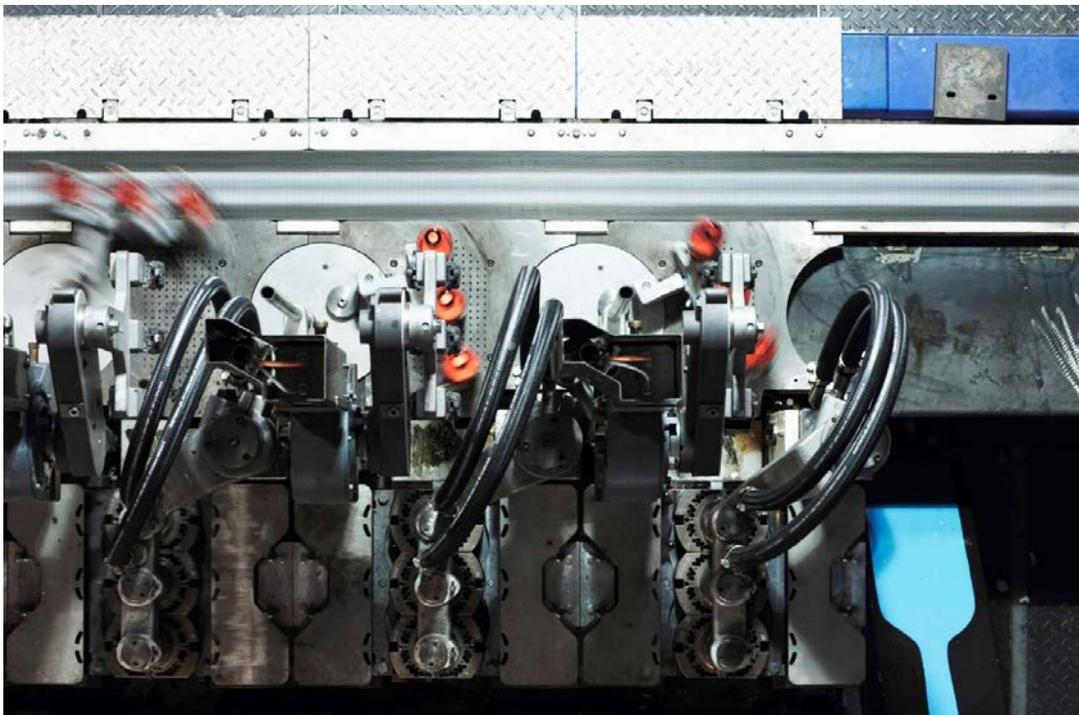


Technical News Bulletin

Steinhausen, February 2008



FlexPusher

- Available on all our machine configurations providing precise and flexible hot end container transportation.
- Flexible Pusher Finger concept with exchangeable liners and highly efficient vertical pocket air.
- No bottle air guide required for standard applications.

Introduction

Constantly increasing production speed and larger machines move the production speed limitation more towards the ware handling. 12 Section Quadruple Gob (QG) machines with an output of up to 800 containers per minute are real challenges for every ware handling system.

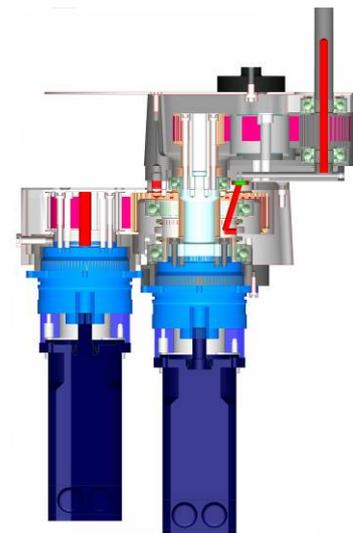
Rising demands for flexibility and increasing numbers of container designs increasing the complexity for the stable ware handling. One of the main components of the hot end ware handling is the pusher mechanism on the IS machine.

Emhart Glass developed a new pusher coping with these rising demands and provides more stability in the entire ware handling. The FlexPusher is available on all our machine configurations providing precise and flexible hot end container transportation.

Specification

The motion of the FlexPusher is generated by high dynamic servo motors, all the pneumatic motion as been eliminated. The high level of repeatability is achieved by the use of 2 servo drives per pusher mechanism. The motor and the drive are standard FlexIS components already used on other mechanisms.

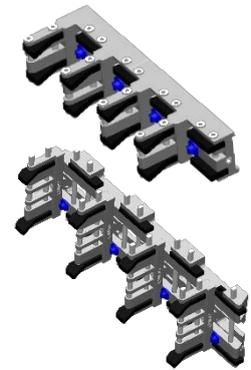
The unique motion of the FlexPusher uses all available space on the dead plate for a smooth sweep out motion. The motion of the pusher determines the placement of the containers on the belt which is the main factor on the performance on the downstream ware handling. Precise placement of the containers by the pusher also reduces losses at the ware transfer, the stacker, and the hot end coating tunnel.



