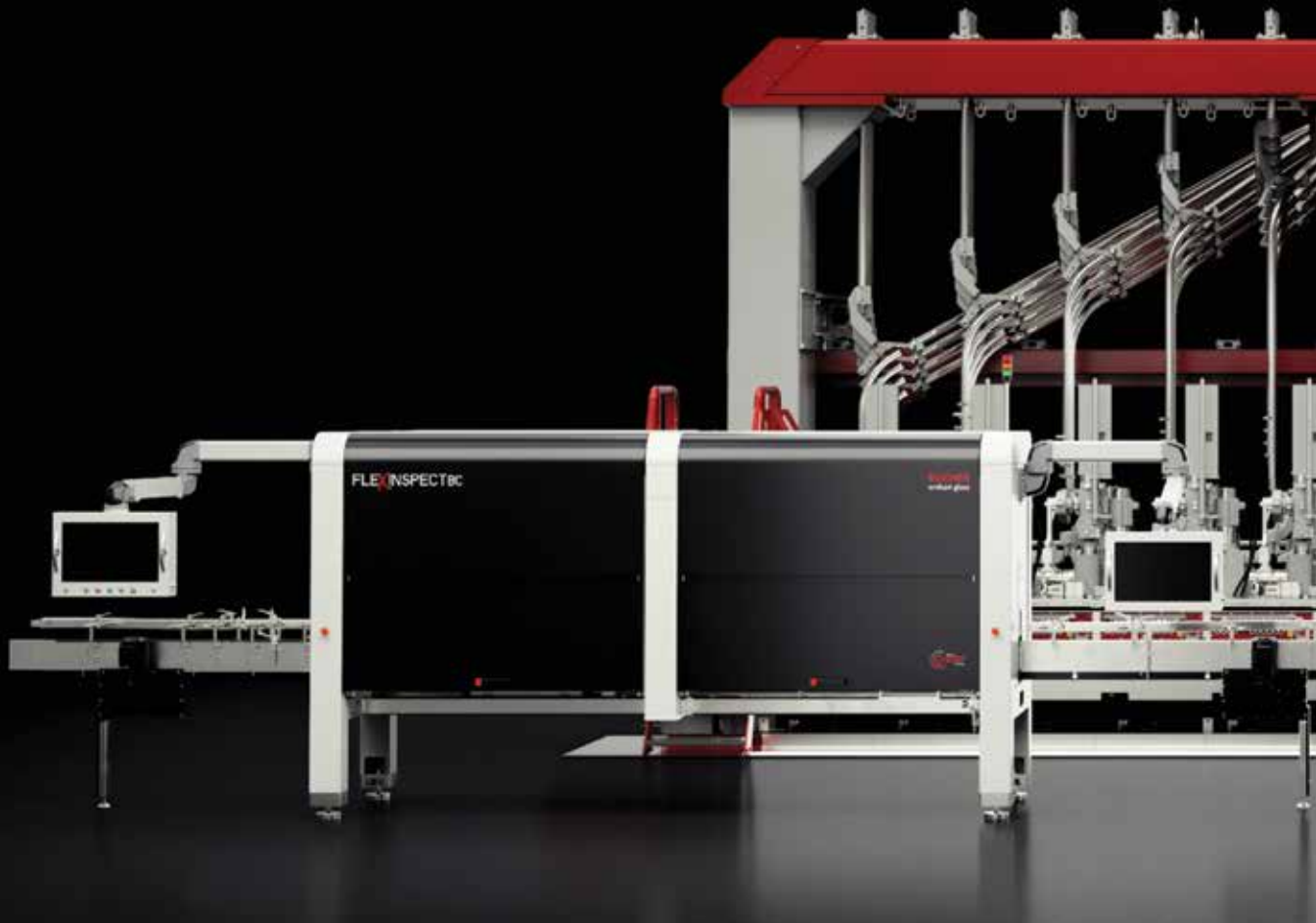
Automation is our technology and the intelligence that makes our equipment 'smarter'. With these innovative automation systems and associated technology, glass plants will be able to read, analyze and automatically react to data to gain greater performance, reliability and profitability.

Support

Care keeps our machines running; original parts, service and repair. Our parts are original because things work better together when they are made by the same manufacturer. It makes sense that when you need a part for your Emhart machine, you choose a part from Emhart. And our service and repair teams know the equipment better than anyone.

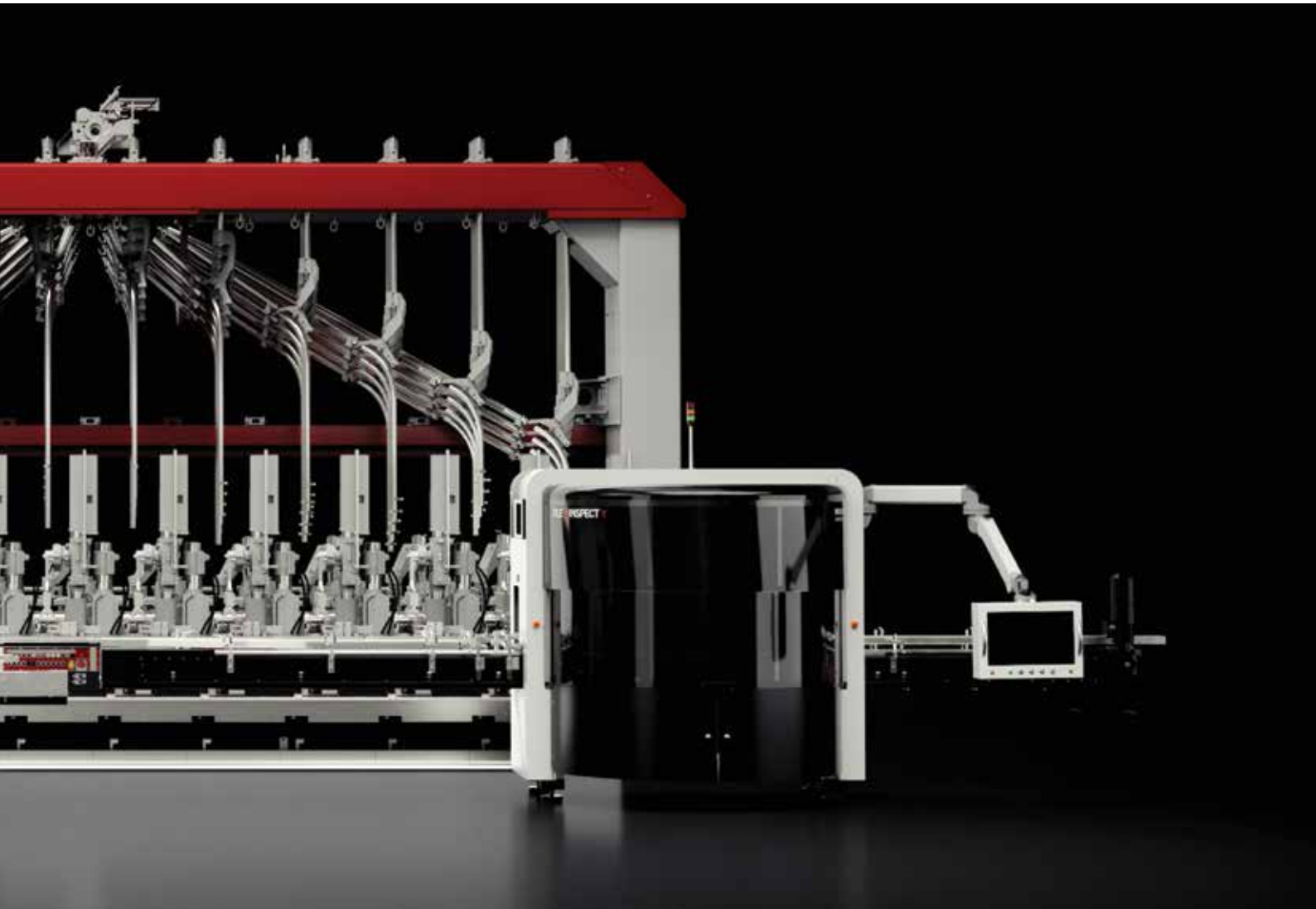
Empower is our support network that will empower you in the use of your technology. We will show you how to customize and optimize with a tailored approach to your specific set-up. We will enable you to get the very best out of your machines.

Academy is our school of thought in leading the next generation forward. Without this in place our progress as an industry will not just stumble, it will halt. It is our mission to share everything we know so that the next generation takes our experience and expertise, and adds to it. With our help there is every chance they will find both new efficiencies and better ways to achieve.



End to End Technology - Equipment

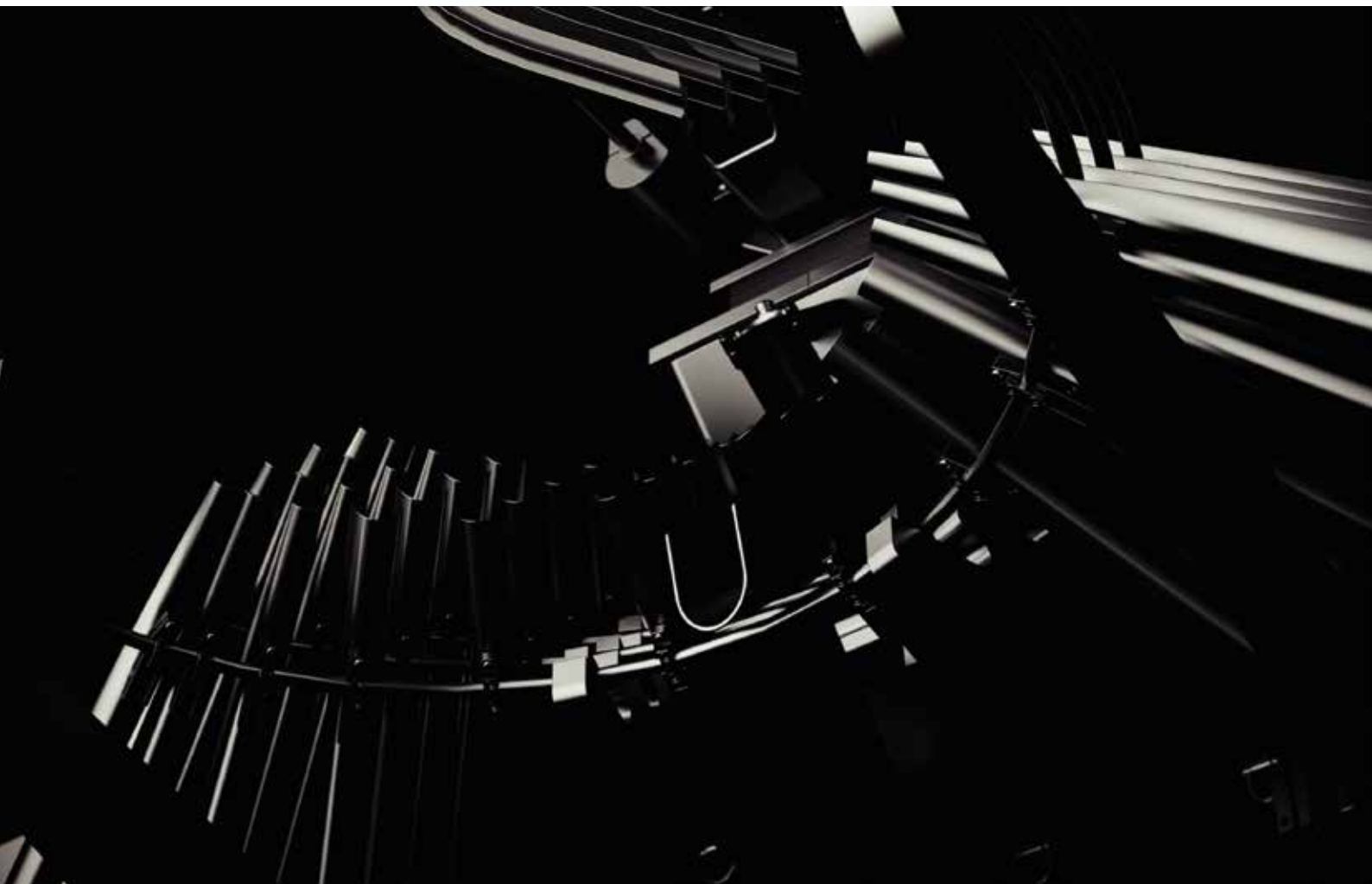
Equipment is our forming and inspection machines; our hardware. Across the hot end and cold end, our equipment is where we made our name. And now we continue to lead the industry by bringing both processes together.



End to End technology powers the glass plant of the future, with integrated equipment that document, analyze, and react to data automatically to ensure product quality and optimize operation.

Products are immediately traceable. Employees are safer and more productive. And plant operations run at peak efficiency to achieve optimum productivity and result in increased profitability.

Gob forming



Out of the continuous glass flow from the forehearth, gob forming systems generate a constant gob in weight and shape which is required for processing in the forming machine. The feeder plunger, tube height and rotation and the shear mechanism form a gob which

is tailor-made for the container to be produced in the forming machine. Errors made in this process step cannot be corrected afterwards in the forming of the container. This is the reason why the gob forming is a key factor of the quality of the finished product.



Superior gob forming technology

Bucher Emhart Glass has perfected the process of gob forming to turn streams of molten glass into the shapes that will be molded into the finished container.

Our complete product line includes feeders that offer wide operating ranges for simplified operation. The parallel shear is designed for synchronized cutting to deliver consistent gob shapes and weights with reduced shear marks. The spout system consists of an entire set of spout refractory components specially designed to promote optimum gob forming conditions. Delivery and support systems provide precise alignment for smooth and centered gob transition into the mold which is essential for high ware quality.

Servo Feeder System

The Servo Feeder System offers the ability to improve production quality and to customize the gob forming. The 555 system includes the feeder plunger, tube height and rotation, and the shear mechanism as well as the optional metering spout system. The metering spout features reduced servo tube sensitivity and improved thermal and weight variations. This degree of control with the servo-driven gob forming equipment reduces glass loss and optimizes feeder and shear performance. The Servo Feeder System is available fully integrated into the FlexIS process control system and also as a standalone version which interfaces with existing non-FlexIS timing systems.

Features and benefits

- Improves gob forming and loading at rates from 1 to 220 cuts/minute
- Speeds job changes and allows quick save & recall of all critical job information
- Provides high torque needed to make custom feeder plunger motions
- Improves gob weight control

Specification

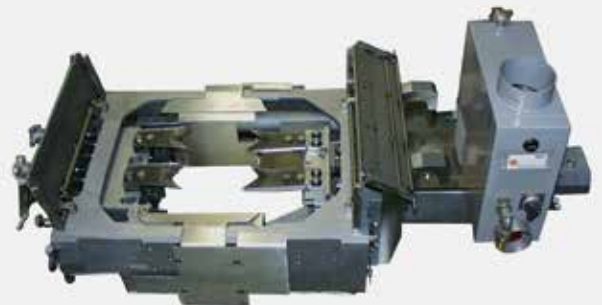
- Covers tonnage from 5-200 m TPD
- Fits 81, 503, 515 and 585 spout assemblies
- Advanced servo technology
- Cut rate from 1 to 220 cuts/minute
- Software cam profiles can be adjusted while feeder is running
- Includes metering spout system for: reduced tube sensitivity, improved thermal and weight variations, improved loading
- High dynamic servo motors for precise plunger motion
- Bucher Emhart Glass standard FlexIS technology
- Fits to new or existing applications
- Available with standalone or integrated controls

570 Feeder Plunger With the general increase of machines operating in triple gob and quad gob format, the need for a feeder plunger which can control the shape and the weight of the individual gobs has been realized. With improved controls and monitoring of gob shape, the new 570 plunger mechanism has the added benefits of:

- Direct motor drive
- Mechanical spring plunger assist system

565 Shear

- Parallel shear motion
- Synchronized cutting forms consistent gob shapes and weights with reduced shear marks
- Improves gob loading
- Minimal contact time extends blade life and reduces shear spray consumption
- Universal mounting design to simplify installation and reduce mechanism spare parts





Gob distributor

The gob distributor and delivery system on an IS machine receives the gobs after the shear cut for delivery to the individual sections of the machine. The gob distributor moves the scoops with high speed and accuracy to the entrance of the troughs in accordance with the firing order. The motion and the resulting dwell time of the scoops are important for smooth transition of the gobs into the troughs. The Bucher Emhart Glass gob distributor has proven to be a very reliable and low maintenance mechanism. The reject system with both gob interceptor and center reject chute increases the safe operation of the machine.

535 Gob Distributor

- Available in all configurations
- Universal drive module with exchangeable distributor heads
- Fast scoop motion up to 140 ms permitting in excess of 200 cuts/minute
- Carbon plate gob interceptor
- Center reject shoot
- Redundant gob reject for increased safety
- Constant cone delivery

Options

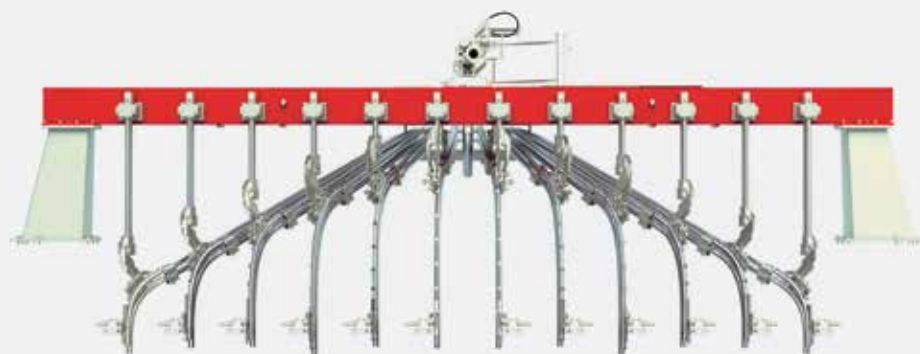
- Multi gob weight system

Constant Cone Delivery

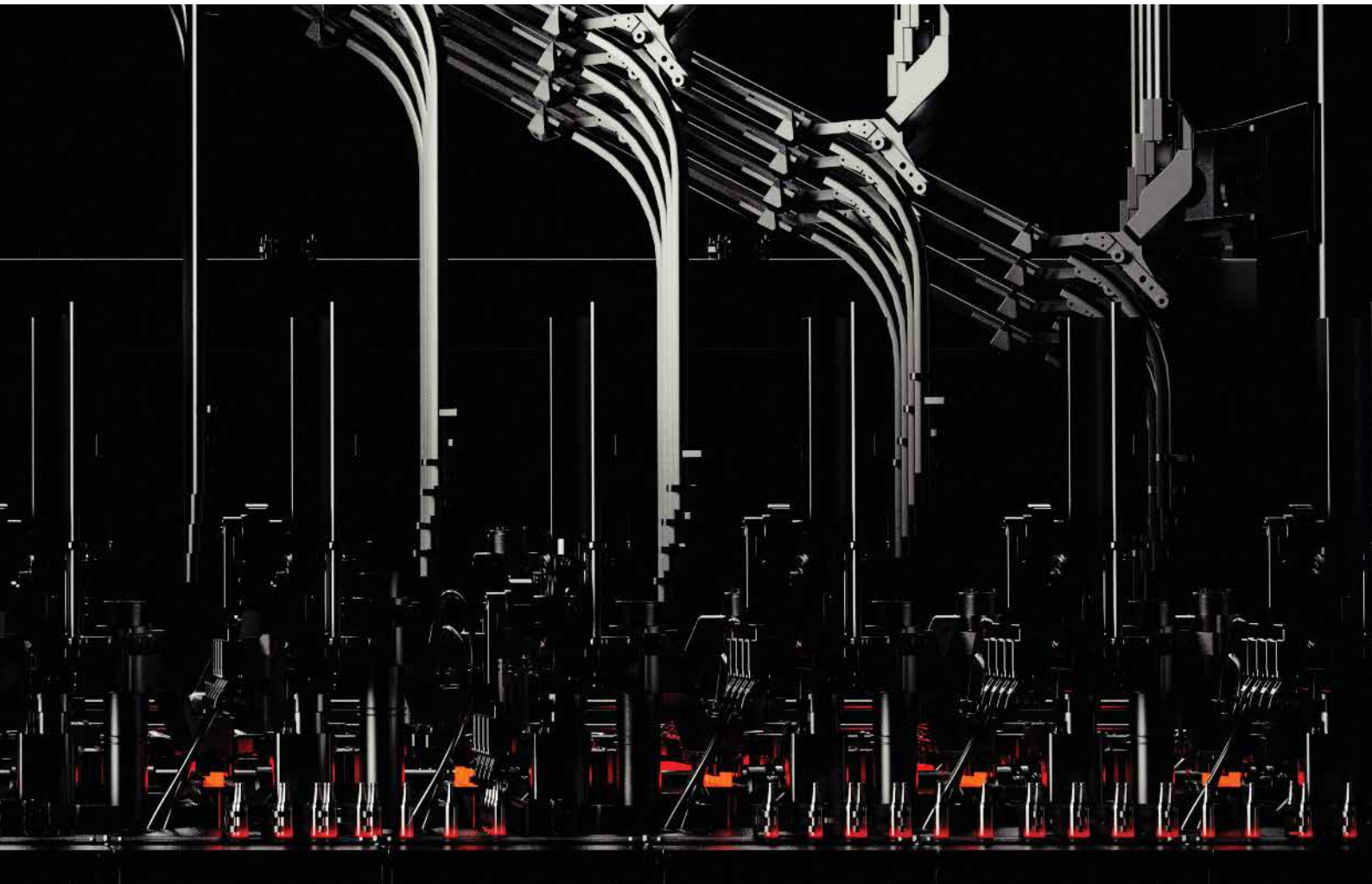
Constant cone delivery is the latest development for optimal gob loading that combines Bézier deflectors with Constant Cone geometry to provide enhanced gob loading.

