Glass bottle manufacturing - the path to optimal sustainability through automation and digitalization

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Agr International, Inc.

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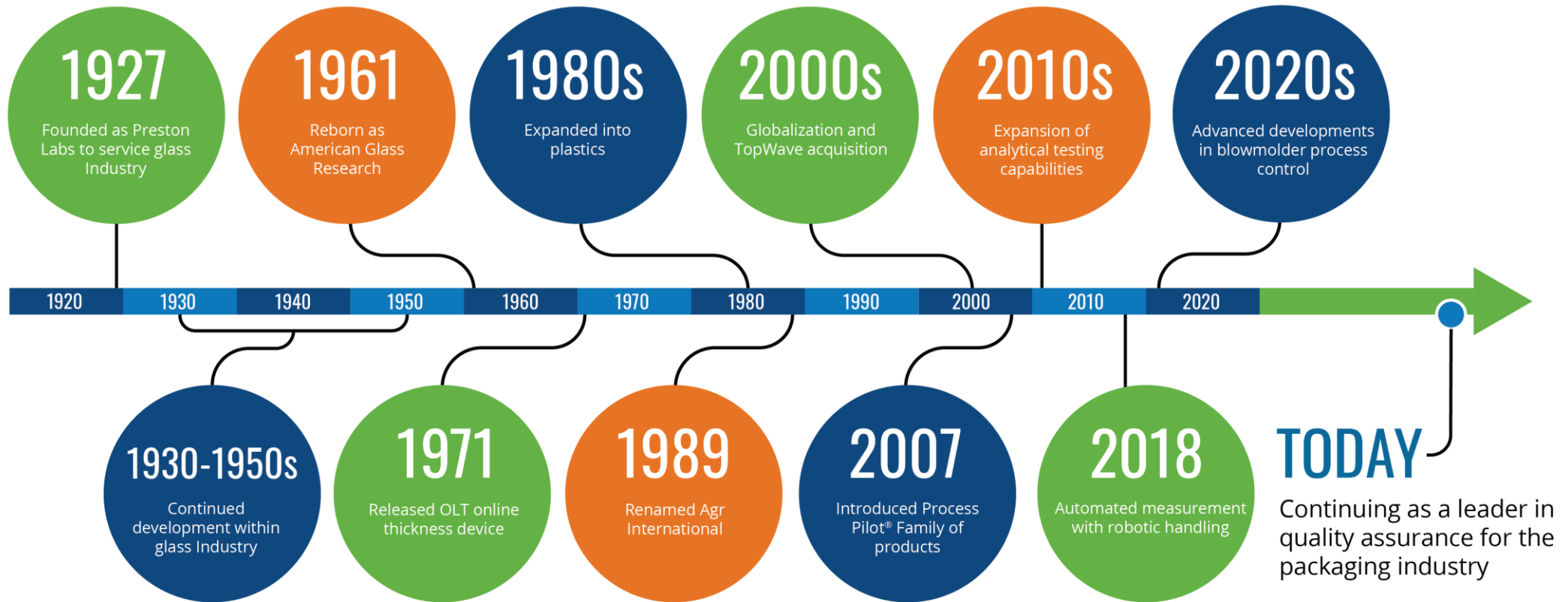
International Women's Day – March 8, 2025

More women are in manufacturing, design, business leadership & sales:

- Entrepreneurship & Corporate Leadership
- Technology & Automation
- Sustainability & Innovation
- Design & Architecture
- Networking & Mentorship

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Accelerate Action
IWD 2025

History

1927 — Founded as Preston Labs to service glass Industry

1961 — Reborn as American Glass Research

1980s — Expanded into plastics

2000s — Globalization and TopWave acquisition

2010s — Expansion of analytical testing capabilities

2020s — Advanced developments in blowmolder process control

1930-1950s — Continued development within glass Industry

1971 — Released OLT online thickness device

1989 — Renamed Agr International

2007 — Introduced Process Pilot® Family of products

2018 — Automated measurement with robotic handling

TODAY — Continuing as a leader in quality assurance for the packaging industry

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Markets served

PLASTICS

GLASS

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Core competencies

DIMENSIONAL

PRESSURE

THICKNESS

COATING

VOLUME

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Core competencies
- Glass testing products

Core competencies
- American Glass Research, Butler & Delft

Research

Testing

Design

Consulting

Training

Product Liability

Auditing

Core competencies
 - American Glass Research, Maumee

Raw Material Testing

Physical Properties

Analytical Testing

Heavy Metal Testing

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Sustainability - What?