The FlexPusher is available for SG – DG – TG and QG operations on SIS, IS, AIS and NIS machines with the Emhart Glass Universal Conveyor. The controls are fully integrated into the FlexIS process control system using common motor and control components.

The FlexPusher consists of an upper rotating arm driven by a servo motor, and a pusher finger support shaft rotated by a second servo motor. Each servo motor has a planetary gear unit based on top of it. Each gear unit drives a belt transmission that provides the actual pusher mechanism motion. The motors and the planetary gear boxes are identical which makes spare part handling more easily. The pusher finger is connected with the mechanism trough the finger bracket. The pusher mechanism is universal for SIS, IS, AIS and NIS machines as well as left hand LH and right hand RH.

The pusher fingers contribute to large extent to the overall performance of the entire pusher system. The FlexPusher has a very flexible finger concept for IS, AIS and NIS machines which allows adopting the finger shape to the different containers in a simple way. The pusher finger itself is a skeleton which provides mounting possibilities for the finger liners in different heights. The finger liners itself are small, inexpensive parts designed to guide the container during the sweep out. The vertical pocket air can enforce the guiding of the fingers by an air stream behind the containers holding them in place during the sweep out. The air stream of the pocket air must be as close as possible to the container to guarantee a high efficiency. Different lengths of pocket air nozzles are available to match different container diameters. The vertical pocket nozzles are attached to the backplane which allow a very flexible finger design without restrictions of the pocket air application through the finger. At the beginning of the sweep out motion the pusher finger moves around the container and collects them into the pockets therefore no guide air is required with the FlexPusher for standard applications.



Operation Principles

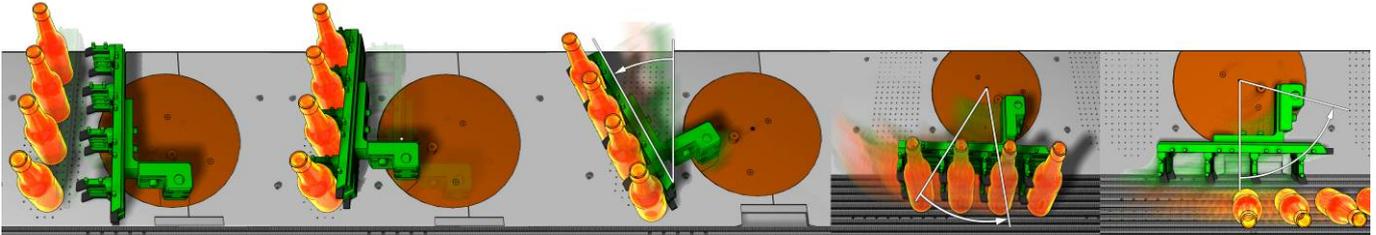
The FlexPusher mechanism combines the motion of two independent servo motors to generate the sweep out motion. The motion can be modified by changing parameters on the pusher page of the FlexIS or accordingly on the screens of the FlexIS standalone Controller.

The mechanism is mounted on the conveyor below the dead plate level. This is protected position for the mechanics which reduces the exposure to heat radiation. Only the Pusher Fingers are above the dead plate. A calibration guard is mounted on the dead plate which is required for the calibration of the mechanism. This guard is required in any case, as calibration does not work without this part.

The sweep out cycle starts with the extent motion where the fingers move from the home position to the position where they receive the containers from the take out. After the start of the push out, the fingers are moving around the containers to collect them and place them correctly in the pockets of the finger. The FlexPusher then rotates the containers already on the dead plate as much as possible in belt direction. This motion requires all the space which is available on the dead plate. This has the benefit of a higher precision in the placement of the containers on the belt without the demand for guide air. This motion does not compromise any dead plate cooling time of the container.

The performance with a 150mm wide belt is superior compared to a 180mm wide belt therefore 150mm wide belts are strongly recommended. The 150mm belt provides more space on the dead plate to turn the containers which gives optimum ware handling performance.

The FlexPusher mechanism has life time lubricated bearing and does not need to be connected to a central lubrication system. The mechanism is maintenance free while the transmission belt for the finger and the arm should be visually checked every 12 month.