Features and benefits

- Smaller curvature of Bézier deflector maintains maximum consistency in gob entry/shape for increased loading stability
- Smoother entry curve path of Bézier deflector reduces impact and normal forces for optimized loading, consistent gob shapes and longer coating life
- Less kinematic energy
- Reduced gob speed and gob shape variation from section to section
- Current Constant Cone Delivery can be upgraded to Bézier geometry by replacing deflectors, troughs, and suspension forks
- Non-Constant Cone machines can be upgraded with a machine retrofit



Container forming



Bucher Emhart Glass has the world's most comprehensive product portfolio for glass container manufacturing.

Whatever our customers' requirements, we have the perfect products to meet or exceed their needs.



Machines for every requirement

NIS machines

The most productive, flexible, and energy-efficient machines available today. Fully servo machines that are easily converted between double, triple and quadruple gob to achieve the highest levels of productivity and flexibility.

BIS machines

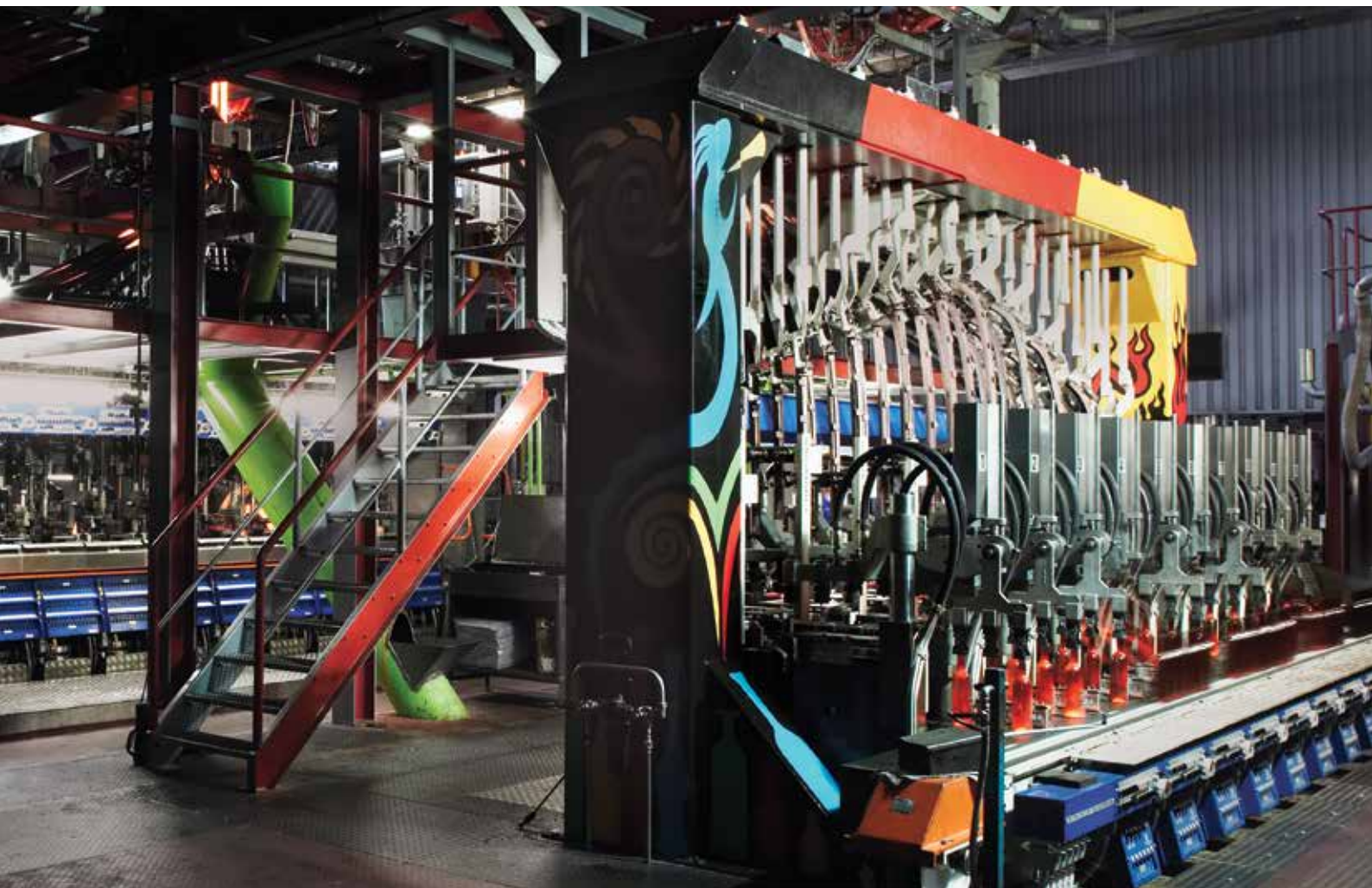
The latest servo machines focusing on small and midsize container production, providing highest flexibility and performance, enabling fast job changes, process and center distance changes thus combining the best of NIS and AIS. BIS can utilize existing molds with minor modifications.

AIS machines

The proven class leader in pneumatically driven machines, with the famous parallel mold open and close mechanism and ability to change easily from DG \Leftrightarrow TG.

IS machines

Pneumatic conventional machines available in four different double gob center distances, three triple gob center distances, and single gob.



Container forming machines

For producers of glass containers, the competitive situation today means that the highest quality of machinery with the maximum productivity, minimum downtime, and reduced energy consumption are prerequisites for success. As ecological awareness in consumers grows, the industry has to respond with lighter and stronger products.

With our large range of machine types and our commitment to investment in automation and controls, Bucher Emhart Glass is the ideal partner for success. We continue to invest in cooling technologies, parison forming technologies, delivery systems and new forming processes, to make certain we lead the market in helping our customers to produce the highest quality container at the lowest cost.



Machine overview

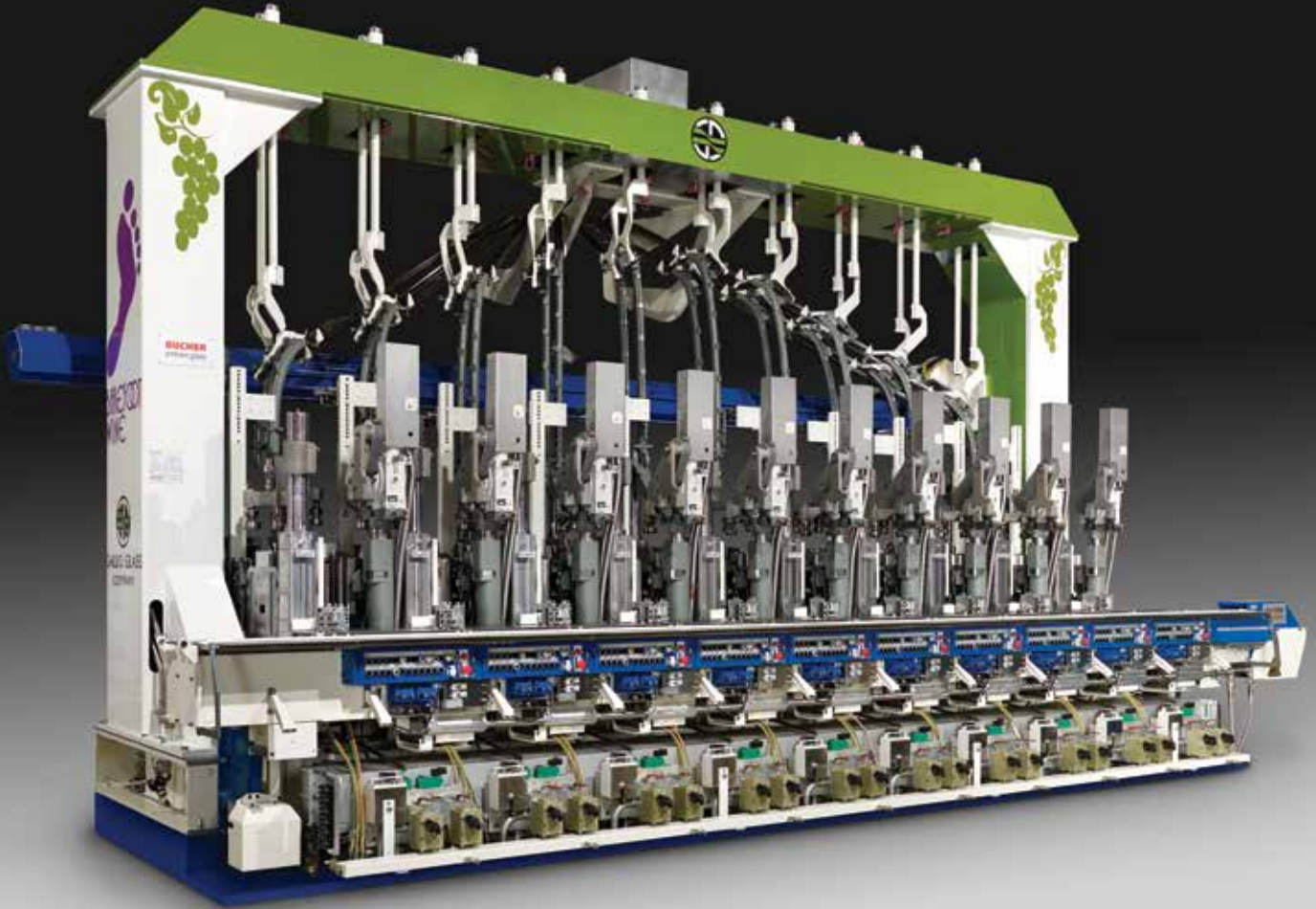
Type	Name	Gobs	Center	6	8	10	12	16 (8+8)
NIS	NIS	QG	95 mm	-	X	X	X	●
		TG	5"	-	X	X	X	●
		DG	6 ¹ / ₄ "	-	X	X	X	●
BIS	BIS	QG	70 mm	●	■	■	■	
		TG	95 mm	●	X	X	X	
		DG	140 mm	●	X	X	X	
		SG		●	■	■	■	
AIS	6 ¹ / ₄ "	TG	4 ¹ / ₄ "	-	X	X	X	X
		DG	6 ¹ / ₄ "	-	X	X	X	X
		SG		-	X	X	-	X
IS	4 ¹ / ₄ "	TG	3"	X	X	X		-
		DG	4 ¹ / ₄ "	X	X	X	X	X
		SG		X	X	X	-	X
	5"	QG	64 mm	X	X	-	-	X
		TG	85 mm	X	X	X	X	X
		DG	5"	X	X	X	X	X
	5 ¹ / ₂ "	SG		X	X	X	-	X
		DG	5 ¹ / ₂ "	-	X	X	X	X
	6 ¹ / ₄ "	SG		-	X	X	-	X
		TG	4 ¹ / ₄ "	-	X	X	X	X
	6 ¹ / ₄ "	DG	6 ¹ / ₄ "	-	X	X	X	X
		SG		-	X	X	-	X

- not available

X available

● on request

■ planned



NIS machine

The servo electric-driven NIS machine was introduced as the high performance forming solution from Bucher Emhart Glass. The servo mechanism technology ensures that the NIS machine outperforms traditional IS machines through better and precise motion control, perfect repeatability and faster and more precise setup time.

The use of servo electric motors reduces not only the noise level of the machine, but also significantly lowers the energy consumption. The extended center distances of 6¼ DG, 5" TG, and 95mm QG together with the conversion features DG <=> TG <=> QG make the NIS a flexible, high performance machine.



Standard features

- FlexIS control system
- Servo electric gob distributor
- Constant Cone delivery system with Bézier deflectors
- Pneumatic Control Module PCM
- Blank side with FPS valve technology
- Quick change plunger mechanism
- VertiFlow blank mold cooling RH/LH
- VertiFlow blow mold cooling
- Neck ring cooling RH/LH
- High/low dead plate cooling
- Pocket air fingers
- Conveyor with silent chain
- Automatic lubrication system with 4 zones
- Vacuum assist blow side
- Machine Control Unit MCU
- Blank side Barrier

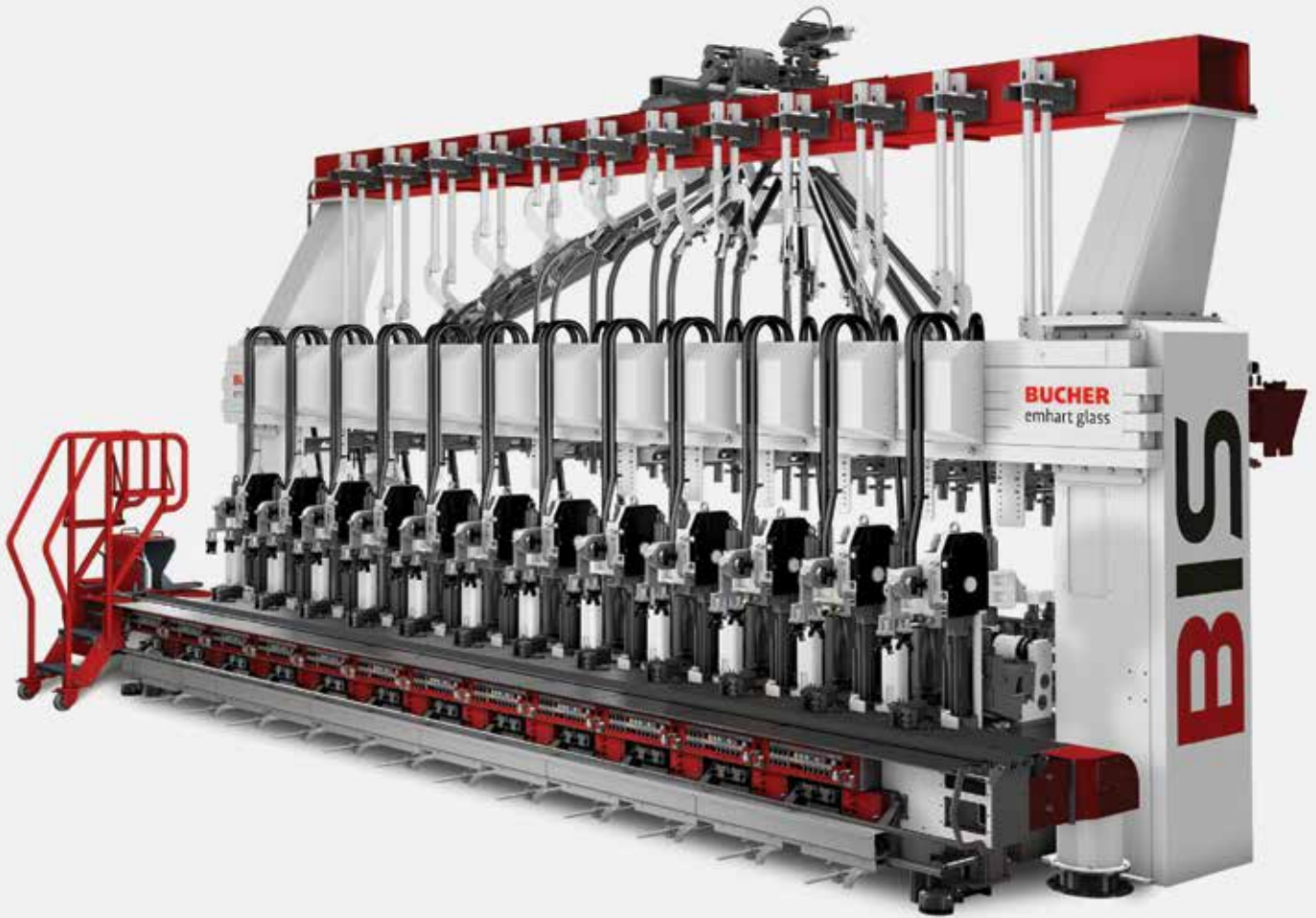
Servo electric mechanisms for:

- Parallel Blank Mold Open and Close MOC
- Baffle mechanism
- Invert mechanism
- Parallel Blow Mold Open and Close MOC
- Blowhead
- Takeout mechanism
- FlexPusher

Optional features

- InVertiFlow blank mold cooling (DG, TG)
- VertiFlow Assist
- Vacuum assist blank side
- Variable Center Distance tong head VCD (TG, QG)
- Integrated dead plate guide air
- Plunger Process Control PPC (enabling closed loop control)
- Temperature Control System TCS (enabling closed loop control)
- BlankRadar
- FlexRobot
- Lifting device Blank Side

NIS	6 1/4" Double gob			5" Triple gob			95 mm Quad gob		
	B&B	P&B	NNPB	B&B	P&B	NNPB	B&B	P&B	NNPB
Height under finish									
Minimum	95 mm	75 mm	75 mm	95 mm	75 mm	75 mm	70 mm	70 mm	70 mm
Maximum	365 mm	345 mm	345 mm	365 mm	345 mm	345 mm	250 mm	250 mm	250 mm
Body diameter									
Maximum	121 mm	121 mm	121 mm	90 mm	90 mm	90 mm	65 mm	65 mm	65 mm
Finish diameter									
Maximum	48 mm	83 mm	50 mm	48 mm	70 mm	50 mm	35 mm	50 mm	38 mm



BIS machine

BIS is the future industry standard, replacing the pneumatic IS machine types 4¼", 5" and 5½". One BIS machine has a ware range which covers almost the complete ware range of the respective pneumatic machines. Existing molds, using specific adaptations, can continue to be utilized which results in a low transition cost.



Standard features

- FlexIS control system
- Servo electric gob distributor
- Constant Cone suspended delivery with Bézier deflectors
- Parallel blank and blow mold
- Flex Pressure System FPS
- Quick change plunger mechanism
- Automatic lube-system with 4 zones
- Pneumatic control module
- Blank side with FPS valve technology
- VertiFlow blank mold cooling - 6 on/off
- Neck ring cooling - 2 on/off
- VertiFlow blow mold cooling
- VertiFlow Assist - 4 on/off
- High low dead plate cooling
- Pocket air finger
- Vacuum assist blow side
- Blank side Barrier

Servo electric mechanisms for:

- Blank Mold Open and Close MOC (single motor)
- Baffle mechanism
- Invert mechanism
- Blow Mold Open and Close MOC (single motor)
- Blowhead
- Takeout mechanism
- FlexPusher

Optional features

- Special adaptors to utilize existing molds
- (Type 4¼" DG, 3" TG, 5" DG, 85 mm TG, 5½" DG)
- Funnel mechanism (servo)
- Blow side VertiFlow assist cooling
- Vacuum assist blank side
- Integrated dead plate guide air
- Plunger Process Control PPC (enabling closed loop control)
- Temperature Control System TCS (enabling closed loop control)
- BlankRadar
- FlexRobot
- Lifting device Blank Side

BIS

	140 mm Double gob			95 mm Triple gob			70 mm Quad gob *		
	B&B	P&B	NNPB	B&B	P&B	NNPB	B&B	P&B	NNPB
Height under finish									
Minimum	64 mm	45 mm	45 mm	59 mm	40 mm	40 mm	TBD	TBD	TBD
Maximum	342 mm	323 mm	323 mm	322 mm	303 mm	303 mm	302 mm	283 mm	283 mm
Body Diameter									
Maximum body diameter with Vertiflow cooling	102 mm	102 mm	102 mm	65 mm	65 mm	65 mm	45 mm	45 mm	45 mm
Finish diameter									
Maximum	48 mm	90 mm	38 mm	48 mm	50 mm	38 mm	TBD	TBD	TBD

* Planned availability



AIS machine

The AIS machine is recognized by the industry as the superior performer among pneumatically driven glass container forming machines.