The ability to meet current needs by maintaining or supporting a process continuously over time...

...without compromising the ability of future generations to meet their needs.

Sustainability - Why?

To balance economic growth, healthy communities and environmental protection
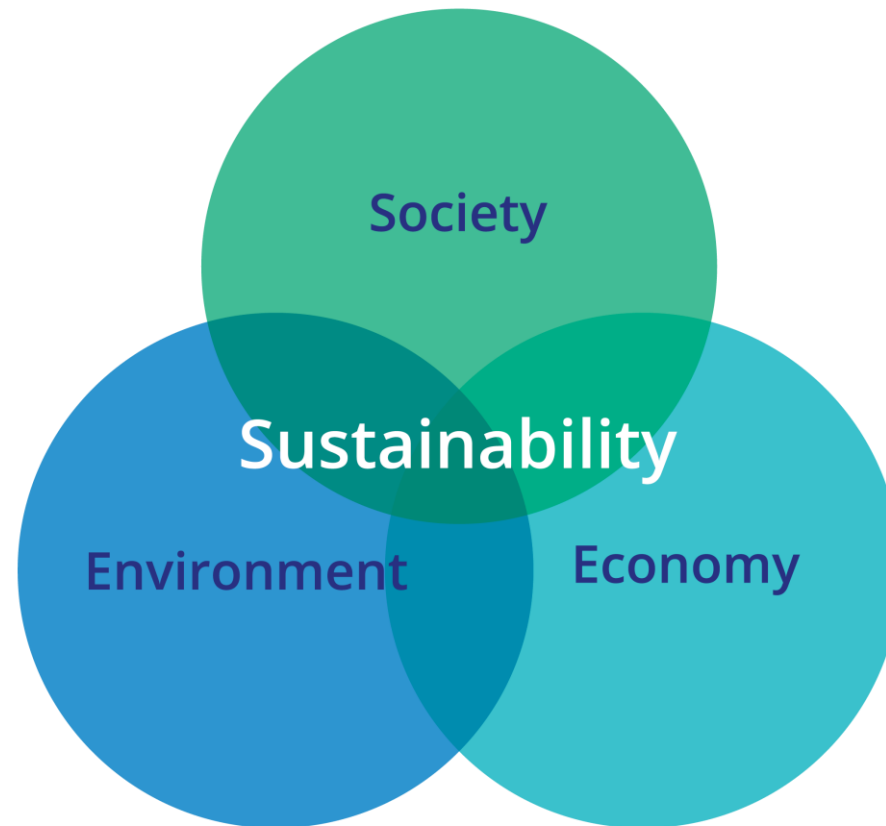
Sustainability – How?

- **Economical**
  - Growth without negative impact
  - Green business practices and technologies
- **Environmental**
  - Conserve natural resources
  - Reduce pollution and waste
- **Societal**
  - Promote well-being, equity and access to resources
  - Community involvement and education

