CONTAINER GLASS INDUSTRY 4.0 - PROCESS CONTROL 2025
1. Verallia – The Glass Alliance
2. What does it mean: Industry 4.0?
3. What does it mean for the Container Glass Industry?
4. The new Paradigm
5. The Journey is the Target
VERALLIA DEUTSCHLAND AG

at a glance
COMPANIES & SUBSIDIARIES OF VERALLIA DEUTSCHLAND AG

Container glass - Processing
- Plant Bad Wurzach
- Plant Neuburg
- Plant Essen
- Plant Wirges

Processing recycling glass (SAR)
- Bad Wurzach

JSC „Kavminsteklo“
Mineralnye Vody, Russland

ZAO Kamyshinsky Steklozarny Zawod
Kamyshin, Russland

Private JSC ,CONSUMERS SKLO-ZORYA`
Rivne Oblast, Ukraine
# HISTORY OF VERALLIA DEUTSCHLAND AG

<table>
<thead>
<tr>
<th>Event</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation of „Oberland GmbH“ as „peat-glassworks“ to manufacture of household-preserve-jars; some years later than first production of bottles for beverages</td>
<td>1946</td>
</tr>
<tr>
<td>Dr. Wiegand becomes associate and sole CEO</td>
<td>1956</td>
</tr>
<tr>
<td>Purchase of Neuburg Plant by Veba Glas AG, Essen</td>
<td>1983</td>
</tr>
<tr>
<td>The Oberland Glas share is floated to the stock exchange</td>
<td>1986</td>
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<tr>
<td>The Oberland Glas AG assumes the business activities of Ruhrglas GmbH, the Westerwald AG for the silicate industry and the Westerwald Glasstein GmbH</td>
<td>1994</td>
</tr>
<tr>
<td>The Compagnie de Saint-Gobain holds 96.7 % of the capital stock and renaming into Saint-Gobain Oberland AG</td>
<td>1998</td>
</tr>
<tr>
<td>Increase of the shares in Kavminsteklo to 60 % and acquisition of 80 % in the glass factory Consumers-Sklo-Zorya, Rivne Oblast, Ukraine</td>
<td>2005</td>
</tr>
<tr>
<td>Acquisition of more than 90 % of the shares of the glasswork ZAO Kamyschinsky Steklozarny Zawod in Kamyschyn, Russia</td>
<td>2008</td>
</tr>
<tr>
<td>Launching of the brand VERALLIA for the packaging branch of Saint-Gobain, symbol for a strong identity on the international market</td>
<td>2010</td>
</tr>
<tr>
<td>Transition of the whole VERALLIA-Group to ownership by the investors Apollo Global Management LLC and Bpifrance</td>
<td>2015</td>
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<tr>
<td>Brand name changes to company name: Verallia Deutschland AG</td>
<td>2016</td>
</tr>
</tbody>
</table>
PRODUCTION SITES

- Verallia Deutschland AG
- Wirges
- Essen
- Bad Wurzach
- Neuburg
- Zorya
- Kavminsteklo
- Kamyshin
## PRODUCTION SITES IN GERMANY

<table>
<thead>
<tr>
<th>Site</th>
<th>Furnaces</th>
<th>Lines</th>
<th>Employees</th>
<th>Trainees</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bad Wurzach</td>
<td>3</td>
<td>9</td>
<td>330</td>
<td>23</td>
<td>With headquarter and recycling glass processing</td>
</tr>
<tr>
<td>Neuburg</td>
<td>2</td>
<td>6</td>
<td>273</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Essen</td>
<td>3</td>
<td>9</td>
<td>354</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Wirges</td>
<td>2</td>
<td>5</td>
<td>213</td>
<td>19</td>
<td></td>
</tr>
</tbody>
</table>
FURTHER SITES

Kavminsteklo (RU)
- Furnaces: 2
- Lines: 6
- Employees: 559

Kamyshin (RU)
- Furnaces: 3
- Lines: 10
- Employees: 630

Zorya (UA)
- Furnaces: 2
- Lines: 6
- Employees: 557
PRODUCTION PROGRAM

Wine & Sparkling Wine  Beer  Spirits  Fruit Juices  Water & Soft Drinks  Dairy Products
PRODUCTION PROGRAM

- Oils & Vinegars
- Delicacies
- Instant
- Jams, Jellies & Honey
- Babyfood
- Vegetables & Fruits
Industry 4.0 is not a new invention but a new heading, drawing attention to a rapid process, which brings a change of paradigm for the glass industry:
The glass maker with know-how will be more and more replaced by the process engineer/technician with know-why.

