Heading for an innovative future
Annealing lehrs | Tin bath equipment for glass applications
As market leader, CNUD-EFCO offers you state-of-the-art technical solutions in terms of both engineering and equipment for forming and annealing glass.
Energy savings, higher performance and added value products are driving the glass industry today. With our experienced team, we want to assist our customers to address these challenges and to offer reliable equipment and services that meet their standards. As a world leader, we want to distinguish ourselves by providing trustworthy equipment but, even more importantly, by guaranteeing a process. At all times, we strive to improve quality, lead times and share our technical knowledge. Based on a strategy of innovation and product development and a constant desire to exceed customers’ expectations, CNUD-EFCO is committed to serving the glass industry. The CNUD-EFCO team and I want to share our mission and vision with you.

Our mission
CNUD-EFCO optimises the process of forming and annealing glass for glass manufacturers. We offer high-quality technical solutions in terms of both engineering and equipment, enabling our customers to successfully introduce new products and applications and to develop a higher profile in the global glass market. This way we constitute a beacon of knowledge our customers can always rely upon.

Our vision
In an environment where energy is becoming scarce, CNUD-EFCO wishes to further develop the process of forming and annealing glass with a view to offer the optimum technical solution to its customers in their development of innovative high-tech glass products and applications. CNUD-EFCO wants to expand its portfolio with extra equipment and services it will develop and manufacture in order to consolidate its global leadership position.
For many years, our aim has been to develop high-level solutions for the thermal treatment of glass, including research, design, construction and maintenance. CNUD-EFCO has the ambition to remain the preferred engineering and solution provider. Particularly as for the tin bath and annealing lehr, we would like to remain the leading reference in the float glass industry.

We have implemented more than 300 installations worldwide, including both lehrs and roofs. Altogether, these installations process:

- More than 160,000 tons of glass per day;
- More than 58 million tons of glass per year;
- More than 3,300 km of glass per day, i.e. approx the earth circumference, every 12 days;

Based on its experience in the hollow glass industry, CNUD decided to introduce a steel lehr for rolled glass, an important innovation that has led to valuable advantages for the float industry. Not only was the construction lighter than what existed at that time, it also led to better control over the process, a better yield and a significant increase in performance. CNUD's invention was soon applied to other types of glass manufacturing. Today, the company claims to possess the knowledge of annealing of various types of glass, a feat we are very proud of.

CNUD-EFCO owes its market share to a pioneering role in the second half of the last century, when the float process was developed, and to the merger of 2 well-known references in the glass world. This leading position worldwide is nothing else than the consequence of vigorous business growth. EFCO Ltd, founded in Weybridge (UK) in 1928, and CNUD, created in Brussels (Belgium) in 1957, are pioneers in the thermal treatment of glass. Since the invention of the float process in the early 1960s, they have been at the origin of the very first steel lehr and the first roof for the float glass market: innovations that have changed the glass industry.

EFCO's contribution to the history of glass manufacturing is equally important. When Pilkington introduced the float glass process, the company asked EFCO in its capacity of furnace supplier to develop the technology for the tin bath roof, an essential part of the float glass line. The quality of the roof is strongly related to the quality of the forming process. The world's major manufacturers of float glass have consulted EFCO on the tin bath roof design. Those years of experience have earned EFCO its current technological leadership.

After being taken over in the 90's by the BMT group, CNUD-EFCO International and F.I.C. in Penzance (Great Britain) today form the glass engineering division of the group. Taking into account our rich history, we are determined to undertake new challenges to bring our business to a higher level within BMT.
**Services**

Research and development
Thanks to years of investment in research and development, CNUD-EFCO is capable of calculating any lehr configuration for float or rolled glass projects. The annealing of about 90% of all windows (coated or uncoated), glass floors, glass walls, windscreens, LCD screens, and (smart)phone screens has been calculated by our R&D department. We are continuously in search of solutions to reduce energy consumption and to integrate TCO on line coating with an optimal lehr length. The future CNUD-EFCO lehr may generate electricity instead of consuming it and provide perfect annealing at the same time. The same applies to the tin bath roofs; we continue to innovate in order to improve the performance and lifetime of the roof, whilst facilitating the installation and the execution of repairs.