Container quality The unique parallel Mold Open and Close mechanism MOC enables more balanced cooling, improves mold equipment alignment and permits equal parison reheat. User experience shows mold wear can be reduced by up to 30%, resulting in better containers at lower cost.

Productivity The combination of an improved pneumatic system, highly efficient VertiFlow cooling, and parallel MOC motion ensures stable operation at higher cavity rates.

Flexibility Market demand for containers is often unpredictable. To cope with changing requirements, the AIS machine can be converted between 6¼" DG and 4¼" TG within less than a shift, providing the most cost-effective way to benefit from familiar technology with the option of Servo Electric Takeout SETO and Invert SEI mechanisms.



Standard features

- FlexIS control system
- Servo gob distributor
- VertiFlow blank cooling, InVertiFlow blank cooling
- Quick change plunger mechanism
- Quick change accessories
- VertiFlow blowside cooling
- Servo Electric Invert SEI
- Servo Electric Takeout SETO
- Constant Cone delivery with Bézier deflectors
- Conveyor with silent chain
- FlexPusher
- High/low dead plate cooling
- Automatic lubrication system
- Blow & Blow BB, Press & Blow PB, Narrow Neck Press & Blow NNPB
- Center distance change DG <=> TG
- FPS valve technology
- Blank Side barrier
- Safety flaps
- Blowhead and Blow Mold interlock

Optional features

- Plunger Process Control PPC (enabling closed loop control)
- Temperature Control System TCS (enabling closed loop control)
- VertiFlow Assist
- BlankRadar
- FlexRobot
- Lifting device Blank Side

AIS

	6 1/4" Double gob			4 1/4" Triple gob		
	B&B	P&B	NNPB	B&B	P&B	NNPB
Height under finish						
Minimum	110 mm	80 mm	80 mm	110 mm	80 mm	80 mm
Maximum	347 mm	300 mm	295 mm	304 mm	285 mm	285 mm
Body diameter						
Maximum	121 mm	121 mm	121 mm	76 mm	76 mm	76 mm
Finish diameter						
Maximum	48 mm	105 mm	38 mm	48 mm	70 mm	38 mm



IS machine

The traditional machine on the market today. The IS machine is based on the original invention from the 1920's, and has undergone continuous development and improvement over the last 90 years.

Available in the "small" section (4¼" and 5") and "large" section (5½" and 6¼"), IS machines are offered in single, double, and some in triple gob configurations.



Standard features

- FlexIS control system
- Integrated drive system
- Servo gob distributor
- Delivery Suspension System DSS
- Quick change plunger mechanism
- Quick change accessories
- VertiFlow blowside cooling
- Constant Cushion invert
- Constant takeout mechanism
- Conveyor with silent chain
- FlexPusher
- High/low dead plate cooling
- Automatic lubrication system
- Blow & Blow BB, Press & Blow PB, Narrow Neck Press & Blow NNPB
- Process change SG <=> DG or SG <=> DG <=> TG
- FPS valve technology
- Safety flaps
- Blowhead and Blow Mold interlock

Optional features

- VertiFlow blank cooling
- InVertiFlow blank cooling
- Servo Electric Invert SEI
- Servo Electric Takeout SETO
- FlexPressure System FPS
- Constant Cushion blowhead
- Plunger Process Control PPC (enabling closed loop control)
- Temperature Control System TCS (enabling closed loop control)
- BlankRadar
- FlexRobot
- Lifting device Blank Side

IS	* Type IS 4 1/4"			Type IS 5"				** Type IS 5 1/2"		Type IS 6 1/4"	
	SG	DG 4 1/4"	TG 3"	SG	DG 5"	TG 85	QG 64	SG	DG 5 1/2"	DG 6 1/4"	TG 4 1/4"
Blow and Blow											
Max. height under finish	341 (358) a)	301	276	341	325	244	N.A.	380 (352) b)	343	342	287
Min. height under finish	61	58	59	74	73	55	37	121	68	115	105
Max. body diameter											
* with stack cooling	178	90	52	178	102	62	40	178	111	130	90
* with VertiFlow cooling	156	76	51	156	95	60	N.A.	156	102	121	76
Max. finish diameter	48	48	30	48	48	30	N.A.	48	48	48	48
Press and Blow											
Max. height under finish	265 (282) a)	282	268	265	290	212	N.A.	326 (298) b)	302	301	268
Min. height under finish	74	40	47	74	55	50	18	121	58	105	86
Max. body diameter											
* with stack cooling	178	90	52	178	102	62	40	178	111	130	90
* with VertiFlow cooling	156	76	51	156	95	60	N.A.	156	102	121	76
Max. finish diameter	120	83 c)	38	120	90	55	N.A.	120	90	90	70
Narrow Neck Press and Blow											
Max. height under finish	N.A.	282	268	N.A.	285	212	N.A.	N.A.	296	296	268
Min. height under finish	N.A.	40	47	N.A.	55	50	N.A.	N.A.	57	105	86
Max. body diameter											
* with stack cooling	N.A.	90	52	N.A.	102	62	N.A.	N.A.	111	130	90
* with VertiFlow cooling	N.A.	76	51	N.A.	95	60	N.A.	N.A.	102	121	76
Max. finish diameter	N.A.	38	38	N.A.	38	38	N.A.	N.A.	38	38	38

The specified ware ranges are valid when using standard mold equipment, Q.C. plunger mechanisms, through bed/through frame VertiFlow bottom plate mechanisms and blank mold stack cooling (excluding AIS and NIS which have standard InVertiFlow blank side cooling)
 a) with blow mold stack cooling using non VertiFlow adaptor b) with blow mold stack cooling, with or without non VertiFlow adaptor c) 70 mm max. finish with VertiFlow blow mold cooling

* IS 4 1/4" - TG 3" is mostly superceded by IS 5" TG 85 mm ** IS 5 1/2" and IS 6 1/4" are mostly superceded in the market by the AIS machine

Ware handling



Hot end ware handling has to ensure the stable transport of the still hot and fragile containers from the forming machine into the Lehr. This is the part of the production process where good

ware can not only be lost or damaged but the speed as well as the efficiency of the entire production line can be limited.



Precision handling of hot glass

Good ware handling significantly improves the stability of operation on any production line. During the start up of a machine the hot end transport should work without any intervention of the operating personnel. This improves start up time and allows the production specialists to focus on the important forming issues.

The advanced ware handling system supports the flexibility of IS production lines with smart variable parts like pusher fingers and low maintenance requirements on the equipment such as the pusher mechanism or the conveyor belt. The ware handling system must operate consistently and without the need for operator adjustments.



Servo Electric Takeout SETO

The Servo Electric Takeout SETO picks up the containers from the blow mold, moves them over the dead plate for cooling and afterwards releases the containers on the dead plate. A backlash-free pickup and a smooth transfer are essential to avoid damaging the sensitive hot containers. Increasing production speeds requires tight control of the takeout motion with dynamic servo motors.

The SETO can be retrofitted to existing machines to reduce defects and improve the performance of the ware handling.

Features

- Servo control
- Compact design
- Front mounted safety lock, tong close speed adjustment and takeout height adjustment
- VCD Tong Head to reduce ware spacing and belt speed
- Fully integrated into the FlexIS
- Upgrades with FlexIS standalone on existing lines
- Gearbox running in oil bath

Benefits

- Precise motion control and adjustment with the FlexIS process control system
- Good access into section
- Easy handling
- HS Ware handling ware handling TG/QG
- One control system
- Available for all machine configurations on the market
- Low maintenance

Ware Handling Supervision WHS

The Ware Handling Supervision WHS, fully integrated in the FlexIS timing, rejects incorrectly positioned containers at the hot end. The unit uses a light barrier to detect cullet and “stuck” or “down” ware on the conveyor belt. An air reject system removes such ware from the conveyor before it can become the source of handling problems on the rest of the production line.

Features

- The WHS helps to eliminate line jams at the hot end coating tunnel and transfer wheel by sensing and removing faulty ware before it reaches these areas
- The WHS is fully integrated in the FlexIS Timing hardware

Benefits

- The WHS will improve packed ware quality
- The number of rejected bottles are reported on the FlexIS Production Counters PC



FlexPusher

The unique motion of the FlexPusher uses all available space on the dead plate for a smooth sweep out motion and opens the door for conveyor speeds which were not possible before. The motion of the pusher determines the placement of the containers on the belt which is the main factor in the performance of the downstream ware handling. Precise placement of the containers by the pusher also reduces losses at the ware transfer, the stacker, and the hot end coating tunnel. The pusher fingers of the FlexPusher are designed to be equipped with carbon fiber liners. This makes these fingers very flexible and contributes to the high performance of the entire system.

FlexPusher Special Performance SP The FlexPusher Special Performance SP is a FlexPusher extension, addressing specific high speed triple gob, non-round and unstable productions, which could otherwise restrict the standard FlexPusher ware range. Where the ware range limitation is not an issue, standard FlexPusher installations are upgradable to FlexPusher SP (and vice versa), by changing the upper housing (conversion kit 904-12/16). The FlexPusher SP is so far not available on NIS machines due to the larger 22.5" section width.

Features

- 2 axis fully servo-controlled
- No pneumatics & no lubrication
- Available for IS, AIS, BIS and NIS machines
- Fully integrated into the FlexIS
- Simple interface for motion profile adjustments - optimization made by plant personnel
- Upgrades with FlexIS standalone on existing lines
- Various finger spacings available for SG, DG TG and QG
- Flexible finger liner concept
- 2 different finger heights
- Flexible finger liner inserts
- Vertical pocket air at the back plate

Benefits

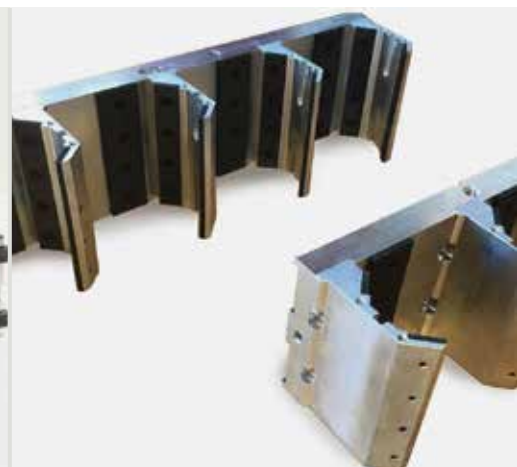
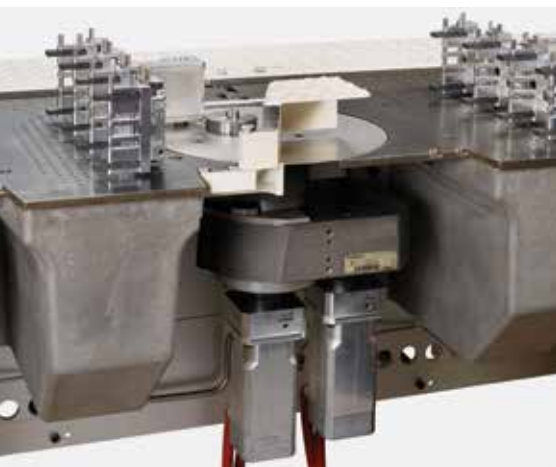
- High repeatability
- Reliable
- Standard
- One control system
- Easy setup and handling
- Fits all machine types on the market
- Standardized
- Easy to customize for special products
- Built in features for high speed production

Additional Features

- Full parallel container positioning before going onto conveyor belt
- Same centrifugal forces for all cavities

Benefits

- Improved high speed ware handling in TG and QG
- Better handling of unstable ware (non-round)
- Reduces ware handling losses





FlexConveyor

The FlexConveyor fulfills all the different customer needs. This new standard steel conveyor improves the stiffness, reduces the reach distance, optimizes the wind box for equal flow with an option for two on/off controls, integrates the pusher cables and provides a height-adjustable dead plate. To improve the ease and safety of blow side accessibility, the FlexConveyor has an integrated ladder.

Features

- New steel girder
- Integrated safety ladder
- Dual controlled wind box
- Height adjustable wind box
- Closer access to blowside
- Fits all Bucher Emhart Glass machines
- Can be changed to dual row operation

Benefits

- Increased robustness
- Safe and easy access to blowside
- Balanced flow & adjustable pressure profile
- Standard
- Easier blow side swabbing
- Universal



Cross Conveyor

The Cross Conveyor has a unique cast iron girder, reducing vibrations and minimizing distortion due to the hot environment. It reduces installation service requirements (fluid cooling) and guarantees a long equipment life. The Cross Conveyor fits nearly all lehr widths and heights.

Features

- Cast iron main structure
- Adjustable dead plates
- Spring steel belt wear plates
- Reduced vibration
- All lehr heights supported

Benefits

- Increased robustness & reduced high temperature distortion; Fluid cooling not needed, no running cost for cooling
- Tilt/rocker smoother container transition
- Long girder life time
- Better container handling
- Universal



Ware Transfer

The Ware Transfer moves the containers from the machine conveyor to the cross conveyor. The transfer wheel has to cope with spacing variations and transfer the containers with consistent spacing. A smooth motion is essential to avoid damage or loss of any containers during the transfer. 178, 478, and the X-Transfer are driven with a servo motor controlled from the integrated FlexIS Ware Handling Controller WHC. (Optional is the reluctance motor with special transmission system.)

178

Features

- Reliable and simple design
- Easy to change fingers
- Up to 250 containers/minute

Benefits

- Low operation costs
- High flexibility

478

Features

- Precise and stable
- Pocket inserts which match the container shape

Benefits

- Reliable, high speed transport
- Reduces ware losses
- Low maintenance

X-Transfer

Features

- Precise and stable
- Quick change fingers - 600 containers/minute

Benefits

- Reliable, high speed transport
- Reduces ware losses
- Simplifies job change, setup and maintenance



FlexStacker

The new three-axis FlexStacker is a result of a joint development project. It uses the FlexIS control hardware from the IS machine. This enabled the introduction of a pioneering human interface with built-in expert knowledge, allowing easy setup of the new stacker without the need of "specialists". Performance is proven to handle high speed loading into the lehr.

Features

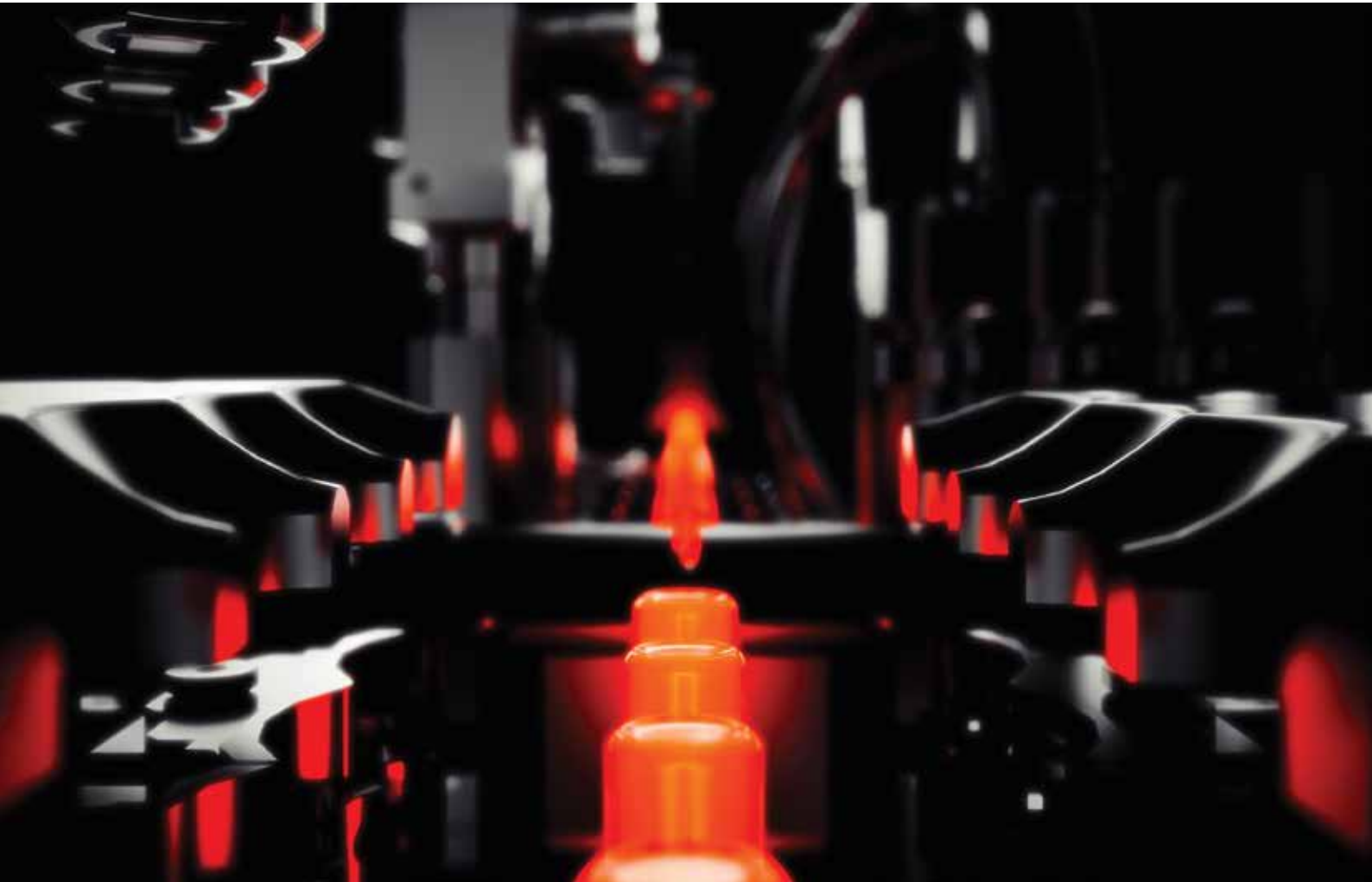
- 3 axis fully servo
- FlexIS control
- Newly developed user interface
- Optimized motion profiles
- Airless pushbar

Benefits

- High repeatability
- Bucher Emhart Glass standard
- Easy setup and handling
- High speed lehr loading



Process products and sensors



It is clearly understood that a key factor in improving pack-to-melt and container quality is the kinematics of the forming machine, which must be reliable, mechanically precise and fully controlled. The stability of the forming process is also vital to achieve excellent quality and superior performance which results in reduced

container costs. Variations and fluctuations can now be managed with the Bucher Emhart Glass Process Product line, designed to ensure optimum handling and forming for consistent quality and uniformity from a single gob machine running slow volumes to quad gob high speed production.

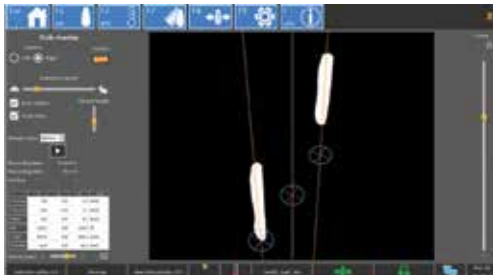


The keys to superior product quality

Container forming is the heart of the glass container process, where the gob is manipulated and pressed or blown into its final form. Different techniques are used to make different types of containers. Both processes comprise a blank side, where the gob is formed into a partially completed form known as a parison, and the blow side where the final shape is achieved.

In Narrow Neck Press & Blow NNPB and Press & Blow PB containers, weight control and the motion of the plunger are critical in producing high quality glass. The Plunger Process Control PPC system visualizes and displays the actual plunger stroke providing vital information to optimize the container quality.

For Blow & Blow BB containers, FPS technology provides programmable pressure control for the plunger movement and plunger cooling/counterblow, increasing accuracy and reducing variation in the parison formation. Combining the PPC with FPS technology offers the ultimate in control for optimizing parison forming.



BlankRadar

The Bucher Emhart Glass BlankRadar is a gob and temperature monitoring system that is installed in the blank panel of the forming machine.