Society

Sustainability

Environment

Economy

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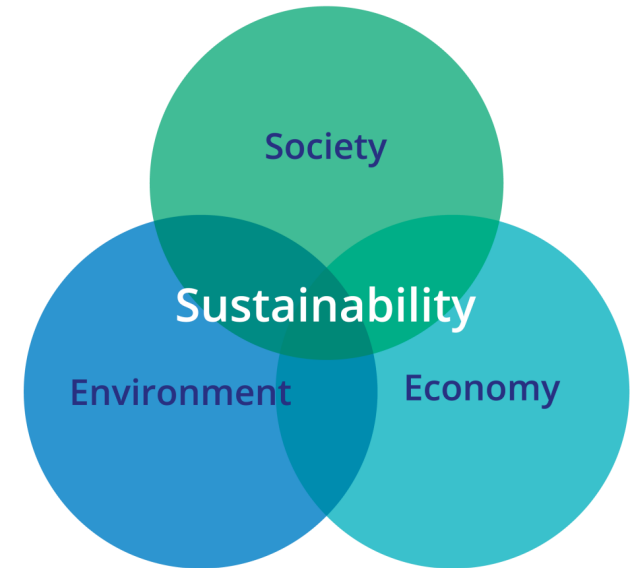
How can these goals be accomplished in glass container manufacturing?

- **Product Sustainability - Responsible Packaging**
  - ➢ Lightweighting
  - ➢ Recycled material

- **Process Sustainability - Automation & Digitalization**
  - ➢ Digitize
  - ➢ Monitor
  - ➢ Manage
  - ➢ Control

Glass bottle factory

Bottling & consumption

collection

Cullet

Product Sustainability - Lightweighting

The targeted reduction in the glass thickness of a container without compromising the strength and functionality of the container.

- Less glass means:
  - Fewer raw materials used
  - Lower transportation costs
  - Less energy consumed & lower CO_2 emissions
  - Financial benefits
  - Reduced wear on plant equipment
  - Lower land fills
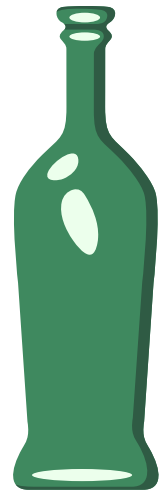
Product Sustainability - Lightweighting

Internal Pressure   Vertical Loading   Thermal Shock   Impact Loading
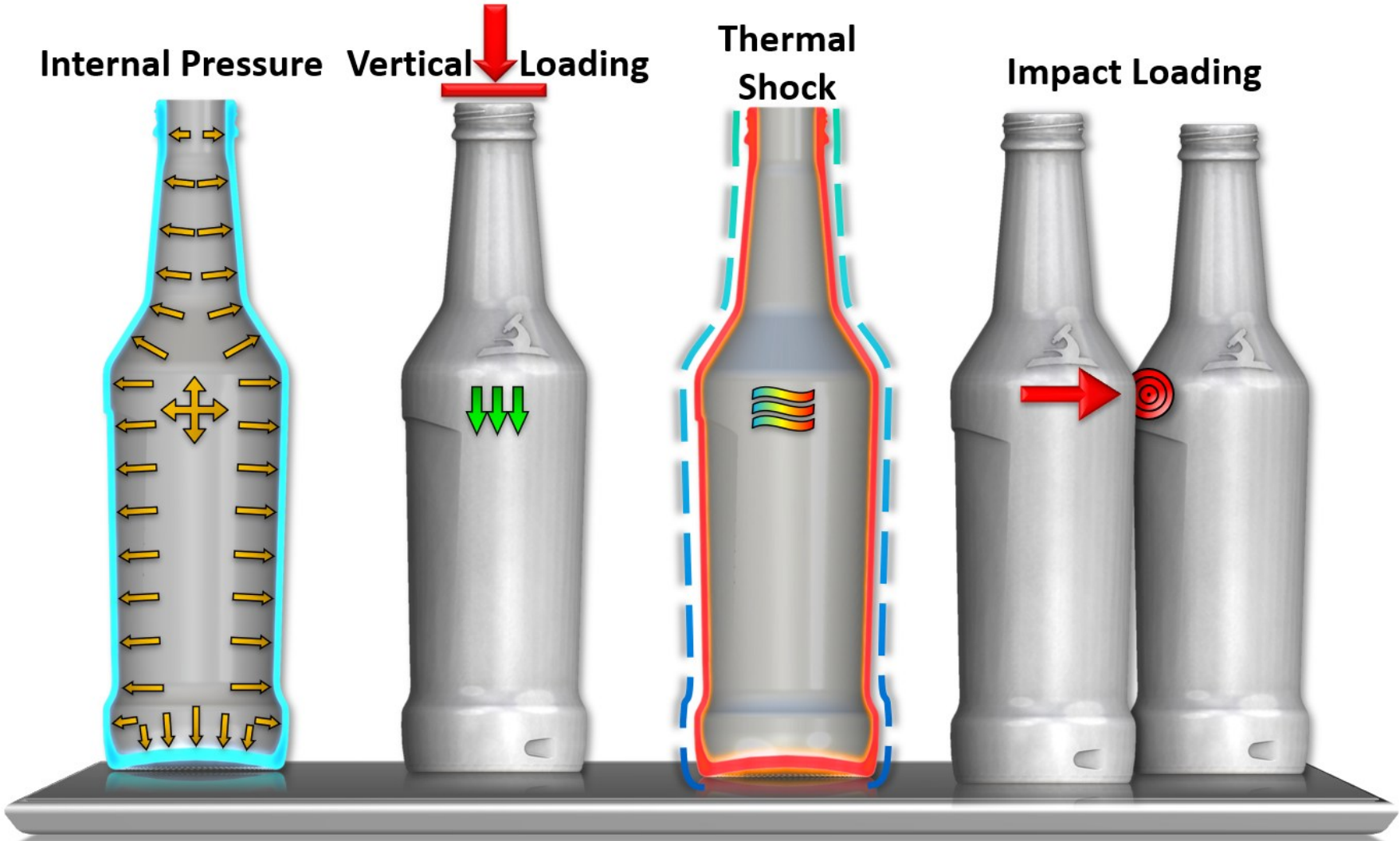
Product Sustainability - Lightweighting