Design
CNUD-EFCO has developed its engineering capacities over the years and has extensive know-how of how to optimise and improve the design of the offered equipment. It comprises a team of designers both in Brussels, (Belgium) and in Iasi, (Romania) for conceptual design and fabrication drawings. The drawings are based on the input of the customer and the thermal calculations of the R&D department, which are translated into conceptual, fabrication and mounting drawings. Today's vision is to migrate almost completely to 3D drawings for its lehrs and mechanical drives, which will allow to respond to the demands of the customers to present an overall integrated view within short delivery times.

Engineering
Our team consists of experts in the field of projects, project management, logistics, purchasing and installation. From purchase orders to final hot tests and glass pull, our team will closely look after your projects and train your people at start-up to ensure maximum yield. Key milestones include kick-off meetings, placing of & follow-up on orders, continue to innovate in order to improve the performance and lifetime of the roof, whilst facilitating the installation and the execution of repairs.
factory acceptance tests, delivery to site, installation supervision and assistance for tests and glass pull. You can rest assured that our project and supply chain team will give you their utmost support for the full duration of your project.

**Construction**
With workshop facilities of over 10,000 m², CNUD-EFCO’s manufacturing plant in Iasi (Romania), has the skills and know-how to manufacture annealing lehrs, driving mechanisms, pattern glass lines, etc. Located nearby a renowned university, the site in Iasi offers to CNUD-EFCO skilled and competent engineers. By having its own factory, CNUD-EFCO is able to meet the expectations of its customers in terms of quality and competitiveness.

The factory boasts impressive machinery: a 200 A plasma cutting machine, a laser cutting machine, a CNC bending machine, MIG-MAG and TIG welding appliances… As a global player, CNUD-EFCO also uses manufacturing facilities in Asia and in Latin America.

**Technical assistance**
Each project has a dedicated project engineer and a team of supervisors. They guarantee the timely and perfect assembly of the equipment according to the CNUD-EFCO quality standards.

They supervise the tests and the start-up in line with good practice and with respect for the safety instructions. Finally, they make sure to deliver a reliable installation in accordance with the process guarantee.

**Process support**
We would like to put our know-how at your service to optimise the float glass process and to support you in the development of new products. By choosing CNUD-EFCO, you can benefit from years of experience of the market leader to guarantee your process and to maximise the return of your investment.
Markets

Architectural

Automotive
SolAr furniTure
HOLLOW GLASS

FOAM GLASS
The CNUD name is associated with annealing lehrs for the hollow, flat and float glass industry. The first lehrs were built in 1957 to respond to the demands of the hollow glass industry. A few years later the company introduced the concept of a steel construction for flat and float glass production. This innovation offers the flat and float glass industry better control over the process and a spectacular increase of the yield in comparison to brick annealing lehrs. Annealing is a critical phase of the float glass production cycle. If not properly annealed, the glass will develop stresses due to uncontrolled cooling. This will lead to glass breakage and a reduced yield. The CNUD annealing lehrs are known worldwide for their high performance and for their flexibility in operation.

**Float glass**
Thanks to our reliable equipment and our internationally recognised glass annealing technology, our lehrs are perfectly capable of optimising the ribbon cooling curve for ribbons between 2 and 5.2 m wide with a thickness varying from 0.3 to 25 mm. CNUD-EFCO’s know-how is applied to clear glass, coloured glass, reflective glass, Low-E glass, electronic glass, aviation glass …

**Pattern glass**
The CNUD-EFCO equipment for the production of patterned glass is designed to treat between 50 and 180 TPD of glass and can achieve a ribbon width between 1.2 and 2.7 m with thicknesses ranging from 2 to 15 mm.

**Driving mechanism**
Thanks to its expertise in gear technology and heat treatment and its machining facilities, CNUD-EFCO offers drive mechanisms for flat and float glass lines which meet our customers’ toughest criteria for longevity and accuracy. The drive mechanisms are designed to cover a speed range from 1 to 25 m/min and to minimise installation time and maintenance. The driving arrangements are determined according to the specific requirements of the customer.