The system consists of a camera housing that moves along the forming machine, driven by a servo motor. The system stops in front of each active section and takes a number of consecutive measurements before continuing to the next section.

The gob vision module of the BlankRadar takes automatic real time measurements of the falling gob just before its entry into the blanks. With the aid of this data the system can alert the user regarding changes in the loading pattern and trigger corrective actions to avoid loading related defects and section jam-up.

Recent developments of the BlankRadar aid the user with achieving optimal loading during startup of a section. This is done with an interrupt from the normal operation and an intuitive new part of the user interface which provides assistance for the user to achieve optimal gob loading position.

BlankRadar is also equipped with a temperature module that facilitates automatic temperature measurements of the blanks, plunger, and neckrings, as well as parisons on the forming machine. The data from the temperature measurements can be used to warn the user of violations of the defined temperature levels. It provides historical data logging and it can also be used with the Blank Cooling Control and the Plunger Cooling Control for automatic adjustments.

Features and benefits

- Automatic gob and temperature measurements
- Long term process data storage
- Warning and alarms for out-of-range
- Temperature measurements of metal and glass

Availability:

- AIS
- BIS
- NIS (10, 12 section)

On demand:

- IS
- NIS (8 section)

Available with Blank Cooling Control and Plunger Cooling Control.



Plunger Process Control PPC

The Bucher Emhart Glass Plunger Process Control PPC system is a product which monitors individual plunger motions during the parison forming process. The system uses full stroke sensors and a unique method to eliminate cabling in the plunger mechanism.

As well as measuring plunger stroke in the NNPB and PB process, gob weight is automatically controlled, with closed loop technology to adjust tube height and individual plunger needles in the feeder.

The display shows by cavity the full plunger stroke profile allowing optimization of the press time and plunger up profile. All profiles are stored electronically and all data is easily displayed.

Most recent developments include plunger position profiles for BB process, allowing a visualization of the plunger operation for the first time. All the features enable the production specialists to optimize the forming process, reduce variability and improve quality.

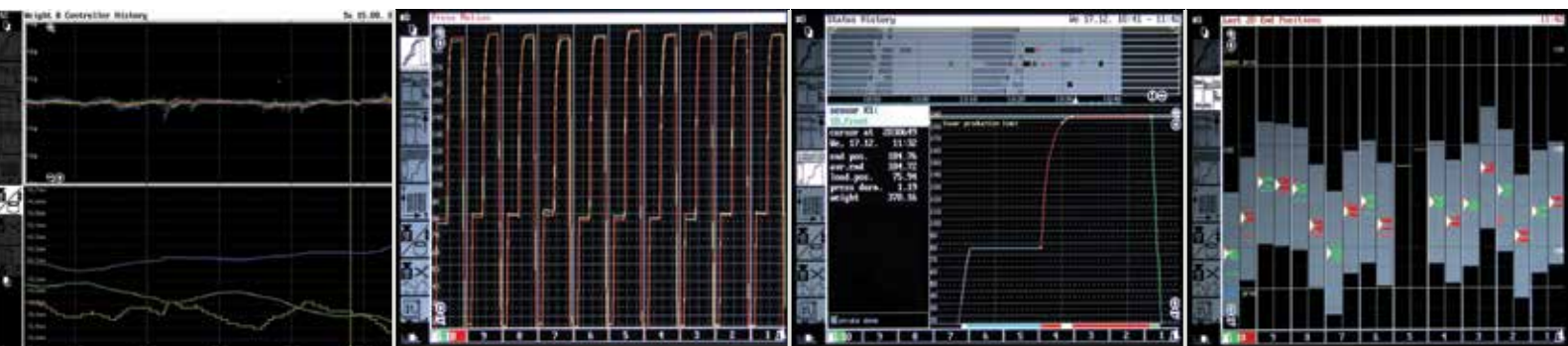
PPC features

- Full stroke motion tracking
- Gob weight control
- Wireless sensor connection
- Hot End Ware Reject HEWR
- Process data collection and storage
- Advanced diagnostic tools
- Support of all processes NNPB, BP and BB
- Status visibility with large LED display

Configuration

PPC is available for the following quick change plunger mechanisms

- 4¼” DG
- 5” DG
- 85 mm TG - 5” DG quick conversion
- 5½” DG
- 6¼” DG (IS/AIS/NIS)
- 4¼” TG (IS/AIS)
- 4¼” TG - 6¼” DG quick conversion
- 5” TG (NIS)
- 95 mm QG (NIS)
- BIS 140 mm DG, 95 mm TG (70 mm QG)

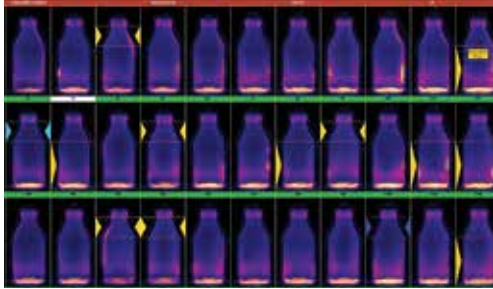


Weight and controller history

Screen stroke overview - press motion

Screen stroke analysis - status history

Screen end positions - last 20 end positions



FlexRadar

FlexRadar is a glass forming process monitor system that produces thermal images of the glass containers as they are transported from the forming machine.

Detects real time process variations The system utilizes high-resolution infrared technology to measure the level of intensity that is radiated from the hot glass containers. The thermal images are a direct representation of the glass distribution within the container allowing identification of glass forming process deviations and quality issues. They also provide data for detection and rejection of critical defects in the hot end.

Using two high-resolution infrared cameras positioned at an angle on opposite sides of the conveyor, FlexRadar captures thermal images from each passing container. The images are processed to identify cavities producing containers with glass distribution or dimensions that stand out from the overall population. Cavities or sections producing outliers are quickly identified and reported to the hot end operator for immediate corrective action.

In addition to trend analysis and the identification of outlier containers, the FlexRadar has good capabilities to detect and reject thin bottom, wedged bottom, thin neck, choked bore, fin, thin spots, bird swing, freak, verticality, stuckware and inclusions. Finding these defects on the forming side of the lehr enables rapid action to maintain stability in the forming process.

With the aid of the optional FlexRadar weight control, the infrared data from the containers is used to automatically keep the overall container weight around a close bandwidth.

Features and benefits

- Automatic detection and rejection of defects
- Gob weight control (optional)
- Long term process data storage
- Warning and alarms of cavities of out-of-range cavities
- Automatic camera setup

Available with Bottle Spacing Control.





Temperature Control System TCS

The Bucher Emhart Glass Temperature Control System TCS is a pyrometer-based system which monitors mold equipment on the blank side of the forming machine.

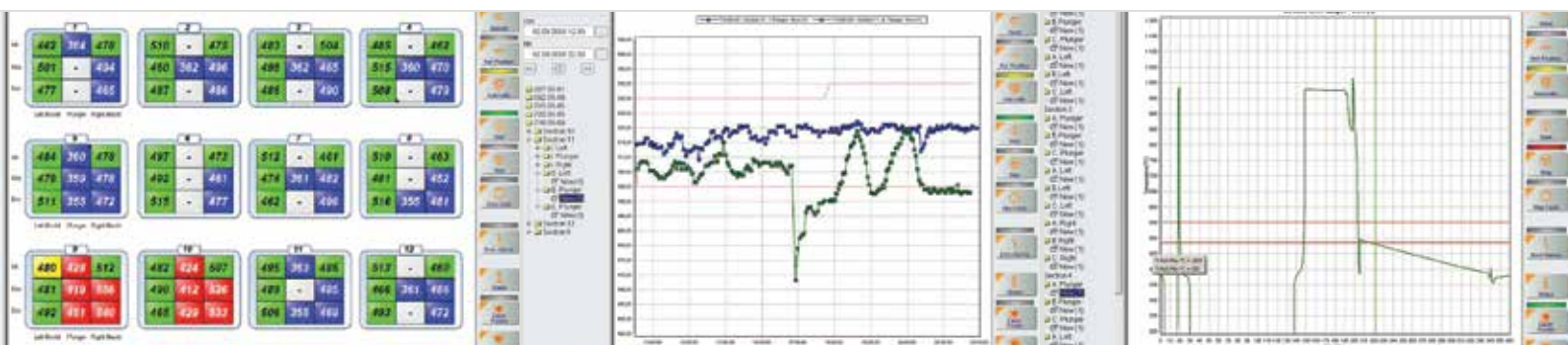
Mounted on a rail fixed to the blank side panel, the pyrometer is capable of being programmed to measure and display individual blank temperatures, blank temperature vertical profiles, plunger temperatures, and neck ring temperatures.

These temperature readings give the process transparency needed to reduce blank mold, plunger and neck ring temperature variations, resulting in improved process stability. The collected data is plotted on various graphs and a warning is activated if any of the temperatures fall outside the predetermined set limits. On new forming machines the TCS system is fully integrated and is hidden behind the blank panel without interfering with the machine operator. Field upgrade on existing forming machines can be done and may require a prior installation review on-site.

Features and benefits

- Simple setup using integrated laser
- Warnings and alarms for out-of-range
- Storage of data
- Automatic swab detection

Available with Blank Cooling Control and Plunger Cooling Control.



TCS temperature overview screen

Temperature history screen

Altering the manual scaling



NIS final blow with FPS valve



NIS blank side pneumatic control module

FlexPressure System FPS

The Bucher Emhart Glass FlexPressure System FPS is a technology for optimization and programming of the pneumatic process function on the forming machine. For the parison formation, FPS is a well-accepted technology for plunger up control and plunger cooling/counterblow optimization. Always standard on the NIS machine, the FPS technology is an option on IS/AIS machines. Latest application of this technology is on final blow and finish cooling.

New valve designs are now available to allow programmable FPS technology to be applied to the final blow. This allows for increases in productivity and quality. With the FlexIS forming control, the optimization of pressure profiles are job dependent and stored as part of the job setup data.

Features and benefits

- Automatic pressure control
- Quick response to pressure changes
- High air flow
- Maximized cooling time and efficiency
- 4 different pressures in one cycle
- Tailored pressure for each process step
- Job related setting
- Testing and repair features

Valve type application

- ED 02 Pilot for regulators
- ED 07 Plunger up
- ED 12 Counter blow
- Plunger cooling
- ED 19 Final blow
- Finish cooling
- Settle blow



FlexIS Multi Gob Weight System

The Multi Gob Weight System provides long desired capabilities like sampling a different glass container on one section without affecting the commercial production on the other sections.

Offers today's required flexibility Unprecedented production flexibility is achieved by operating the 555 Feeder and 565 Shear with the new Bucher Emhart Glass FlexIS Multi Cam/Multi Shear software. This permits each section of a forming machine (IS, AIS, NIS or BIS) to produce items with different gob weights and shapes. The advantages of such a system are many:

- Production can be very closely coordinated with demand, both in time as well as in quantities. This optimizes machine utilization and minimizes stock.
- To accommodate a short-notice job, it is no longer necessary to halt an existing run. Some of the sections can continue, while the remainder can be changed to one or more new jobs.
- For low-quantity production runs, it is not required to equip the entire machine with molds, or to leave some sections standing idle
- This application can be used to test a new set of mold equipment or to make sampling on a single section without interrupting the normal production
- Production can be adjusted precisely to the supply of glass, thus optimizing the furnace output





Cooling

Mold cooling is a key process to cope with current market demands including production speed, flexibility, quality and lightweighting. A predictable and efficient cooling system is a must to accomplish a good container quality and an elevated production speed. Such a high efficiency (energy waste) cooling offers also more

production flexibility, especially as far as special shapes are concerned. The available service tool TekPak calculates the 3D mold glass contact temperatures and ensures predictability based on mold and process parameters. In addition, a successful cooling system has to serve different needs on the blank and blow sides.



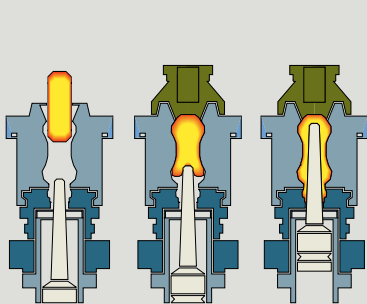
Blank side

The final container glass distribution is primarily set by the blank mold temperature profile and the resulting parison quality. Therefore a predictable, adjustable and stable blank mold temperature grid is vital to achieve a high container quality. The blank cooling is in fact a parison conditioning system.

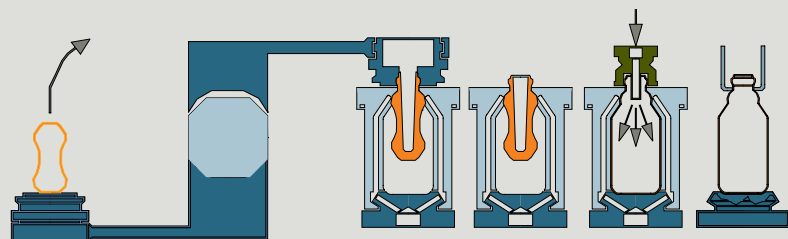
Blow side

On the blow side, cooling leads to the stability of the container. This stability defines the production speed. The cooling capacity has to be predictable and high. It is also important to use cooling wind as efficiently as possible and not to waste energy.

Parison conditioning = glass distribution



Mold contact time = stable containers



VertiFlow

- Efficient cooling air utilization = energy savings
- More constant potential predictable mold temperature
- Production speed increase
- Less job-change and production downtime
- Noise reduction
- Ideal for BB/WMPB production



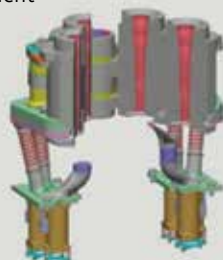
VertiFlow through the bed

- High cooling capacity
- Individual cooling air pressure for blank and blow mold cooling is possible
- Simple, maintenance friendly design
- Less mold surface temperature variation
- Upper support brackets interchangeable with Series 9700 mechanisms



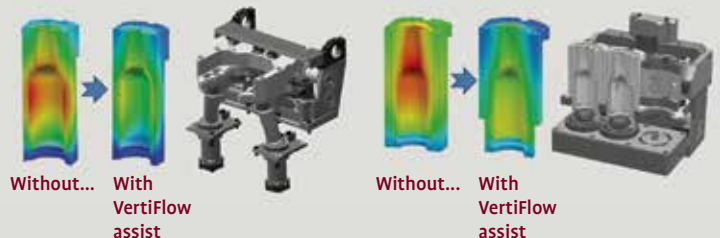
InVertiFlow

- Higher cooling efficiency -> speed increase potential
- Individual cooling of molds -> optimized cooling conditions
- Fumes and heat carried away -> improved operator environment
- Easier mold change -> reduced downtime
- Ideal for NNPB production



VertiFlow assist on AIS/NIS/BIS

- Addition to the efficient VertiFlow cooling
- Higher cooling efficiency 360° resulting in higher speed
- Extra cooling on specific critical areas
- Independent control through left and right on/off control
- Up to 20% higher cooling capacity
- Upgrade on existing AIS machines possible





FlexIS Control System

The FlexIS system takes into account the closed loop control strategies that lead to considerable reductions in operator intervention and higher levels of automation. The system includes a simple, operator-friendly user interface with a unified look and feel that enables easy access to setup, configuration and adjustment parameters. FlexIS adds a new level to glass container process control. It is the platform for current and future innovations in process control from Bucher Emhart Glass.

The FlexIS 3 is a scalable and expandable control system for IS and AIS machines. The FlexIS for NIS and BIS has the same design concept, running the same software but controlling more servo axes. FlexIS unifies the section, machine and ware handling controllers into a single system. The simple, three-module configuration keeps spare parts costs to a minimum. The system is capable of controlling both pneumatic and servo-electric devices.

FlexIS is housed in two different cabinet layouts: one for the machine controller and ware handling controller, and one for the section controller. Communication and synchronization are via ethernet, which allows remote access and supervision if required.

Machine controller/ware handling controller cabinet

The machine controller drives five gob-forming servo motors, ensuring precise and controlled motions for:

- Tube Rotation and Tube Height
- Feeder Plunger (up to four needles)
- Shear
- Gob Distributor
- Pressure Control Unit

The ware handling controller manages the various servo motors involved in smooth container handling:

- Conveyor
- Ware Transfer
- Cross Conveyor
- Stacker

In addition the ware handling controller can control:

- Conveyor Height
- Ware Handling Supervision WHS, operating as stuck- and down-ware reject
- Machine Control Unit MCU, which is standard for BIS and NIS and optional for IS and AIS. It manages up to 12 compressed air lines of a forming machine in a closed loop.

Section controller cabinet

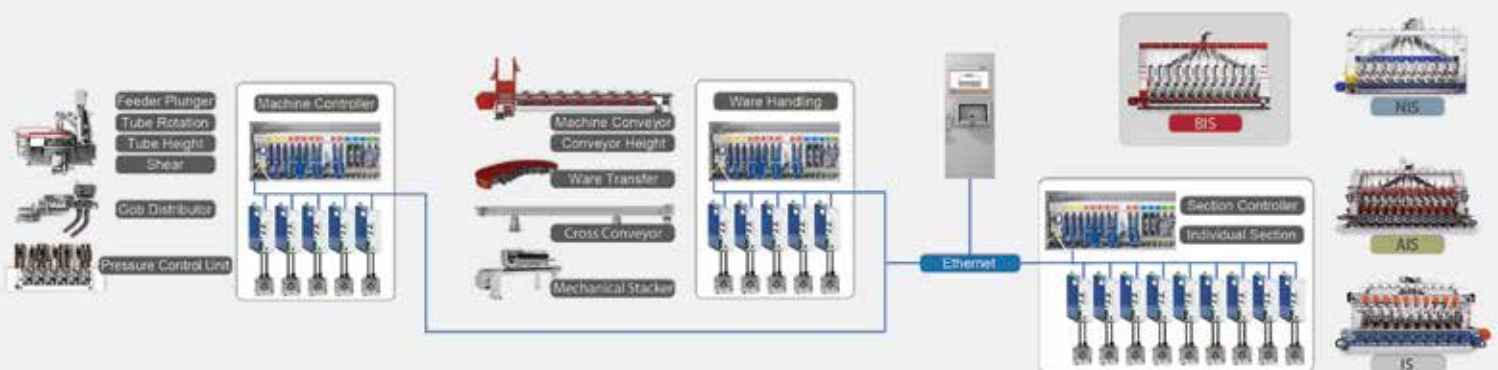
FlexIS 3 for IS and AIS machines:

- One cabinet hoists 4 section controllers. Up to four servo drives can be added in order to support FlexPusher, SEI, SETO
- FPS control for a maximum of 12 channels with feedback as option is integrated in the section control

FlexIS NIS/BIS designed for NIS and BIS machines

- One cabinet hoists 2 section controllers with a maximum of eleven drives per section and the FPS with feedback

We can help our current and future clients to make a truly future-proof investment in state-of-the-art glass manufacturing controls. The current Bucher Emhart Glass controls portfolio fulfills all customer needs for a reliable, flexible, scalable, best fit control system that allows seamless and straightforward future expansion.