Specification

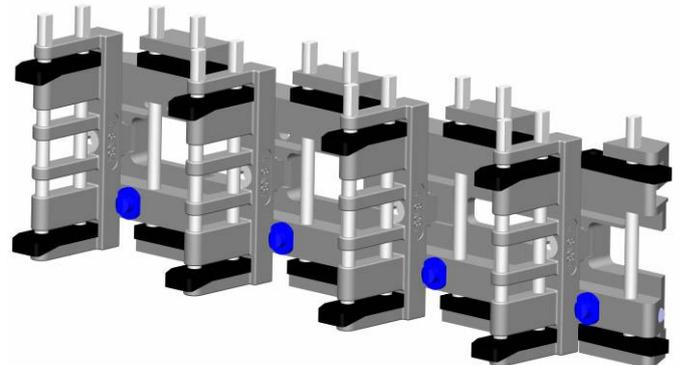
The FlexPusher mechanism is the same assembly for LH and RH. A LH mechanism can be converted to RH and vice versa with no additional parts. The basic mechanism is identical for SIS, IS, AIS and NIS. Pusher fingers, pusher mounting brackets, calibration guards and dead plates are different for each machine configuration and must be selected accordingly.

The Pusher Fingers is available in a large variety of setups for SG, DG, TG and QG. The fingers for SIS machines are available in 80mm height while the fingers for IS, AIS and NIS are available in 116mm height and for most of the setups also in 50mm height (see chart).

The Finger is mounted with a bracket to the mechanism. This bracket is identical for SIS IS, AIS and NIS as well as LH and RH for tall fingers (116mm). For small ware the fingers (50mm) mounting bracket is the same for IS, AIS and NIS but different for LH and RH.

Machien Type	Mold Spacing	Belt Advance	Finger Spacing	Finger Height
IS	4 1/4 DG	7 7/8	3 15/16	50 and 116
		10 1/2	5 1/4	116
SIS		7 7/8	3 15/16	80
		10 1/2	5 1/4	80
IS	5" DG	7"	3 1/2	50 and 116
		8 3/4	4 3/8	116
		10 1/2	5 1/4	116
SIS		7"	3 1/2	80
		8 3/4	4 3/8	80
		10 1/2	5 1/4	80
IS	5 1/2 DG	10 1/2	5 1/4	116
SIS		10 1/2	5 1/4	80
IS/AIS	6 1/4 DG	10 1/2	5 1/4	116
		13 1/8	6 9/16	116
SIS		10 1/2	5 1/4	80
		13 1/8	6 9/16	80
NIS		11 1/4	5 5/8	116
IS	3" TG	9"	3"	50 and 116
		10 1/2	3 1/4	50 and 116
		10 1/2	3 1/2	50 and 116
IS	85 TG	10 1/2	3 1/2	50 and 116
IS/AIS	4 1/4 TG	7 7/8	2 5/8	50 and 116
		8 3/4	2 59/64	50 and 116
		11 13/16	3 7/8	50 and 116
		13 1/8	4 3/8	50 and 116
NIS	5" TG	11 1/4	3 3/4	50 and 116
		15"	5"	116
NIS	95 QG	9 3/8	2 11/13	50 and 116
		11 1/4	2 13/16	50 and 116
		12"	3"	50 and 116
		14 1/16	3 33/64	50 and 116
		15"	3 3/4	50 and 116

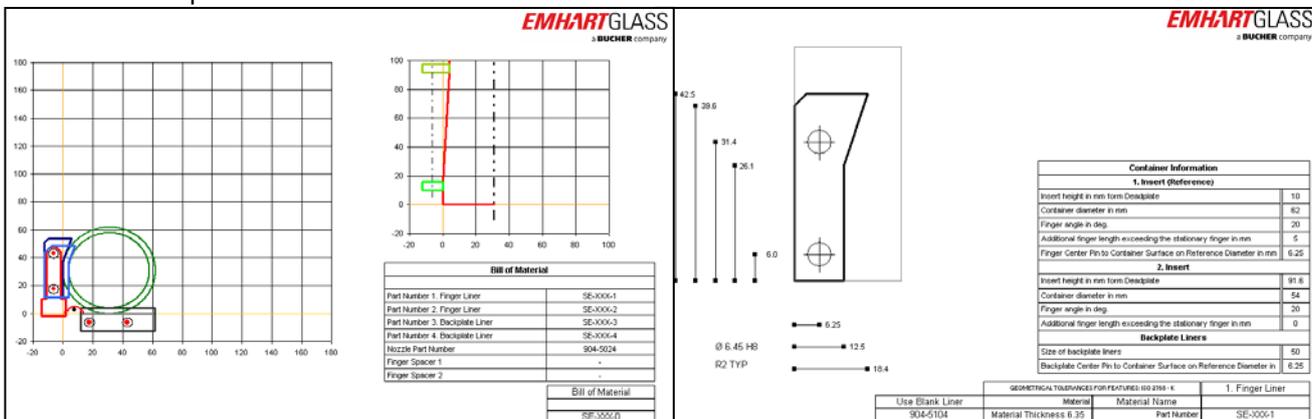
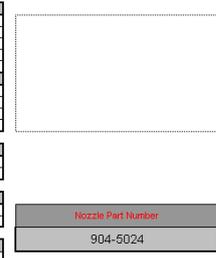
The Finger skeleton needs to be equipped with Finger Liners. These small carbon parts guarantee a precise container guiding during the sweep out. The finger liners together with the corresponding pocket air nozzle are available as packages. One set provides the parts required for one cavity for a certain container diameter including pocket air nozzle with screw, 2 back plate liner, 2 finger liner and finger spacers if required. (see following chart)