**Power cabinet and speed variation systems**
CNUD-EFCO’s annealing lehrs can be fitted with a power cabinet to provide highly accurate control over the heating and the cooling pattern. This high accuracy will help the customer to stabilize the flatness and the stress of the glass. The speed variation system offers tight control over the ribbon speed and delivers a signal to the cutting line.
**Technical details**

**Float glass**
- Tonnage range: 50 to 1000 TPD
- Ribbon width range: 2 to 5.2 m
- Thickness range: 0.3 to 25 mm

**Pattern glass**
- Tonnage range: 50 to 180 TPD
- Ribbon width range: 1.2 to 2.7 m
- Thickness range: 2 to 15 mm

**Driving mechanism**
- Number of main drives: 2 or more
- Main drive power: from 7.5 kW to 30 kW
- Main drive speed: 1,500 rpm
- Maximum speed: about 25 m/min
- Minimum speed: about 1 m/min
- LOR drive: LOR box configuration or individual drives
- Pony drive: optional
- 100% redundant configuration

**Electrical cabinets**
- Cooling cabinets
  - Starters: \(\Lambda/\Delta\) configuration
  - Inverters configuration
- Heating cabinets
  - Thyristor units
  - Optional: Profibus
- Voltage: according to the local standard
Tin bath roof

From its early collaboration with Pilkington in the design of the tin bath roof in the late 1950s, CNUD-EFCO has worked tirelessly to ensure that the high standards set by the Pilkington pioneers are still maintained today. Over 300 successful roof installations have been put into service worldwide, with some installations now entering their 5th campaign. It is a testament to the design and quality of the materials used for the construction.

Over the years CNUD-EFCO has developed and improved the design of the roof, the most notable improvement being the change from single module to double module, which is applied in all roof designs today.

CNUD-EFCO’s team of experienced engineers will support you from the very early design stage to the completion of the installation, offering guidance and advice.

The roof is mounted on top of the bath of molten tin to provide heat to melt the tin, and provides heat where required and delivers an inert atmosphere above the glass during production.
Main characteristics

- 3.8 m to 6.7 m narrow section width
- 4.3 m to 8.6 m wide section width
- 7 to 24 bays long
- 1.5 to 7.5 megawatts heating capacity
- 24 to 54 heating zones

Applications: Electronic glass (ultra thin glass); architectural glass and automotive glass
Bath accessories

Through constructive dialogue with its customers, CNUD-EFCO has also developed a new generation of bath equipment. Today CNUD-EFCO can assist any glass manufacturer in the glass-forming process as well as in the annealing process. CNUD-EFCO is capable of producing and installing all equipment between the furnace and the cutting line: a guarantee of success.

Top rollers
CNUD-EFCO top roller machines are compact and do not require a lot of installation space. They include the latest up-date communication system between the machine and the control room to assist the operators in the glass-forming process. They offer a very high accuracy combined with easy maintenance and guarantee good formation of your glass ribbon. CNUD-EFCO top roller machines are used for the production of architectural, automotive and electronic glass ribbons.

Dross box
CNUD-EFCO’s dross boxes are interface devices between the tin bath and the annealing lehr that contribute to the smooth transition of the ribbon inside the lehr. CNUD-EFCO offers a non-flanged bearing design that suppresses any stress on the lift-out rollers during the expansion of the dross box at high temperature and protects the caps of ceramic lift-out rollers against hot temperatures. An innovative push carbon system avoids the usage of springs.

Tweel
The tweel manufactured and installed by CNUD-EFCO allows accurate control over the flow of the glass in the tin bath.

Coolers
The coolers developed by CNUD-EFCO are manual or motorized and the high-quality construction guarantees longevity.

Cameras
The tin bath is fitted with cameras in order to assist the operator in the positioning of the top roller machines inside the tin bath so as to control the movement of the ribbon.
**Top roller machines characteristics**