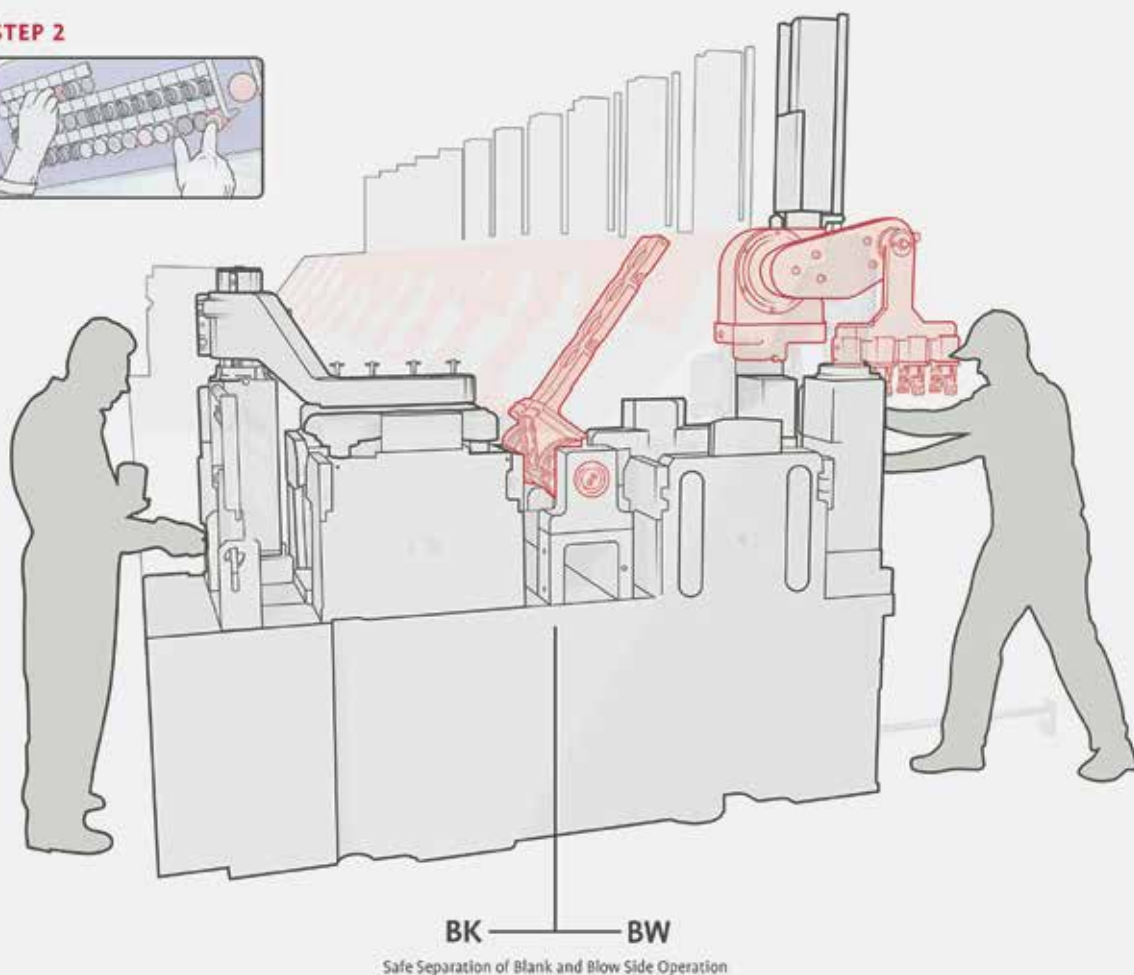
Machine controller/ware handling controller cabinet

Section controller cabinet

STEP 1



STEP 2



BK — BW
Safe Separation of Blank and Blow Side Operation

Manual Mode

The latest safety level for the machine operation, Manual Mode gives the operator a simple and safe method for changing mold equipment.

UC2

The User Interface UC2 offers the latest capabilities for interactive screens which in return give endless possibilities for user-friendly machine operation.



Manual Mode - Simple and safe

Using state-of-the-art safety technology, Bucher Emhart Glass introduces a simple and safe mode of operation. We call it Manual Mode.

This technology allows users to supervise the speed of servo mechanisms. It ensures that the Servo Electric Invert SEI and the Servo Electric Takeout SETO move with limited speed when operators interact with the section. We have also developed a unique method to safely separate the operation of the blank and blow sides. This allows an operator to interact with the blank side while the operator on the blow side moves mechanisms.

It is no longer necessary for operators to activate Maintenance Stop MS when working in the section. Operators simply activate Manual Mode on their side of the machine. There are separate Manual Modes for the blank and blow sides.

User Interface UC2

The face of a control system is the Human Machine Interface HMI. The machine operator needs to enter many parameters to successfully make a glass container. We are proud to present a new user interface which offers endless possibilities to make it even easier and faster for the operator to enter data.

The User Console UC2 runs on a standard Windows PC with a touch screen, housed in an air-conditioned cabinet. The interface features ergonomic and rapid navigation, allowing operators to quickly set the desired parameters. It provides

alarms in the event of problems plus reports on status, production and downtime. Servo axis parameters are now fully integrated in the bar chart with intuitive graphics, showing theoretical and real curves. UC2's multi-language database allows operators around the world to use it in their primary language.

The UC2 comes with new features:

- Full Multi Article data handling. Every section can run with its own type of container.
- Fully integrated and interactive bar chart. Make all section adjustments on one screen.
- Enter data on multiple clients (user interfaces) simultaneously.

As a replacement for the Hand Held Terminal HHT, a portable wireless tablet (FlexPad) gives full access to the UC2 functionalities while standing at the machine.

For the direct interaction with the machine, the blank side panel is located overhead on the blank side of the section, while the blow side panel is located on the conveyor in front of each section. These two panels feature switches and buttons with functionality clearly indicated with pictograms. Operators can override or disable each mechanism individually, to allow manual operation, initiate an automatic calibration cycle for all the section's servo mechanisms or activate special cycles including cold blank/blow cycle, manual swab, delivery request, normal stop and blow side special cycle.



UC2 Home screen

UC2 bar chart with curve



FlexPad



Traceability

Total traceability in the production process means the possibility to attach all production information and inspection results to an individual glass container.

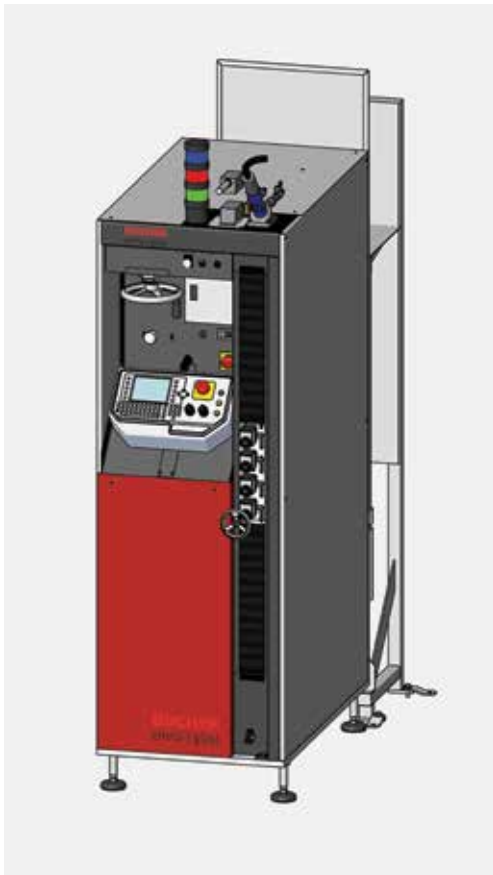
Having all its production information stored to the single bottle opens up new dimensions for the understanding and optimization of the container production process.

Full traceability offers:

- Fact-based discussion between glass producer and filler
- The basis for improved process control
- Opportunity to identify root causes for defects more easily
- ... and ultimately the possibility to remedy defects automatically

Bucher Emhart Glass offers all the equipment needed for this:

- Flex Control Center collects and stores the data
- ID Mark marks the bottle with a unique code
- ID Read reads the bottle code



The ID Mark laser marking system is the universal tool to mark human-readable information, data matrix codes or combinations of these on hot glass bottles. The laser marking system has a proven track record of over 100 installations and operates at production speeds. Marking the bottle with a unique code using the ID Mark makes the individual bottle identifiable. The code typically contains the real time of manufacture and a line code. This information facilitates the resorting of bottles.

Along the value chain of glass production additional benefits apply, for example, the brand protection against counterfeit and the improved management of returnable bottles. Together with the Flex Control Center, forming production data like forming machine settings and sensor data can be stored to an individual container which is the basis for a deeper process understanding and process control.



ID READ

The ID Read options to the Bucher Emhart Glass FlexInspect machines read the data matrix code laser marked on the bottle by the ID Mark.



In the context of connecting hot end and cold end information, this also offers the possibility to store all the inspection results to the individual bottle ID.

An additional function of the ID Read is to verify the machine readability of the data matrix code for further uses like anti-counterfeit applications.



Container Inspection



Glass is truly a perfect package representing quality and value in the eyes of the consumer. To uphold its premium image, the glass container must achieve the highest standards of excellence. A company's reputation, therefore, relies on the effectiveness of the container inspection system.

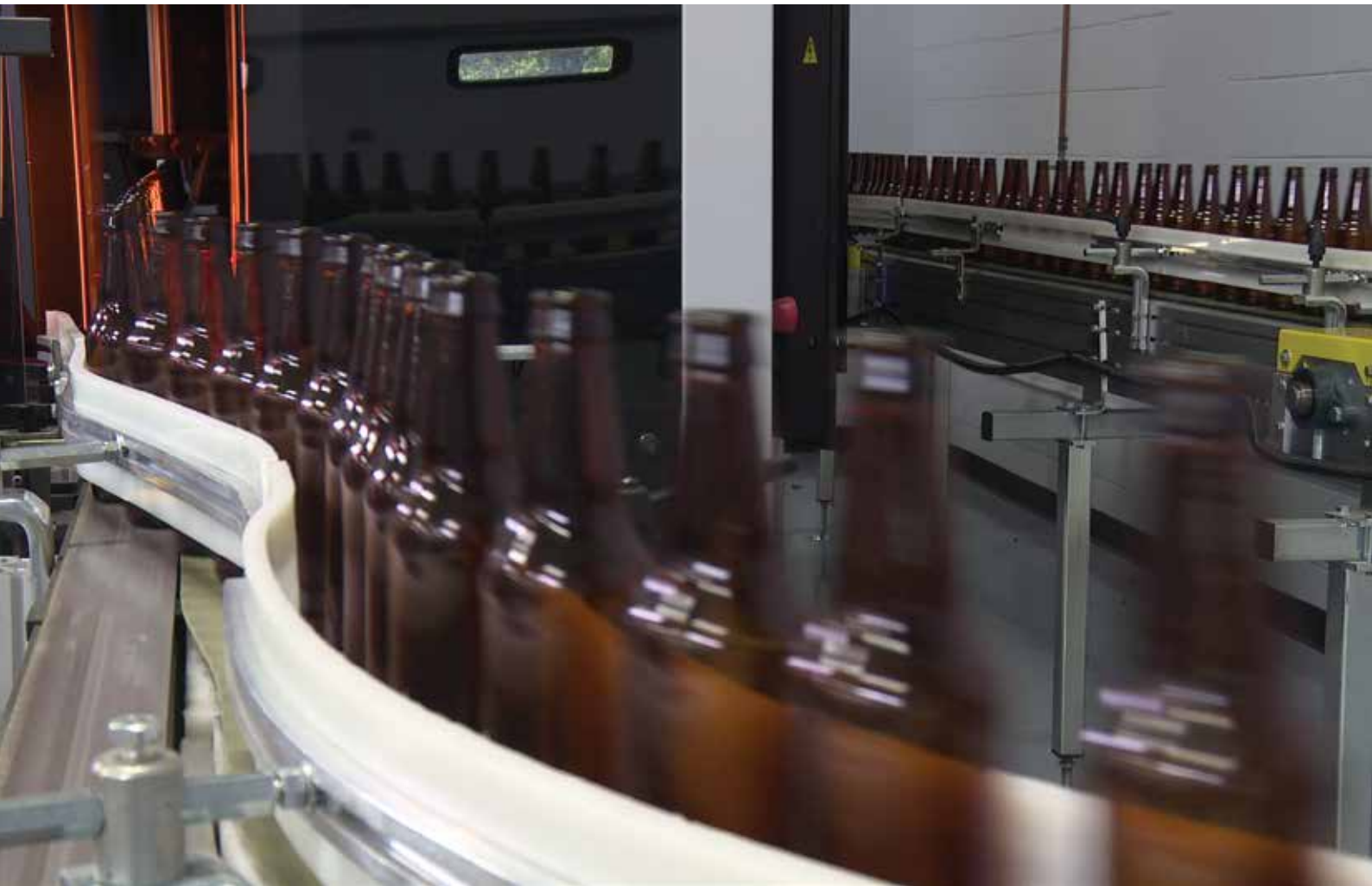
Bucher Emhart Glass inspection solutions verify container quality and integrity at the highest levels, combining vision inspection, software, lighting, and reject systems for optimum system performance at production line speeds.



Ensuring the quality of every container

We deliver the industry's most comprehensive selection of empty glass inspection solutions. From base, sidewall, finish and stress inspection to mold correlation and check detection for glass containers in all sizes, shapes, colors, and configurations, Bucher Emhart Glass inspection systems perform all critical inspection tasks at production line speeds.

Our systems offer exceptional flexibility with quick product changeover, ease of operation and maintenance, and concise, real-time data generation for production analysis and trending. Our systems are intelligently designed for ease of operation with minimal operator intervention.



Inline container inspection machines



FleXinspect is the tool that increases efficiency and reduces costs by allowing glassmakers to configure only those functions they need on a modular platform. To reduce capital expenditures while maintaining flexibility, the manufacturer can add additional inspections on the existing platform as the need arises. With a large 21.5” touchscreen, the user interface has been enhanced to utilize icon-based command sequences for simplified setup and operation. Container inspection parameters can be pre-programmed

for easy recall, thereby reducing downtime for job changes. Additional highlights include built-in production trending screens, change logs recording all settings being modified, and system logs monitoring the machine uptime.

FleXinspect is powered by SCOUT technology that enables new levels of automation, performance and simplicity. SCOUT is the foundation that will support future advancements in hollow glass inspection.



Machine overview

Inline inspection	Total	Mechanical	Vision	Vision	Vision
Model	FleXinspect T	FleXinspect M	FleXinspect BC	FleXinspect B	FleXinspect C
Inspections:					
Base	●	●	X	X	
Base stress	●	●	●	●	
Sealing surface	●	●	X	X	
Mold number reading					
- Heel dot codes	X	X	●	●	
- Bottom codes	●	●	●	●	
Vision plug	X		●	●	
Vision dip/saddle	X		●	●	
Vision ring	X				
Vision check	●	●			
Wire edge	●	●	●	●	
Check detection	X	X			
Wall thickness 1-4 head	●	●			
Mechanical plug, dip, saddle, ring	●	X			
Out of round detection 2 pts	●				
Sidewall inspection (opaque)	●*		X		X
- Dedicated transparent			●		●
- Dedicated shoulder			●		●
Sidewall stress	●**		●		●
- Dedicated shoulder stress			●		●
Dimensional inspection (lean, height, diameter)	●		X		X
Matrix code reading	●	●	●	●	●

- X standard inspection
● additional inspection

* The sidewall inspection on the FleXinspect T is performed in two stations and is optimized to detect all types of glass defects in all areas of the container from the heel to the top of the neck

** The sidewall stress inspection on the FleXinspect T is performed in two stations and is optimized to detect stress types in all areas of the container from the heel to the top of the neck



FleXinspect T

The FleXinspect T is a fully equipped system capable of providing all the necessary cold end inspections. The unique design of the servo-driven handling devices allows inspections that in the past were not possible with rotary inspection machines. The reliable and uniquely configurable platform easily allows additional functionality and redundancy as needed, providing unmatched versatility and value for glassmakers' current and future requirements.

- Reduced line space and maintenance
- Higher speeds and larger ware
- Non-contact vision gauging (plug, ring, dip)
- Precise container rotation

As a component of the FleXinspect family, the FleXinspect T can be used in concert with other FleXinspect machines to create the most comprehensive inspection solution in today's market.



Features

- All inspections in one machine capability
- Modular/expandable inspection systems
- Cavity correlation of all defects
- Non-contact gauging for the finish
- Integrated inspection conveyors
- Brushless non-round container handling
- Traceability of change (who, what, when)
- 840 mm servo-driven starwheel
- 5 modular servo-driven rotation devices
- Servo-driven infeed screws
- Servo-driven starwheel
- Live belt outfeed handling system
- SCOUT technology

Ware range

- Height: 35 mm - 381 mm (450 mm option)
- Body diameter: 16 mm - 170 mm

Standard inspections

- Modulated check detection
- Mold number reader - Heel code
- Vision plug/ring/dip/saddle/height

Additional inspections

- Wall thickness - 4 elevations
- 2 point out of round (2 positions)
- Mechanical plug/ring
- Mechanical dip/saddle/height
- Vision mold number reader - Alpha numeric/bottom dots
- Sidewall/Sidewall stress
- Base/Base stress
- Sealing surface/Wire edge
- Dimensional (height, diameter, lean)
- Tramp glass
- Vision check
- Matrix code reader





FleXinspect M

The FleXinspect M is a servo-indexing, rotary inspection system designed to be a drop-in replacement for many of the well known mechanical machines of the past. It reduces the cold end footprint by combining multiple inspections within a single machine frame. The unique design of the servo-driven handling devices allows accurate and reliable inspections not historically associated with rotary inspection machines. It provides configurable inspection functionality, modular versatility, value, and flexibility for glassmakers' current and future requirements.

- Multiple inspections within a single machine
- New infeed design
- Modulated LED check inspection
- Non-contact wall thickness inspection

Part of the FleXinspect machine family, the FleXinspect M can be used with the other FleXinspect products to create the most comprehensive inspection solution in today's market.



Features

- Active cooling of main electronics, with thermal protection
- 30° Infeed entry angle
- Integrated inspection conveyor
- 680 mm Ø star wheel
- Traceability of changes
- Cavity correlation of all defects
- Servo-driven rotate devices
- Servo-driven infeed screw
- Servo starwheel
- SCOUT technology

Machine configuration (2 configurations offered)

- 9/18 pocket star wheel with 3 servo-driven rotate stations (in this configuration can reuse Veritas IM tooling)
- 12/24 pocket star wheel with 5 servo-driven rotate stations

Ware range

- Round and non-round containers
- Height: 38 mm - 350 mm
- Body diameter: 16 mm - 120 mm

Standard inspections

- Modulated check detection
- Mold number reader - Heel code
- Mechanical plug/ring
- Mechanical dip/saddle/height

Additional inspections

- Wall thickness - 4 elevations
- Vision mold number reader - Alpha numeric/bottom dot
- Sealing surface/Wire edge
- Base/Base stress
- Vision check
- Matrix code reader





FleXinspect BC, B, C

Offered as standalone units B and C, or together as BC, FleXinspect is a reliable and uniquely configurable platform that easily allows inspection functionality and redundancy as required.

FleXinspect BC delivers 360-degree wraparound lighting and patterned lighting for 100% sidewall inspection to precisely pinpoint both opaque and transparent defects. Polarized lighting is utilized for stress inspection to ensure detection of defects that may be missed by conventional methods. When equipped with a mold reading option, the FleXinspect BC mold-correlates results from all installed inspections.

- Unmatched inspection accuracy
- Optimized container stability at high speed
- Maximum throughput at minimum speed



Features

- Integrated belt spacing device
- Cavity correlation of all defects
- Integrated inspection conveyors
- Traceability of change (who, what, when)
- Wraparound LED sidewall lighting
- Independent belt position for tapered ware
- 4 Servo-driven carry belts
- Consolidated electronics
- Nema 12 electronics with thermal monitoring
- Single or dual 21.5" multi-touch display
- SCOUT technology

Ware range

- Height: 35 mm - 381 mm
- Body diameter: 16 mm - 170 mm

Standard inspections

- Sealing surface
- Base
- Sidewall 6 views
- Dimensional 6 views

Additional inspections

B-side

- Base stress
- Mold reader (heel codes/bottom codes)
- Vision plug/Vision plug with wire edge
- Vision dip/saddle
- Matrix code reading on outfeed

C-side

- Sidewall transparent (cosmetic) 6 views
- Sidewall stress 6 views
- Shoulder/Shoulder stress 6 views
- Matrix code reading on outfeed





Statistical sampling

Bucher Emhart Glass machines for statistical sampling are designed to provide frequent measurement of a variety of critical glass container dimensions through sampling,

giving the glassmaker valuable feedback about the quality of the production and advance warning of any drift in the forming process.



Providing critical quality control

Bucher Emhart Glass statistical sampling machines provide important product quality information so the bottlemaker can take immediate action, significantly reducing the response time to possible anomalies. Furthermore, by reducing the feedback time to the hot end operator, they are very effective tools in bringing the forming process to target pack-to-melt and shortening the actual job change time.

These statistical sampling solutions ensure adherence to critical quality criteria and reduce plant labor via automation while improving measurement accuracy and repeatability.



MiniLab

MiniLab is a turnkey solution to control critical glass container dimensions while improving measurement frequency and accuracy. Its flexible and scalable design lets glass manufacturers integrate multiple devices to serve specific quality control requirements.

- Fast and accurate measurement of a variety of critical glass container dimensions
- Increases the frequency and efficiency of the time-consuming quality control tests
- Designed to withstand operation on the production floor



The MiniLab system

A typical MiniLab integrates MiniLab D and MiniLab P with the conveyors, gates, and control system. It is offered in several layout configurations easily installed on the production floor or in the quality lab:

- Online sampling with containers diverted from the production line
- Off-line sampling with sets of containers loaded by the operator

MiniLab communicates with the factory information system for data gathering, archive, and review of production trends.