Container Diameter	29	34	39	44	48	53	57	62	64	69	74
Diameter Range	25-29	30-34	35-39	40-44	45-49	50-53	54-57	58-62	63-64	65-69	70-75
Container Diameter	80	85	90	96	102	110	121	128	134	-	-
Diameter Range	76-80	81-85	86-90	91-96	97-102	103-110	111-121	122-128	129-135	136-167	168-178

High speed ware handling and handling of complex shaped containers require special pusher fingers. The finger liner design tool has been developed to support the design of the finger liners for round cylindrical and non cylindrical containers. Non cylindrical containers require the support of different body diameters in different heights. The tool can also used to design finger liners dedicated for one container to improve the ware handling especially on high speed lines. The finger liner design tool is available on request.

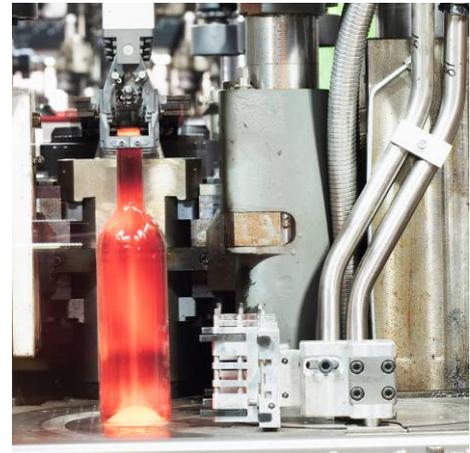
ADOPTION OF THE FINGER LINER TO THE CONTAINER	
Reference drawing: 904-5024, PUSHER FINGER LINER AND NOZZLE SELECTION CHART	
1. Insert (Reference)	
Insert height in mm form Deadplate	10
Container diameter in mm	62
Finger angle in deg.	20
Additional finger length exceeding the stationary finger in mm	5
Finger Center Pin to Container Surface on Reference Diameter in mm	6.25
2. Insert	
Insert height in mm form Deadplate	91.6
Container diameter in mm	54
Additional finger length exceeding the stationary finger in mm	0
Backplate Liners	
Size of backplate liners	50
Backplate Center Pin to Container Surface on Reference Diameter in mm	6.25
Common Finger Information	
Finger Spacing in mm	0
Finger Spacing	± 2 13/16
Pocket Air Nozzle	
Length of Pocket Air Nozzle	5
Container Type	
Finger Liner Material	Material Name
Bill of Material	
Part Number 1. Finger Liner	SE-0001
Part Number 2. Finger Liner	SE-0002
Part Number 3. Backplate Liner	SE-0003
Part Number 4. Backplate Liner	SE-0004
Finger Spacer 1	-
Finger Spacer 2	-



The FlexPusher is available fully integrated into the FlexIS offering all benefits of a modern control system with standardized components and centralized functions like job handling, alarm handling and machine and section setups.

The FlexIS standalone is offering the possibility to upgrade existing machines with the FlexPusher and to interface different, non FlexIS, timing systems.

Firing orders for belt advance 10 ½ and larger must be checked to ensure the performance of the FlexPusher. The FlexIS provides these firing orders for machines with FlexPusher. For machines equipped with FlexPusher and FlexIS standalone the host timing system must also run with these FlexPusher complying firing orders.



Emhart Glass universal conveyor supports the FlexPusher with special designed wind boxes and dead plates. New machines with FlexPusher will always delivered with the Universal Conveyor. Upgrades of existing machines with the FlexPusher also require the Universal conveyor. This makes such conversions quicker and reduces the risk of unforeseeable interference and ensures a low number of interfaces which need to be checked.

The following tools are required for the FlexPusher for transmission belt tensioning and lifting:

- 94-461-01 Finger belt tensioning gauge
- 94-461-02 Arm belt tensioning gauge
- 94-4860 Tensioning lever
- 1180-3641 Lifting eye bolt

Features / Benefits

- Push-out motion created by two dynamic servo axis for single, double, triple and quad applications
- Entire pusher motion without pneumatics
- FlexPusher controls are fully integrated into the FlexIS process control system with standardized components
- FlexPusher with FlexIS standalone for machine upgrades
- Flexible Pusher Finger concept with exchangeable liners and highly efficient vertical pocket air
- No bottle air guide required for standard applications
- No mechanism lubrication required