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| **Knurl rotation** | • Powered by brushless motor of 1.1kW and controlled by one inverter  
• Linear speed range: 0 to 25 m/min  
• Accuracy: 0.002 m/min  
• Water flow detector on each water circuit |
| **Penetration** | • Powered by an asynchronous motor 0.25 kW and controlled by one inverter  
• 2 pre-selected speeds:  
  • High speed for approach  
  • Low speed for correction  
• Auxiliary manual command  
• Feedback signal of position by encoder  
• Position accuracy: ± 0.1 mm  
• Penetration inside the bath: according to tin bath width |
| **Slew** | • Powered by an asynchronous motor 0.25 kW and controlled by one inverter  
• 2 pre-selected speeds:  
  • High speed for approach  
  • Low speed for correction  
• Auxiliary manual command  
• Position accuracy: ± 0.1°  
• Rotating range: -20° till + 20°  
• Feedback signal of position by encoder |
| **Vertical** | • Powered by asynchronous motor of 0.25 kW with inverter without brake and controlled by encoder  
• Feedback signal of position by encoder  
• 2 pre-selected speeds:  
  • High speed for approach  
  • Low speed for correction  
• Auxiliary manual control  
• Position accuracy: ± 0.1 mm  
• Stroke: 100 mm |
| **Pressure (Nip-on/ Nip-off)** | • Powered by an asynchronous motor 0.25 kW and controlled by one inverter  
• 2 pre-selected speeds:  
  • High speed for approach  
  • Low speed for correction  
• Manual command  
• Position accuracy: ± 0.1 mm  
• Stroke: 0 to 225 mm  
• Feedback signal of position by encoder  
• Quick nip-off by pneumatic cylinder |
Our Services
Production process
In the float process, molten glass from the melting furnace is poured onto the surface of an enclosed bath of molten tin in a controlled atmosphere. The glass forms a continuous ribbon floating along the bath. The natural thickness of the glass ribbon, which forms as it floats on the tin under the combined natural forces of surface tension and gravity, is adjusted to the desired thickness by means of temperature control and mechanical forces. The flat glass subsequently enters the annealing lehr. The process gradually cools the molten glass to reduce mechanical stress and potential for cracking as it travels through the length of the lehr. The flat glass must then be processed further depending on its specific use in architectural, automotive or other applications.
Experience working with the market leader

We listen to our customers. Thanks to our experience we are able to provide reliable solutions that meet your needs.

Our proactive service enables us to develop innovations through constructive dialogue.

We invest in R&D in order to find solutions that increase your yield and minimize your energy consumption.

Our approach is flexible: at all times, we work on customized solutions in the most competitive way with the best material and a dedicated team.

We are capable of providing trustworthy solutions. As market leader we are determined to continue to demonstrate that we deserve our leading position in the worldwide market.

CNUD-EFCO is a result-oriented organization: we are convinced that our technology and equipment provide you with the results you require.
## Total number of float lines

### Africa pcs
1. Egypt 1
2. South Africa 1

### Europe pcs
20. Belarus 1
4. Belgium 7
5. Bulgaria 2
6. Czech Republic 3
7. Finland 1
8. France 5
9. Germany 12
10. Hungary 1
11. Italy 8
12. Luxembourg 2
13. Netherlands 1
14. Poland 4
15. Portugal 1
16. Romania 1
17. Russian Federation 10
18. Spain 5
19. Sweden 1
20. Turkey 8
21. United Kingdom 7

### Asia pcs
22. India 4
23. Pakistan 1
24. Taiwan 3
25. Uzbekistan 1

### North America pcs
26. Canada 3
27. Mexico 4
28. U.S.A. 41

### South America pcs
29. Argentina 1
30. Brazil 6
31. Colombia 2
32. Chile 1

### Far East pcs
33. China 50
34. Indonesia 5
35. Japan 6
36. Malaysia 2
37. Philippines 1
38. South Korea 11
39. Thailand 4
40. Vietnam 2

### Middle East pcs
41. Iran 5
42. Saudi Arabia 1
43. Syria 1
44. United Arabian Emirates 1

### Oceania pcs
45. Australia 2
REFERENCES

A.O. Kvartz
AGC
Arabian United Float Glass Co.
Ardakan Float Glass Co.
AVIC
Cardinal FG
Caspian Float Glass
CDGM Glass Co.
China Luoyang Float Glass Group
China Yaohua Glass Group
CSG Holding Co.
CTIEC - China Triumph International Engineering Co.
Daming Group
DTEC
Ducatt
Emirates Float Glass
Euroglas
Flovetro
Fuyao Group
GFT - German Float Technology
Ghazvin Glass
Gomel Glass
Guangdong Yufeng Glass Group
Guardian Industries
HFT - Henry F. Teichmann
HNG Float Glass Co.
Horn Glass Industries
Intex Glass (Xiamen) Co.
Kaveh Glass Industry Group
KCC E&C
Khawaja Group
LG Chem
Liya Glass
Muliaglass
Nippon Electric Glass Co.
NSG Group
Pony International
PPG Industries
Qinhuangdao Aoge Group
Sahand Industrial Group
Saint-Gobain
Salavatsteklo
Samsung Corning Precision Materials
Sangalli Group
Saratovstroysteklo
Schott
Shandong Glass Group
Shenzhen Southern Float Glass Co.
Sisecam
Sphinx Glass
Taiwan Glass
TECO - Toledo Engineering Co.
Tossa Shakti Group
Vitro
Xinyi Glass Holdings