Dimensions measured:

- Height
- Weight
- Off-level
- Lean
- Bent neck
- Finish dimensions for all finish types
- Burst pressure
- Capacity/Volume
- Pushup
- Flange
- Knockout
- Inside neck diameter
- D-angle
- D-radius
- Wall thickness
- External body dimensions

MiniLab D - Dimensional Gauging and Weight Measurement System

MiniLab D brings state-of-the-art vision technology and accurate servo-controlled handling to precision measurement of glass containers. Using high-resolution cameras and application-specific optics, MiniLab D is designed to measure the dimensional characteristics of glass containers and can measure containers of different sizes without requiring a job change.

MiniLab D Non-Round Wall Thickness Gauge This gauge takes advantage of new and innovative technology to automate the measurement of the glass thickness for round and non-round containers. The sensor follows the profile of the container at all times for optimum measurement.

Once installed and calibrated the gauge does not require any adjustment. When creating an article the user simply specifies the locations of the thickness measurements. For each location the thickness measurement is performed 360° around the container. Up to 10 locations can be specified. Those locations can be of different sizes and shapes.

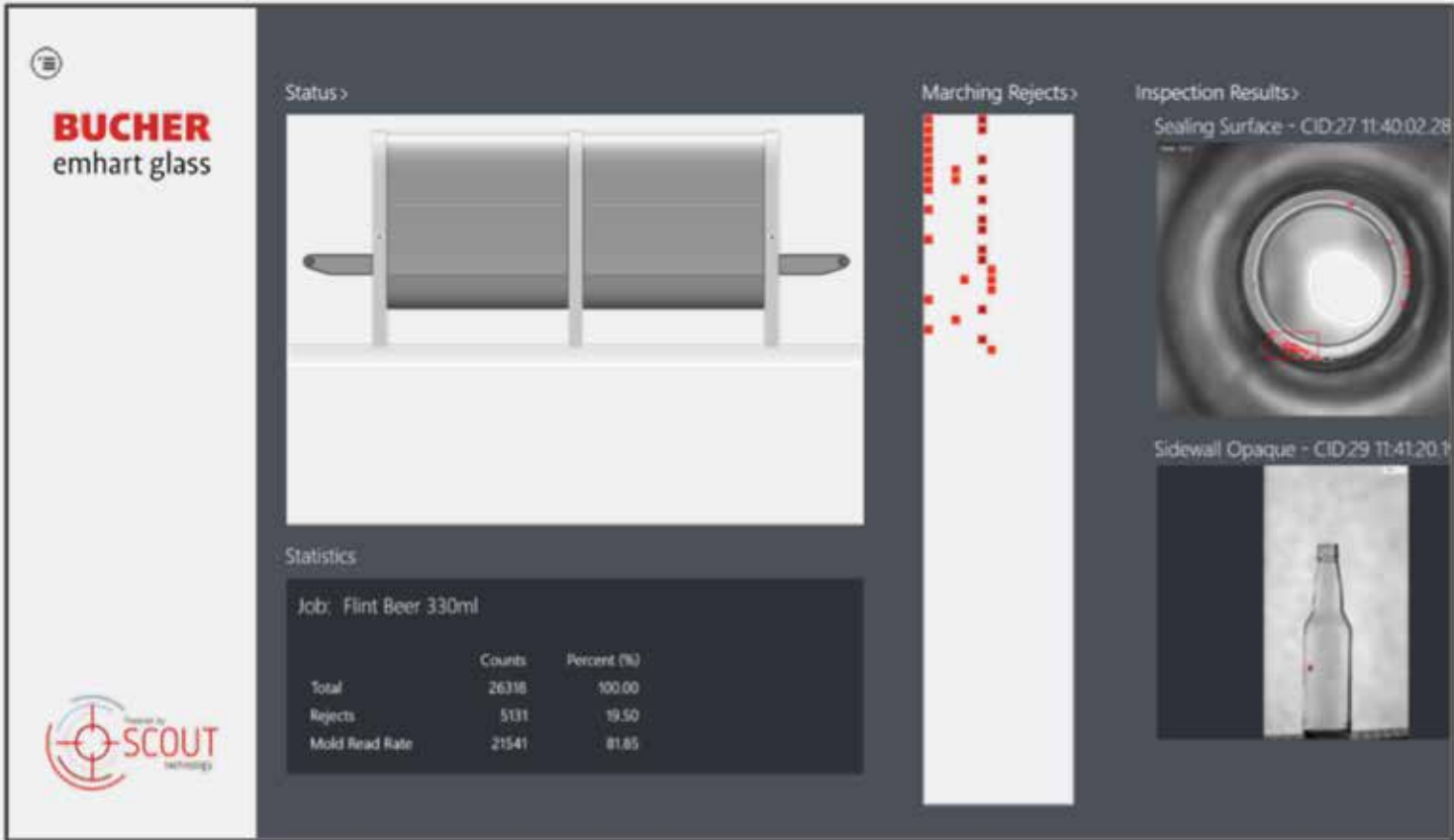
The container is automatically placed in front of the thickness sensor at each measurement location defined for the article. During the container's 360° rotation a servo-controlled arm maintains the multichannel thickness sensor at the ideal distance from the glass surface for accurate measurement.

When creating an article the user specifies independent minimum and maximum thickness limits as well as acceptable thickness ratio for each measurement location.

MiniLab P - Pressure Tester and Capacity Measurement System

MiniLab P measures the maximum amount of internal pressure a container can withstand (meets the ASTM C-147 standard for internal pressure testing of glass containers). When equipped with the Capacity Gauge option, MiniLab P accurately measures the capacity of a container at several fill heights and overflow.

MiniLab P can test two containers of different sizes (with same finish size) without requiring a job change. Job change parts are minimal and a complete changeover does not require any mechanical adjustment.



SCOUT technology

SCOUT is the hardware and software technology that powers the inspection equipment produced by Bucher Emhart Glass.

Developed to take the Flexinspect products to new levels of automation, performance and simplicity, the SCOUT technology platform has become the foundation for all new features and advancements in the hollow glass inspection processes. As the End to End data provider for the cold end inspection equipment, SCOUT will continue to change the way glass plants control their quality by providing critical information about actual process results.



Revolutionary, innovative and practical

SCOUT provides users with a new method of navigation and operation by harnessing the power of multi touch technologies. The gesture-based interface coupled with advanced automation and intelligent learning algorithms completes the system and creates the most usable, reliable and efficient inspection technology in the market.

SCOUT saves time

- Intelligent automation in the inspection setups reduce the time required for job changes and fine tuning
- Predefined defect classes and size limits reduce the time required for job changes and fine tuning
- Simplified multi touch user interface and logical layout reduce the time required for job changes and fine tuning

SCOUT saves money

- Advanced defect classification allows factories to pack more commercially acceptable ware
- Advanced defect classification informs factories what defects are being produced for better feedback and correction
- Advanced defect classification allows all machines to operate with the same sensitivities and limits

SCOUT provides security

- With critical defect alarms, factories can now react faster and reduce the potential for held and returned ware
- Using the automated setups and predefined defect classifications means all machines are set the same, reducing the potential for held and returned ware
- Providing the correct information to the forming department ensures that the process is maintained reducing the potential for held and returned ware

FleXinspect machine upgrades

- All FleXinspect products can be equipped with the SCOUT technology
- Upgrades are performed in place and are completed within a few hours
- All features and benefits including new developments for the End to End will be available as they are released

Veritas machine upgrades

- Veritas iB and Veritas iC machines can be upgraded to SCOUT technology
- All inspection features and benefits from the FleXinspect machine family are included in the upgrade
- All features and benefits including new developments for the End to End will be available as they are released





End to End Technology - Automation

Automation is our technology; the intelligence that makes our equipment 'smarter'. Through these innovative automation systems and associated technology, glass plants will be able to read, analyze and automatically react to data.



End to End Automation helps glassmakers to maximize production efficiencies and reduce dependency on skilled operators. These automated tools allow plant personnel to monitor production and make adjustments remotely, removing human

intervention in the production areas. End to End Automation is instrumental in helping glassmakers achieve better performance, efficiency, safety, traceability, and reliability in their operations, ultimately leading to higher profits.

Closed loop products



Bucher Emhart Glass has reliable and innovative control systems for driving the different types of forming machines in its portfolio. There has been a quantum leap with the introduction of the FlexIS Control, a control system born from the collaboration between Bucher Emhart Glass and Jetter AG, merged now in the Bucher Group.

Knowledge in motion control solutions and technology, combined with expertise in technology and application of the Bucher Emhart Glass forming machines, make the FlexIS a powerful process control system that can manage the entire glass container forming process.



Automating quality control

Measurement systems integrated into the forming machine provide valuable insight into critical stages of the forming process. The machine operator however gets more and more challenged: more information, finer adjustment possibilities, a grown number of cavities per machine and often a demand for more frequent job changes! Manual adjustment starts to become a limiting factor in daily operation.

By providing automatic adjustment, the closed loop products greatly help to achieve tighter production limits and faster start up times after job changes.

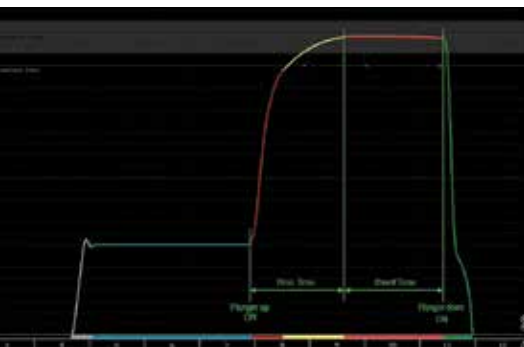
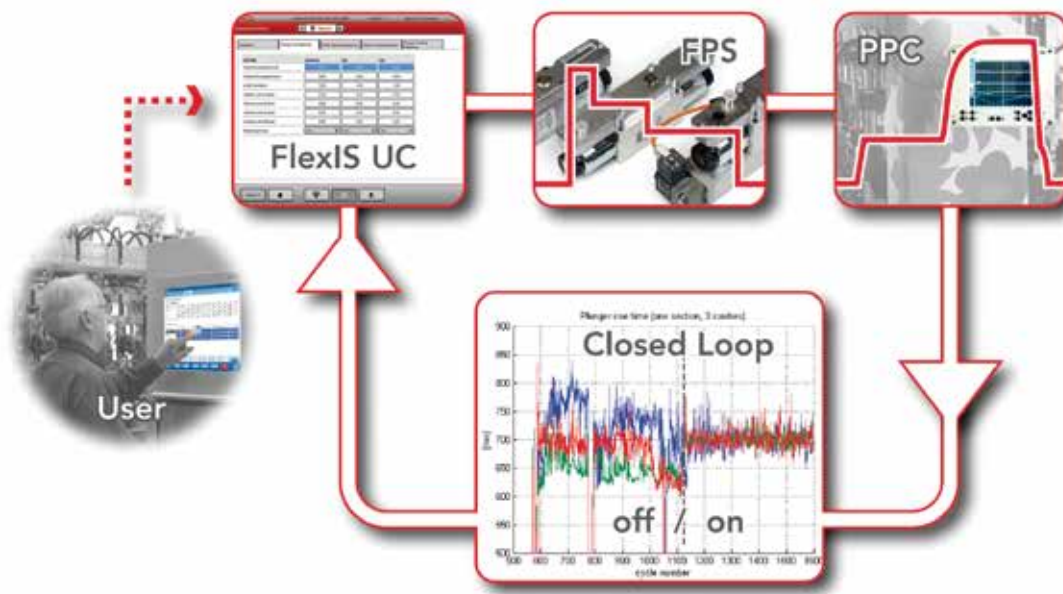
FlexIS Plunger Up Control

FlexIS Plunger Up Control adjusts the Plunger Up motion in Press & Blow PB productions. The system ensures that the cavity is filled entirely with glass at the desired time.

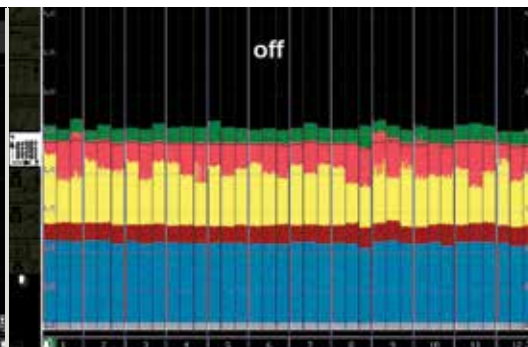
FlexIS Plunger Up Control uses information from the Plunger Process Control PPC in Press & Blow PB and Narrow Neck Press & Blow NNPB production. It determines the time needed to move the plunger up to its end pressing position. It adjusts FPS pressures and sets FPS timing values so that the desired time to raise the plunger is maintained. Controlling the plunger rise

time means also having a defined full contact time (dwell time) which is – in common understanding – an important process parameter.

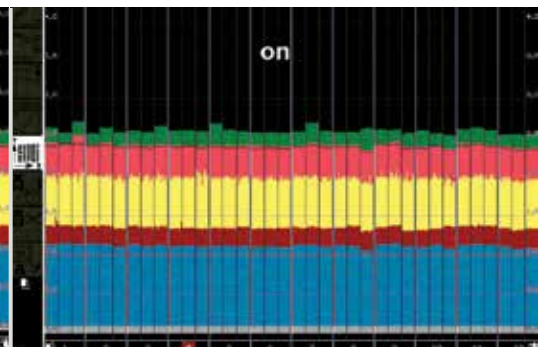
The result of this continuous adjustment is a well-maintained full contact time throughout the production run and across all cavities of the machine. Customers report that also the start up after a job change is greatly supported by the system – Plunger Up adjustment is automatically done within a few cycles.



Screen showing rise in dwell time



PPC Off – Screen shows variation in contact time and fill before switching on



PPC On – Screen shows well-maintained full contact time across all cavities of the machine



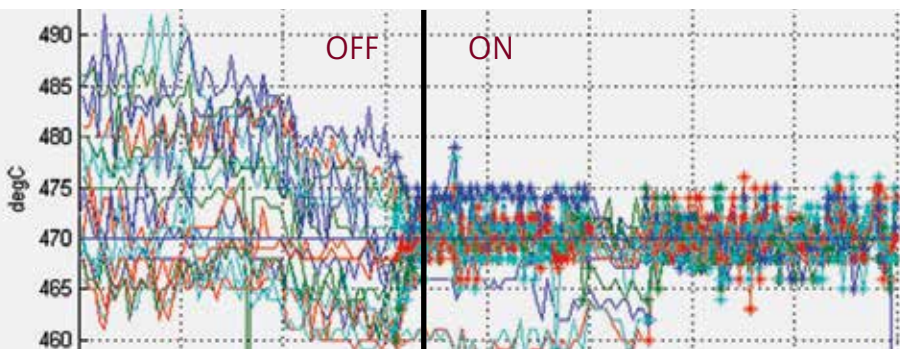
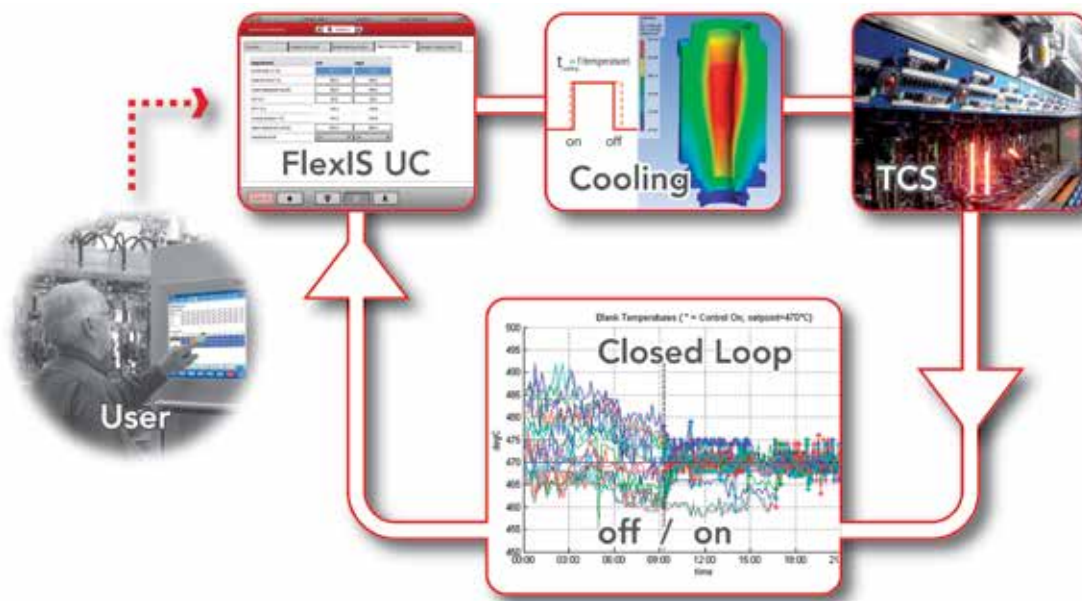
FlexIS Blank Cooling Control

FlexIS Blank Cooling Control automatically adjusts the cooling of the blank mold halves so that the desired temperatures are maintained.

FlexIS Blank Cooling Control uses information from the Temperature Control System TCS or the BlankRadar. It gets the measured temperature values of the mold surfaces and automatically adjusts the duration of the mold cooling.

Depending on the machine type and configuration, up to 72 mold halves are permanently monitored and adjusted to slow changes of surrounding parameters. This leads to more stable production runs and also prevents quality problems like leaners, for example.

With continuous adjustment, the mold temperatures can be kept within tight limits over day and night. The system is also very helpful when starting up a machine after a job change.



Blank temperature screen showing variation with Blank Cooling Control Off and On



Blank Cooling Control temperature overview screen

FlexIS Plunger Cooling Control

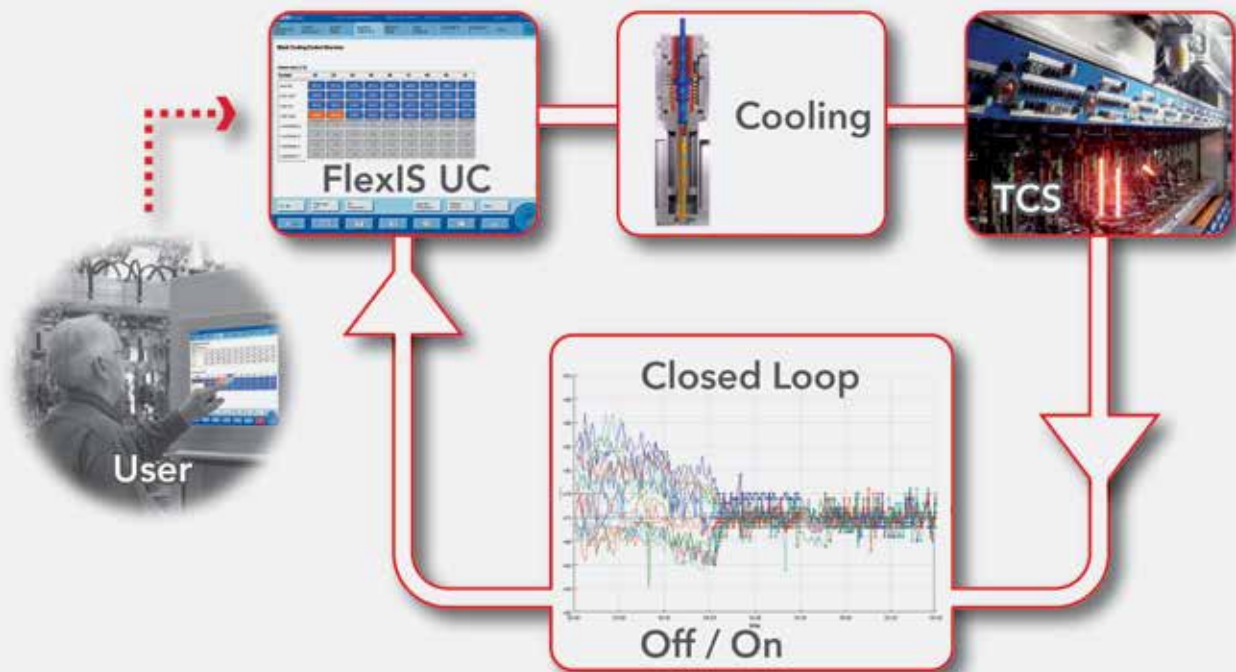
FlexIS Plunger Cooling Control automatically adjusts the cooling of the plungers so that the desired temperatures are maintained.