The basic idea is to create a computerized twin of the real process, functioning as a bidirectional system. On one hand it constantly saves and evaluates measured data from the real process. On the other hand it suggests or (automatically) executes further actions based on the past evaluations. This will lead to a self-learning process network: a real expert system.

The main aim is to obtain fully automatized processes at a maximum level of speed and quality while keeping a high flexibility.

The technical base for that is a perfect pyramid of automation in all its levels combined with data acquisition and reporting systems fully connected with process model systems.
GLASS AND GLASS TECHNOLOGY – A LONG HISTORY
COMPLEXITY AND ADDED VALUE

THE FOUR INDUSTRIAL REVOLUTIONS

FIRST [1784]
Mechanical production, railroads, and steam power

SECOND [1870]
Mass production, electrical power, and the advent of the assembly line

THIRD [1969]
Automated production, electronics, and computers

FOURTH [NOW]
Artificial intelligence, big data, robotics, and more to come

Complexity
WIE UND VON WEM IST INDUSTRIE 4.0 DEFINIERT?

Wiki: (engl. / deutsch)

Industry 4.0 is the current trend of automation and data exchange in manufacturing technologies. It includes cyber-physical systems, the Internet of things and cloud computing.[1][2][3][4]

Industry 4.0 creates what has been called a "smart factory". Within the modular structured smart factories, cyber-physical systems monitor physical processes, create a virtual copy of the physical world and make decentralized decisions. Over the Internet of Things, cyber-physical systems communicate and cooperate with each other and with humans in real time, and via the Internet of Services, both internal and cross-organizational services are offered and used by participants of the value chain.[1]
WHAT COMPONENTS BELONG TO INDUSTRY 4.0?

- Cloud Computing
- Big Data
- Automation (Industry 3.0)
- IT-Security
- Smart Factory
- Business Modell
- IoT Internet of Things
- Cyber Physical Systems
TO MAKE IT MORE PRECISE FOR OUR GLASS INDUSTRY

- Container Glass Industry 4.0
- IT-Security
- E-Commerce
- IoT Internet of Things
- Autonomous Logistic / Maint.
- Fully Automatic visualized Processes
- Intelligent Plant
- Big Data – Total Process Control
- Company Server Network
Container Glass Industry 4.0 means the organization and control of the container glass production process. This includes all support processes on the basis of real time data by the (secure!) networking of all instances or levels of the pyramid of automation.

Only when the processes and their chaining are updated, it will be clear what interdisciplinary capabilities needs to be developed. Basically, the employee competencies must be extended in this direction, with the target to create added value by optimizing the existing processes and products. Further new value chains and business models are yet to identify and, where required, to be developed.

Consequently, industry 4.0 is not a (IT-) project, but must be integrated permanently into the lean management system.
THE NEW PARADIGM

People

Informatics
Know-what

Production
Know-how

Physics
Know-why

Mathematics

Processes

PIT

Process Expert
The working world becomes more and more complex and we need to keep the control!
BASIC MODEL CONCERNING PROCESS CONTROL

ISA-95: Pyramid of Automation
WHAT IS THE BASIC THEORY FOR TIA AND TOTAL PROCESS CONTROL?

Level 4 – Enterprise Resource Planning (ERP)
Company (Data) Processing

Level 3 – Manufacturing Execution Systems (MES)
Plant (Data) Processing

Level 2 – Supervision Control and Data Acquisition (SCADA)
Process (Data) Control

Level 1 – Field Level
Process (Data) Measurement

Level 0 – Process Level
Production Data
(Process & Hardware)
ANALYSIS OF THE CURRENT STATE
ADDED VALUE VS. PROCESS CONTROL

Dynamic Wokability
A VIEW ON THE MAIN TECHNICAL ADDED VALUE PROCESSES
Despite great flexibility & complexity, the processes are stable and reproducible with an yield achievement of more than 94% 

- Robots perform simple activities 
- Lines are retooling for job change automatically 
- Administrative duties are largely automated 
- Most of the staff are engaged in complex maintenance and PIT activities
The reality is virtual reproduced and the resulting process models including KPIs are the basics for process stabilization and optimization

- All the hardware is equipped with bar codes or, even better, RFID chips and sufficiently described at least with its master data in the ERP system.

- The processes together with the related documents are interactively accessible as a swimlane diagrams in the IMS.

- The relevant process variables are measured, processed, visualized and filtered and stored in the long term.

- These process values are used as control variables as much as possible to automatic process control and stabilization.

- In addition, historical and current (measurement) data are combined, e.g. by means of balance models, and used as control variables for automatic processes forecasting and optimization.

- Therefore the process control is shifting more and more from the SCADA to the MES level: Real process guidance (and even management) systems are about to become really useful which can be named – as they are – EXPERT SYTEMS.
WE ARE L(I)Oving GLASS