FlexIS Plunger Cooling Control uses information from the Temperature Control System TCS or the BlankRadar. It gets the measured temperature values of the plunger surfaces and automatically adjusts the duration of the plunger cooling.

Depending on the machine type and configuration, up to 48 plungers are permanently monitored and adjusted to changes of surrounding parameters. This leads to more stable production runs and also prevents quality problems inside the container and finish.



Plunger inner/middle/outer temperatures are kept automatically at set point (example shown: AIS 12 section TG)





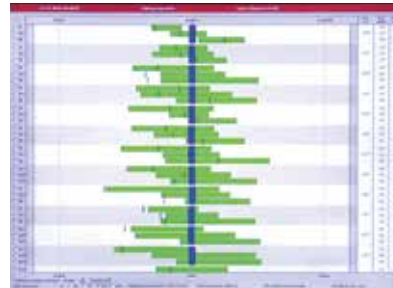
FlexIS Bottle Spacing Control

FlexIS Bottle Spacing Control automatically adjusts the placement of the containers on the conveyor so that an equally distributed ware sequence is maintained.

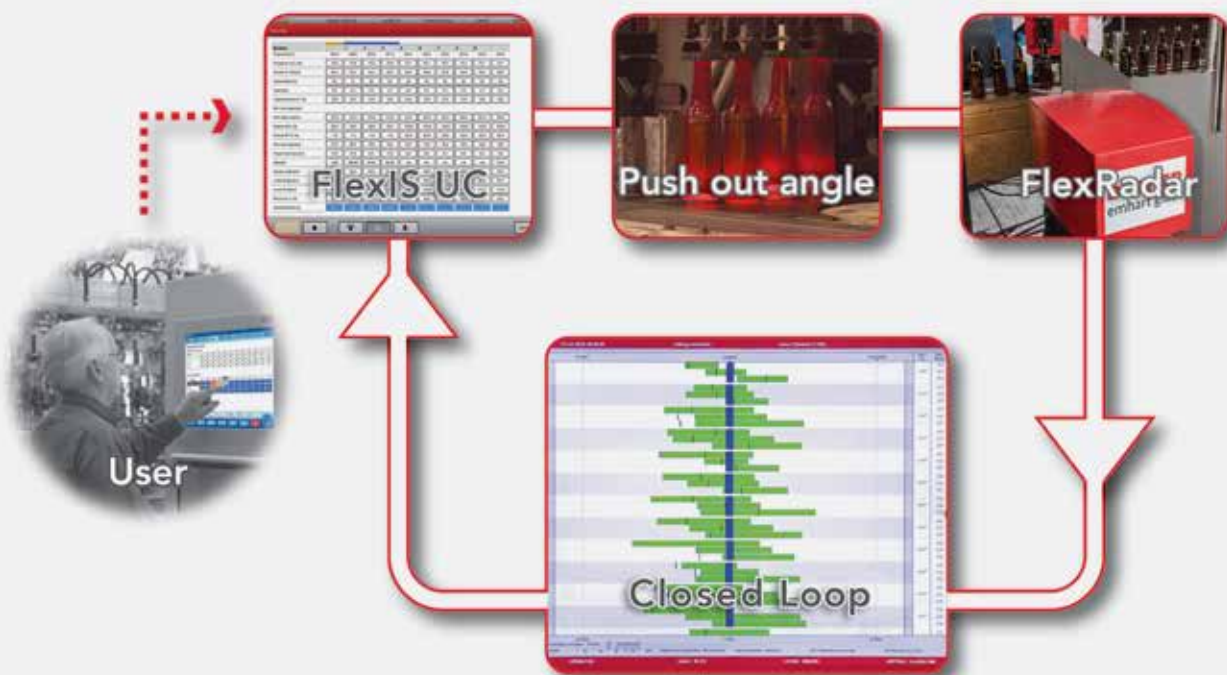
FlexIS Bottle Spacing Control uses information from the FlexRadar forming process monitor system. For each bottle, a deviation value to the ideal position on the conveyor axis is transmitted and used to adjust the pushout timings.

The closed loop averages the position deviations for each section and calculates a correction for the pushout and related events, so that the bottles maintain equally distributed along the conveyor axis.

By the automatic adjustment, an equally distributed ware sequence is achieved and maintained, also when pusher parameters are slightly changed.



Bottle spacing is automatically adjusted and maintained (example shown: AIS 12 section TG)





Flex Control Center

The Flex Control Center is the data hub for the forming line. It collects and interprets the data from the smart sensors, the forming and inspection machines.

With this data available, the door is open for applications running on the Flex Control Center that monitor the condition of the forming process, the inspection results, and the machines' status, and advise the operator to remedy deviations as effectively as possible. The Flex Control Center is the foundation for these applications.



How Flex Control Center applications benefit the glassmaker

They give an overview about the status of the process and enable the operator to remotely access the screens of the Bucher Emhart Glass forming and inspection machines. They display the statistics of defects from the inspection machines and the production counters of the forming machines.

They monitor the condition of machines and processes and advise when actions are needed All the measurement data from different sensors is gathered and stored at one location and the applications consolidate and display this data in a convenient way. The operator has a quick overview of all relevant measurement data and is able to make data-based decisions.

Servo motor temperatures of mechanisms are compared in time series plots, which helps to locate suspicious mechanism behavior. Additionally, based on the gathered data of servo mechanism motion and current profiles, the health state of a mechanism can be analyzed and warnings can be issued to the operator or Bucher Emhart Glass service.

They advise the operator how defects can be remedied

Based on a knowledge database of causes and remedies for defects, the operator is advised how to remedy the currently occurring defects. The system learns by taking into account the measurement data of the installed smart sensors and the user feedback about the effectiveness of certain remedies. Herewith, the prediction of the cause and the effective remedy becomes more and more reliable.

They store the production data to the individual container

With Bucher Emhart Glass traceability equipment installed, the production and inspection data of the current production run is stored to the individual containers. This helps to facilitate a fact-based discussion between glass producer and filler when recalls occur.

There is much more potential....

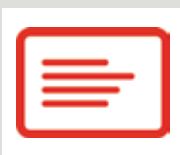
Having the individual production data available for each bottle increases the process knowledge and together with advanced statistical methods results in continuously improved applications as well as new applications to make the glassmakers' life easier. Ultimately, automated process adjustments at the forming machine will become possible based on cold end inspection data.



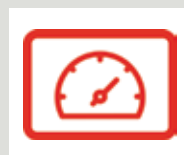
Your Dashboard



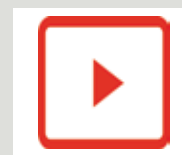
Container ID



Forming process Monitor



Machine condition monitor



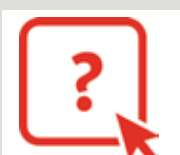
SOP Guide



FlexIS Viewer



FlexInspect Viewer



Defect advisory

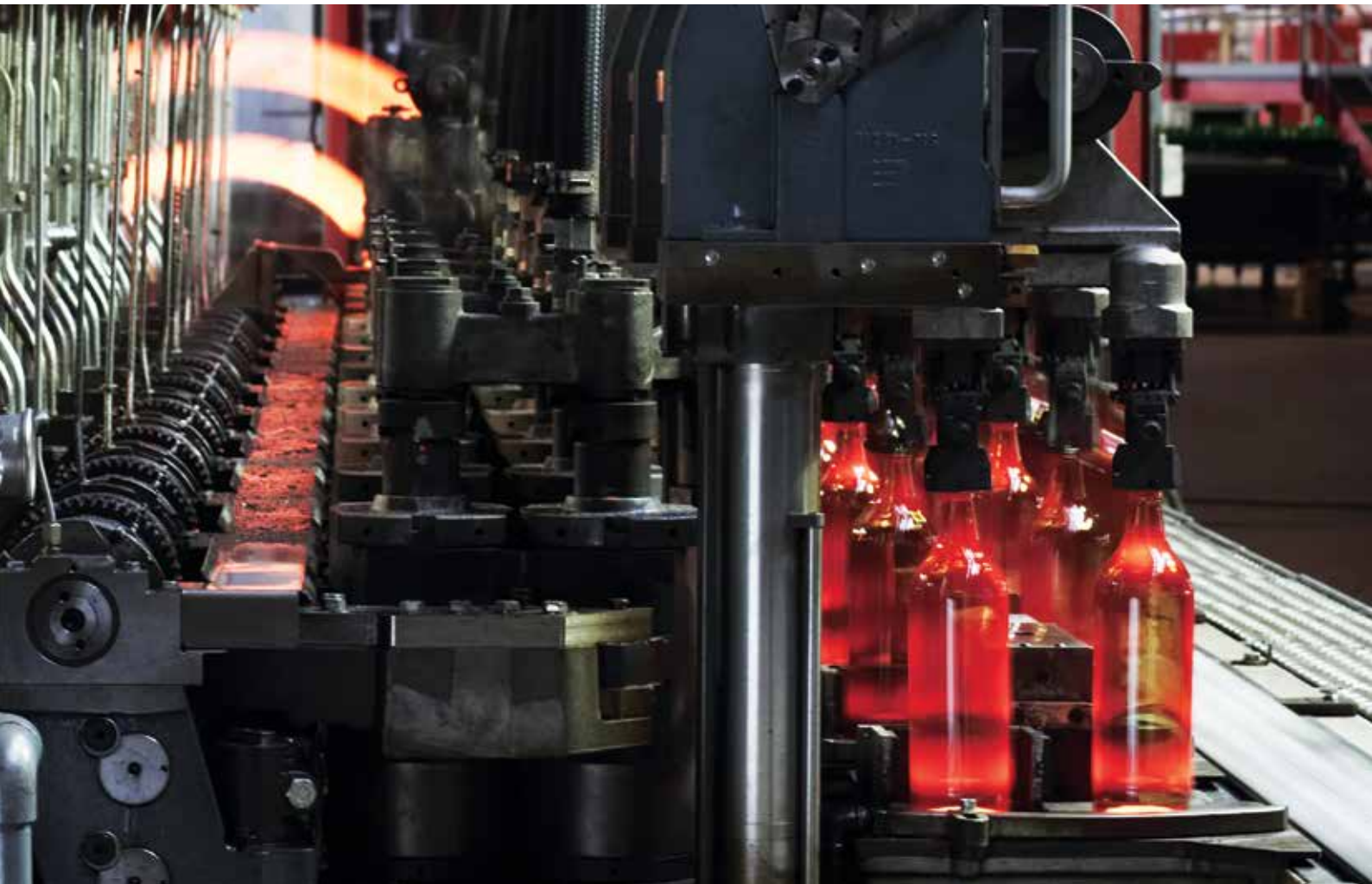


Defect animation



Defect statistics

Robots



Bucher Emhart Glass now provides the FlexRobot system integrated with IS, AIS, BIS and NIS machines. The FlexRobot system is mounted on the Blank side Panel and integrated with the FlexIS controls. The Swab Robot system is provided in

cooperation with Novaxion, a supplier with extensive experience with Swab Robot systems in glass machines. The supply of FlexRobots is part of the Bucher Emhart Glass strategy to provide automation solutions to our customers for increased profitability.



FlexRobot

The FlexRobot swabs the blank molds and neck rings. For tandem machine installations, one FlexRobot services the entire tandem machine.

Consistent swabbing A robot is a perfect solution for repetitive work which makes it ideal to be used for swabbing.

Decrease the amount of swab liquid The amount of swab is decreased with the use of a swab robot.

Increase output The swab robot swabs the blank molds “on the fly” which increases the output from the machine.

Increase mold lifetime The lubricant is sprayed inside the molds and there is no contact between spray nozzles and the mold surface which eliminates wear on the molds.

Gain time for trimming the process A swab robot will gain time for the operators to use the process sensor systems for trimming the process, to achieve higher output from the machine.

Reduce risk of accidents The swab robot decreases the time the operator needs to interact with the machine and therefore risk for accidents.

Eliminate strain injuries During an 8 hour shift, an operator performs approximately 700 swab movements, and lifts the arm to activate the manual swab cycle more than 200 times. Using a swab robot avoids the possibility of repetitive strain injury by eliminating these operator requirements.



End to End Support - Care

Care is what keeps your machines running; original parts, service and repair. It makes sense when you need a part for your Emhart machine, you choose a part from Emhart. And our service and repair teams know the equipment better than anyone.



The glass plant of the future is here today as we develop integrated equipment that reads, analyzes, and responds to data automatically. With this technology comes a need for expert technical support and this is a key element of End to End. End to End Care is a complete program to keep glass production lines running at peak performance all day, every day, for the long term. Much more than spares and repairs,

End to End Care is an integrated program that gives glassmakers the tools to maintain their machines from legacy equipment to the latest machines with side-by-side support from Emhart technical experts. End to End Care is very simple: one plant, one partner. Working with a single supplier who understands every area of the plant gives glassmakers the best return on their investments in machinery and personnel.



ORIGINAL PARTS

Bucher Emhart Glass maintains a portfolio of approximately 150,000 parts for hot end equipment, inspection machines, and refractories. Glass plants can rely on this extensive portfolio for most requirements and achieve significant savings compared to the cost of maintaining a supply at the plant level.

Glass forming and inspection machines need to be maintained correctly. There is a potential for expensive damage to a machine, which could also affect glass container quality, if incorrect parts are used. Choose Original Parts prescribed by Emhart for the health of your forming and inspection machines. Non-OEM parts can have an adverse effect on the health and safety of an Emhart machine. That's why we only prescribe the best.



S-Class supply

Quality parts are readily available:

- Our S-Class program stocks 5,000 of the most frequently requested hot end and inspection machine parts for shipment within hours of order
- Refractory S-Class parts are tailor-made to specifications and shipped within eight working days
- Parts are manufactured to precision standards at Bucher Emhart Glass in Örebro, Sweden
- Top quality parts ensure optimum operating life



Maintenance and repair kits

The highly aggressive conditions of a glass plant inevitably lead to wear on even the best-designed mechanical and electronic components. Kits are based on two levels of refurbishment:

- Maintenance kits for checking/cleaning a mechanism after a moderate period of use
- Repair kits for a complete refurbishment after several years of service

For customers wanting to refurbish their equipment in-house, we offer a range of maintenance and repair kits tailored to virtually all our current and legacy machines. Each kit contains all the parts needed to restore the machine to full working order, based on two levels of refurbishment. Maintenance and repair kits are ideal for everyone involved: workshop personnel, inventory and purchasing. They reduce the cost of maintenance and ensure that every required part is available and easy to find in a single box. As each kit has a single item number, our customers also save time as there is no need to work through drawings and identify individual items one by one.



Customer Contact Parts CCP

In each sales location, the Customer Contact Parts CCP department is the first contact for the daily parts-related business. Offering contact in the local time zone and in local languages is an important service to support our customers in their 24 h, 7 day operations.

Parts Catalog

Our Parts Catalog provides various search functions in our comprehensive parts portfolio, for example, search by item number, product category and specific products such as “cables”. This tool helps to identify the correct part number easily.

Repairs

Bucher Emhart Glass offers the world’s most comprehensive product portfolio to the glass container industry, and our service extends long after the equipment has been supplied and taken into operation, over its entire lifetime.

The severe environment and 24-hour operations encountered in glass container production inevitably lead to equipment wear, and this in turn creates a demand for maintenance, which can include repair of components, mechanisms and the entire machine after a certain time in operation.

To support our customers’ installed equipment around the world, Bucher Emhart Glass offers a complete range of repair services to suit individual customer circumstances, in order to maintain the low life cycle costs which are achievable with our equipment.

Why repair?

As a consequence of the state-of-art machining equipment and advanced hardening technologies utilized by Bucher Emhart Glass, the operating life of many components can now far exceed that of the past. Furthermore, intelligent control systems can protect mechanisms from damage.

However this does not mean that maintenance can be neglected. Even if the machine continues to run into its old age, inevitably tolerances will be exceeded and production rates, downtime and pack rates will suffer. Taken together, these production losses will exceed the cost of maintaining equipment before it fails. Worn pneumatic parts cause substantial leakage, resulting in increased energy costs. Properly maintained equipment can significantly reduce this wastage, making an additional contribution to the positive return on investing in maintenance and repairs. To preserve the optimum cost-per-container standards, it is essential that equipment be maintained on a regular basis.

Repair overview

Type of repair	Repair On-Site in customer plant	Repair Off-Site at Emhart Glass
Minor and standard repairs	<ul style="list-style-type: none"> • New Replacement Parts • Repair/ Maintenance Kits 	<ul style="list-style-type: none"> • Repair services <ul style="list-style-type: none"> - Individual repairs - Pool repairs
Major repairs	<ul style="list-style-type: none"> • Repair projects (see Maintenance Support, p. 84) 	



On-Site repair

New replacement parts All items contained in equipment supplied by Bucher Emhart Glass can also be supplied separately as loose parts, thus enabling the customer to replace specific worn or damaged items at any time. Replacement parts can be ordered from local Bucher Emhart Glass representatives.

Repair/Maintenance Kits Each Repair and Maintenance Kit has been designed to provide the customer's workshop with all the items required to refurbish a specific mechanism or accessory item. By ordering just one kit (instead of several individual parts), workshop personnel are assured of having exactly the right material to efficiently carry out maintenance and repair work, thus ensuring that the repaired item meets quality specifications. Each kit comes packed individually, together with an assembly drawing and an item list, at a lower price than purchasing the parts individually. Two classes of kits can be ordered from our local Bucher Emhart Glass representatives:

Maintenance Kits (B-Kits) include consumable items such as seals, bushings, rings, screws, washers, and springs, which should be replaced after about 2 years' operation, or during any disassembly of the mechanism for cleaning and routine inspection.

Repair Kits (C-Kits) include the items from a B-Kit, plus all other items which are required to return equipment to a good functional condition after about 5-8 years' operation.

Off-Site repair

For many Gob Forming and Section Mechanisms as well as components, we offer individual repairs of the customer's own

items in our facilities. This repair service is carried out by experienced technical personnel, and covers a wide range of our products, from individual valves and motors up to complete gob forming and section mechanisms.

For frequently requested items, Bucher Emhart Glass may establish a pool of repaired items for exchange with the customer's own material, thus minimizing machine downtime. This step will depend on the demand for this service on an item base.

On-Site service

Our global and multilingual team of over 60 professional service engineers and production specialists offer the specialized skills in forming and inspection to assist our customers and resolve problems.

Highly skilled Mechanical, Controls and Inspection Service Engineers and experienced Production Specialists support all our current and legacy forming and inspection equipment as well as automation products. They are happy to help our customers with:

- Advanced equipment and process troubleshooting
- Advice on parameter setups
- Software upgrades
- Assistance with repairs

Please contact your local Bucher Emhart Glass representative or our regional service management in Savona, IT, St. Petersburg, FL/US and Johor Bahru, Malaysia for on-site support.





Remote service

Remote Service gives our customers ready access via secure internet to experienced experts in equipment operation, troubleshooting, and maintenance. This service can reduce operating costs, downtime and lost production by supplying immediate assistance and problem resolution.

Forming: FlexIS Remote Service is available during European and US office hours. Contract customers can call our dedicated Remote Service phone number as published on our website.

Inspection: FlexInspect Remote Service is available during US office hours. Contract customers can call our dedicated Remote Service phone number as published on our website.

Non contract customers, please contact our regional service management in Savona, IT, St. Petersburg FL/US and Johor Bahru, Malaysia, or your local Bucher Emhart Glass representative.



24/7 Emergency service

For production-critical emergencies, 24/7 Emergency service offers phone assistance by experienced service engineers around the clock. If necessary, we can dispatch a service engineer for urgent on-site service.

Emergency number:

+41 41 749 41 41 (worldwide)

+1 860 298 73 91 (USA & Americas)



Refractories for glassmaking

Bucher Emhart Glass refractories are formulated from high purity, special oxide raw materials and manufactured with the properties necessary for the success of each specific glassmaking operation. In our laboratory, manufacturing, and quality operations, we bring together people, processes, and products to meet our customers' needs. Our refractory craftsmen – most with at least a decade of experience – are the heart of our operation. They are supported by engineering and R&D professionals who emphasize innovative product development and individual customer solutions.

Quality engineered feeder and refractory expendables Bucher Emhart Glass has earned a reputation for unsurpassed quality in refractories. As a flexible, well-staffed fabricator of premium refractory compositions, our goal is to serve the individual requirements of each customer no matter what type of glass they manufacture. We deliver a level of customized service normally unavailable from other refractories manufacturers. As a division of the global Bucher Emhart Glass enterprise, we leverage the continuing evolution in glass making technology from the industry leader. We offer a full range of standard refractory shapes and manufacture unusual, complex, and small quantity shapes to the same exacting tolerances. We also serve the optical, tableware, and float glass industries.

Forehearth and feeder products High quality refractories are crucial to proper conditioning of molten glass. Bucher Emhart Glass forehearth refractory components are designed for long life with predictable heat loss characteristics and resistance to thermal shock, erosion, and corrosion. Our range of forehearth

components includes both substructure and superstructure. We manufacture distributor shapes, alcoves, doglegs, and colorant sections and a full range of feeder refractories, including spouts, tubes, plungers, and orifice rings. Feeder refractories are available in many materials to address each customer's needs.

Exclusive refractory products for the handglass industry

The ability to match our proprietary mixes to our customers' melt and firing needs has enabled us to serve a wide spectrum of glass industries. Today, we are a leading manufacturer and supplier of glass house crucibles used exclusively in hand glass shops throughout the world. These highly specialized products demand meticulous craftsmanship. We manufacture a wide variety of shapes and sizes, ranging from one pound glass capacity open crucibles to closed pots with 500 pound glass capacity. We also offer a complete line of refractory accessories designed specifically for the handglass industry.

The industry's widest range of glass refractory expendable compositions

We continue to advance the state of the art in gob forming technology. One way we do this is by providing the industry's widest range of glass refractory expendable compositions. Our bonded compositions include alumina silicates, AZS, zircon, and fused silica. We offer a full range of shapes in industry standard compositions: 301, 315, 333, 311, 338, 345, and 357. For applications demanding customized compositions, our unrivaled R&D capabilities enable us to devise formulations to achieve specific customer objectives.





End to End Support - Empower

Empower is our support network. They say that knowledge is power – we are here to empower you in the use of your technology.



End to End Support starts long before a machine is purchased and continues for the life of your production line. Bucher Emhart Glass' experienced project managers offer valuable insight for the development of a new glass plant location or buildout of an existing factory, including project

specifications, plant layouts, and production plans. Once the equipment is installed, our support teams are here to help optimize performance. We offer machine health checks, predictive maintenance, and performance optimization to help glass plants get the most from their equipment.

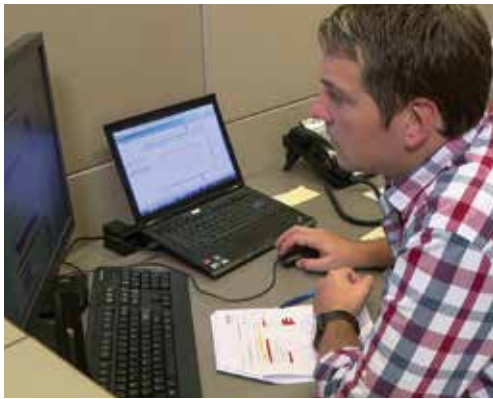


Project management

Our standard Bucher Emhart Glass project management offer assists our sales organization and customers with the technical details required for their new machines, supplying specifications required for installation, utility requirements, line layout consultation (inspection), arranging Bucher Emhart Glass service engineers for installation, and production support. Our project managers follow the machine projects from specification to glass production.

Brownfield projects These projects take place within the existing factory boundary and the full scope of the project is dependent on the individual requirements for the specific production footprint. The internal ability and experience of the Bucher Emhart Glass support group makes this possible and by working closely with our customers, we are able to provide a full project service or specific parts relating to the forming machines and/or the inspection machines.

Greenfield Projects Bucher Emhart Glass consults clients interested in establishing a new greenfield facility. Our experts provide custom consultations based on their deep industry understanding and a well-established glass capability network. Contact your sales representative for information.



Maintenance support

Bucher Emhart Glass supports maintenance of forming and inspection equipment with different support options for equipment condition and maintenance operation.

Forming Options range from equipment condition health checks, detailed, customized repair proposals and repair projects, up to on-site maintenance support and knowledge transfer in the plant by Bucher Emhart Glass maintenance service engineers.

There are two distinctive approaches for repairs:

- On-site repairs, where an experienced crew performs the agreed repair in the plant. As the equipment does not have to leave its position, the de-installing and re-installing of the equipment is not required and the shortest possible downtime is achieved.
- Off-site repairs, in cases where the equipment must change its position and/or in cases the repair is combined with a major upgrade. Repair/upgrade services are furnished in the workshop of one of our repair partners, preferably at Ergon Meccanica in Deago, Italy.

Repair projects are complex but can save a lot of capital. Some repairs might not be viable and sub system upgrades might be more appropriate. Our knowledgeable personnel consults with each customer regarding their options.





Inspection With the Technical Services Agreement TSA for Inspection, Bucher Emhart Glass performs a periodical complete health check, preventive maintenance, as well as minor repairs for all Inspection equipment in the plant to ensure optimum equipment performance.

Inventory support

The cost of holding stocks of spare parts and accessories at the plant level is a significant but often underestimated element in the lifetime costs of a forming machine. Bucher Emhart Glass maintains a portfolio of around 150,000 parts for hot end equipment, inspection machines, and refractories. Glass plants can rely on this central stock for most requirements and achieve significant savings compared to the cost of maintaining a supply at the plant level. Distribution centers are located in Luxembourg and the US (Memphis TN, Elmira NY and Owensville MO).

In addition, Bucher Emhart Glass offers inventory management and optimization and consumption analysis, to help customers manage their maintenance budgets.

Performance optimization

Bucher Emhart Glass accepts the importance of meeting our customers' expectations in production outputs in efficiency, quality, and training. We are able to document and optimize line operation throughout the production process with the technology supplied in both the glass container manufacturing and the inspection equipment and ensure that the customer's production teams receive the operational training to competently operate the technology installed and to ultimately optimize performance.

Our highly skilled and experienced production team works with our customers' production teams to optimize the Emhart technology installed for a specific production line or an entire factory. The support will also review installed equipment/production lines/complete plants with a view to improving or reaching production targets. The line optimization program requires Bucher Emhart Glass forming machines and preferably Bucher Emhart Glass inspection technology where the complete

production line can be reviewed. From this information, an action plan will be developed which will include timelines and agreed targets/outputs with our customer. A performance optimization action plan may include:

Upgrades Bucher Emhart Glass will recommend suitable equipment and automation upgrades to increase performance.

Mold & Cavity Design Available services include:

- Accessory selection
- Mold cooling analysis
- Cavity design (parison design, including forming simulation)
- Mold equipment drawing set
- Container producibility analysis
- Container property analysis

Production Support The Bucher Emhart Glass global team of highly experienced production specialists support our customers' production on-site.

Operational Training This is a key part of improving performance i.e. - improving the skills of the customer workforce. (see Academy, p. 86)

Trials

Bucher Emhart Glass offers trials at our own research center supported by operators and services. With a trial at our facility, our customers benefit from uninterrupted and unlimited plant time, no disruption of production time, know-how transfer from Bucher Emhart Glass and the opportunity to experience new technology (e.g. BIS, NIS, closed loops, etc.)

- Speed trials
- Bottle design
- Bottle sampling
- Machine performance trials
- Configuration change
- Future machine evaluation
- Cooling
- Small lot sizes
- Comparative trials



End to End Support - Academy

Academy is the future. Our school of thought in leading the next generation forward. It is our mission to share everything we know, so that the next generation takes our experience and expertise, and adds to it. With our help there is every chance they will find both new efficiencies and new ways to achieve.



Bucher Emhart Glass has long placed a high priority on training for glass plant operators. We have introduced formalized programs that will bring a new level of knowledge and professionalism to the glass plant. The first of these programs is EmForm training. From introduction training on the equipment up to expert operational training under glass, EmForm modules meet any need.

The second of our Academy programs is EmSpect training, to give inspection operators and specialists advanced knowledge on inspection technology and operating inspection equipment at the highest efficiencies. The modules in our EmSpect program enable operators to become proficient with their equipment on all levels.



Emhart Glass Academies

Skilled operators and managers are essential to the glass plant for it to operate at top production efficiency and produce consistently high quality glass. Bucher Emhart Glass' fully qualified training team helps customers

worldwide get the best out of Bucher Emhart Glass forming and inspection equipment. To be closer to our customers, training centers are located in various regions in the Americas, Europe and Asia.



EmForm - Container forming equipment training

EmForm training is designed for forming machine operators and includes three levels of training: entry (bachelor), advanced (master), and expert (PhG).

Training centers for forming equipment and controls are located next to Bucher Emhart Glass Manufacturing Sites in Sundsvall (Sweden) and Johor Bahru (Malaysia) to give our customers additional insight in our main forming Machine Manufacturing Centers. The proximity to manufacturing sites allows the training centers to be fully equipped with the latest equipment innovations.

Students will gain a complete understanding of the mechanical aspects of forming machines, control systems and production processes of Bucher Emhart Glass hot end products. Courses are carried out in classrooms and with various hands-on exercises to approach a real production setup.

Current modules:

- Machine types IS, AIS, NIS, BIS and FlexIS control systems
- Forming processes NNPB, BB, PB and Closed Loop
- Mold Design & Mechanical Interface

Training modules are flexible to accommodate entry-, advanced- or expert-level students. Customers can register for application-specific or open courses at the training centers. On-site training is also available upon request.

EmSpect - Inspection competence centers

EmSpect training gives inspection operators and specialists advanced knowledge on inspection technology and operating inspection equipment at the highest efficiencies.

Bucher Emhart Glass Inspection Competence Centers are located in St. Petersburg FL (USA), Elmira/Horseheads NY (USA) and Leipzig (Germany). The training centers are equipped with the latest container inspection and laboratory equipment. Courses offer a balanced mix of theory and practice, including container testing. The modules are tailored to specific inspection needs for the following product range:

- FlexInspect T, BC and M
- Veritas iB, iC and iM
- Statistical Sampling - MiniLab D and P





Research and development

From our beginnings more than 100 years ago as the inventors of IS glass forming technology, our success has been based on innovation. Today, we continue to search out new ideas that will shape both our future and that of the entire glass industry.

We aim for innovations that will help our customers thrive in today's commercial and economic environment. That means helping them improve operator safety, automation, process control, productivity, and flexibility. As partners to an industry where environmental concerns are paramount, we also focus on areas such as energy economy, lower cost of ownership and reducing container weight to save material, transport and energy.



Container forming Our forming R&D team spans six locations across three continents, from Sweden, Italy, and Switzerland to the USA and Malaysia. Our engineers focus on three key areas: automation, productivity, and flexibility.

In automation, our aim is to make the glass forming process more stable and repeatable, and less dependent on the skills of expert operators. Results of our efforts include closed loop controls for plunger up motion and blank cooling, which use machine readings to optimize production automatically in real time, and the FlexRadar hot end inspection system.

Productivity is about making the manufacturing process faster and more efficient, to unlock improvements and savings for glass plants. Finally, innovations in flexibility help producers switch between different containers more quickly, or produce different types of containers at the same time.

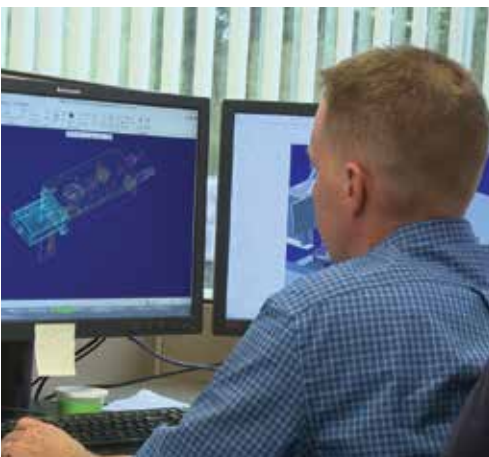


Inspection No other firm offers the same depth of inspection experience combined with a proven commitment to product development. Our inspection research facility in St. Petersburg, FL (USA) houses a dedicated team of engineers specializing in mechanical design, software development, optics, and application engineering for glass container inspection. The next generation SCOUT hardware and software technology developed by Bucher Emhart Glass delivers unmatched precision and reliability in container inspection.

Research center The team at our research center in Windsor, CT (USA) is comprised of over 50 professionals from all over the world. Together they work to improve our existing products and develop new ones.

The state-of-the-art facility includes a complete production line for forming and inspecting glass containers, allowing engineers to test new ideas in real-world conditions, gather incredibly detailed production data, and develop valuable time-saving solutions such as our software for automatic multi-gob weight setup.

Customers can also visit the research center for help with specific issues around quality, efficiency, speed, flexibility, safety, or energy savings.



About us

Bucher Emhart Glass is a company with a rich heritage and a tradition of excellence that we are proud to continue today. Our founders laid the foundations for automation in glass manufacturing, setting us on a course of market-leading innovations that has lasted for over a century. We created the industry-standard IS machine and have repeatedly delivered game-changing innovations in gob forming, container forming, automation, control and inspection.

Growing strategically through new branches, alliances and acquisitions, we have developed into a true global enterprise with the power to serve customers around the world with speed, responsiveness and understanding. Our global footprint provides the very best in established expertise, economical manufacturing, and hands-on client support.

Our work is underpinned by a profound and unshakeable belief in glass as a packaging material. And we back up that belief with investment in R&D. Driven by our clients' priorities, we continue to work towards new milestones in production speed, product quality, testing precision, and glass container strength. The ideas we have today will deliver the improvements of tomorrow.

Our progress

1902 The story begins with an idea shared by US entrepreneurs Karl E. Peiler, William H. Honiss and William A. Lorenz: to find new ways of making and using glass containers.

1912 Four businessmen join to form the Hartford-Fairmont Company, which develops the first glass gob shearing and feeding device, the forerunner of modern glass container machines.

1924 Glass-making pioneer Henry W. Ingle creates the first Individual Section - IS machine, a new automation standard that still forms the core of our product range.

1925 The first four IS machines go into operation, heralding the dawn of automatic container manufacturing.

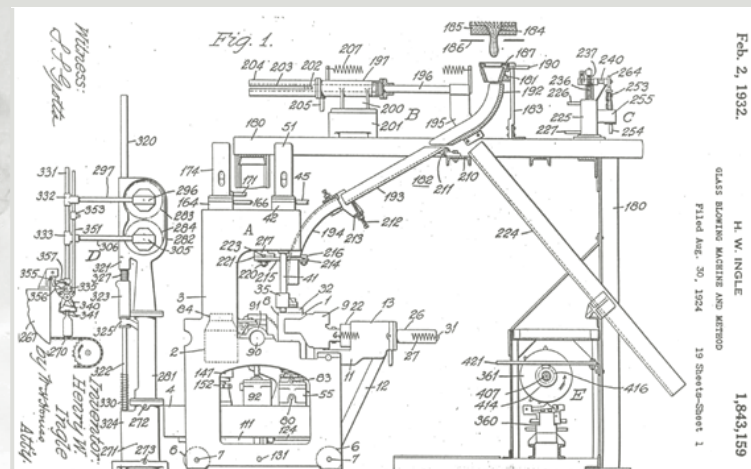
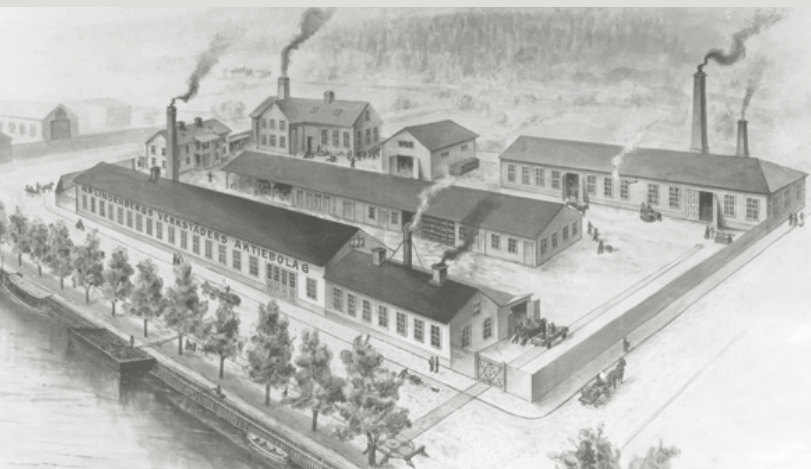
1932 Hartford-Empire introduces a continuously rotating paste-mold machine, allowing glassmakers to manufacture seamless tableware.

1940 The first double-gob equipment is introduced.

1945 The HE-74 check inspector is introduced, and inspection research is made a priority.

1951 A new name, Emhart Manufacturing Company, reflects an ambition to explore new directions.

1954 The first six-section IS machine is introduced, along with the HE-127 automatic finish check inspector.



1968 The first triple-gob machine is introduced.

1970 The first eight-section double-gob machine hits the market, delivering a 30% improvement in productivity.

1972 A ten-section double-gob machine with modular sections is introduced.

1974 Emhart Glass ships its 1000th IS machine and launches its innovative 516 electronic control system.

1977 The first Advanced IS machine - AIS is installed.

1980 Emhart Glass' first total machine AIDA (Automatic Inspection Defect Analysis).

1982 Emhart Glass acquires Powers Manufacturing Inc. and begins producing Total Inspection Machines TIM.

1985 The VertiFlow mold cooling system is introduced, almost doubling production speed and enhancing product quality and strength.

1986 Emhart Glass introduces its FlexLine system, allowing glass producers to make rapid changes to the number of IS sections being used.

1990 Emhart Glass launches innovations including servo-electric parallel shears, an improved 555 servoelectric feeder system, the T600 LAN forming control system, the 560 servo-electric pusher and pocket air fingers for pusher mechanisms.

1998 Emhart Glass is acquired by Bucher Industries of Niederweningen, Switzerland.

2000 The next generation IS machine, NIS, is introduced, delivering up to 4.2% higher cycle rates, reducing workout times by half and increasing mold life by up to 20%.

2005 NIS becomes available in a quad-gob configuration.

2008 Emhart Glass opens a completely new, state-of-the-art production center at Johor Bahru, Malaysia.

2010 FleXinspect, a comprehensive and modular inspection technology, is launched.

2011 Emhart Glass finalizes a joint venture with Shandong Sanjin Glass Machinery Co. of China.

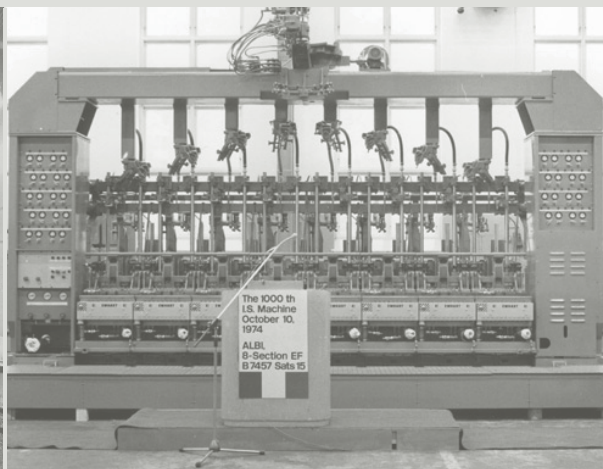
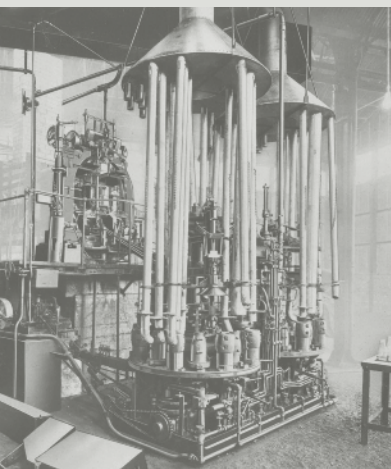
2012 BIS, a highly flexible new configuration of the industry-standard IS technology, is introduced.

2012 First hard glass line is installed. ProLab, a hot end measurement system and FlexRadar are announced.

2013 Emhart Glass becomes Bucher Emhart Glass to emphasize our connection with the Bucher Group, an industrial leader with a clear vision for the future.

2016 End to End and Scout Inspection Technology launch.

2018 Full takeover of Sanjin Glass Machinery China.



Emhart Glass Worldwide Presence

Principal

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