Financial savings example

1000ml Liquor Bottle

Standard Weight	
Glass Weight	700 grams
Machine Speed	6 cycle (180 bpm)
Tons /day (US)	200
Packing Efficiency	90%
Bottles Packed /day	233,280
Selling Price	$0.07 /**bottle**
Annual Revenue	$5.96 M

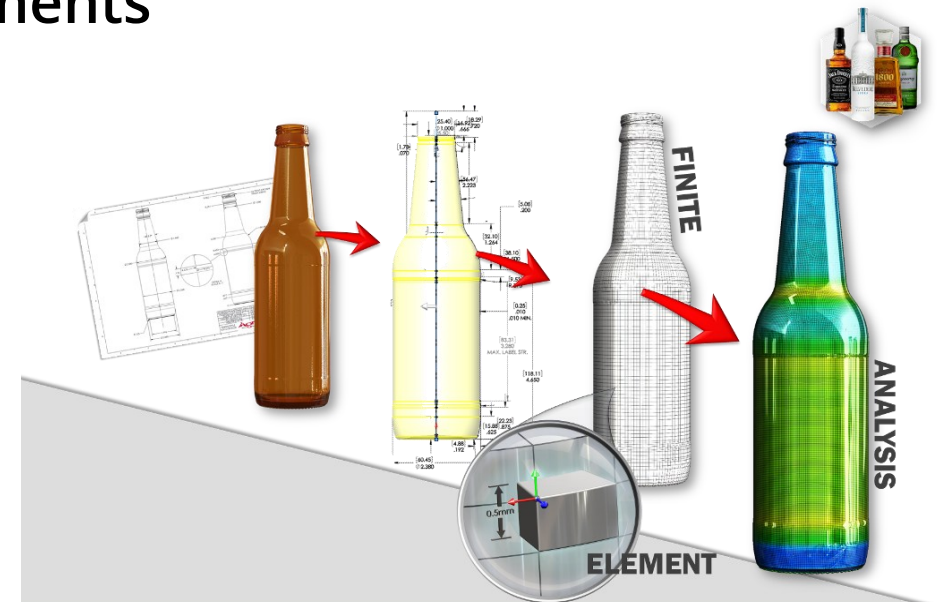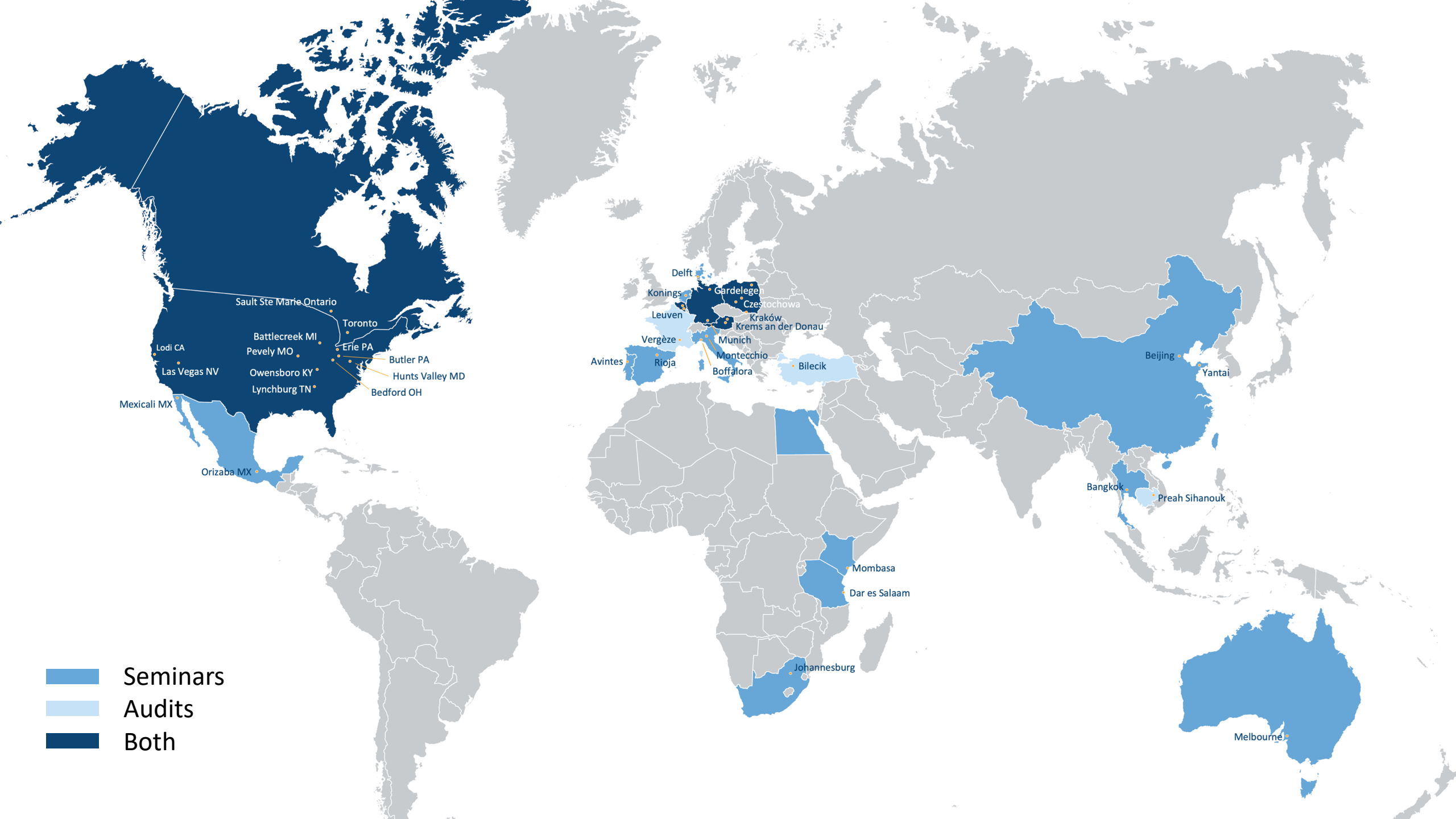| Lightweight Bottle	
Glass Weight	490 grams
Machine Speed	8 cycle (240 bpm)
Tons /day (US)	186
Packing Efficiency	90%
Bottles Packed /day	311,040
Selling Price	$0.07 /bottle
Annual Revenue	$7.965 M

Cost Benefit = 33%
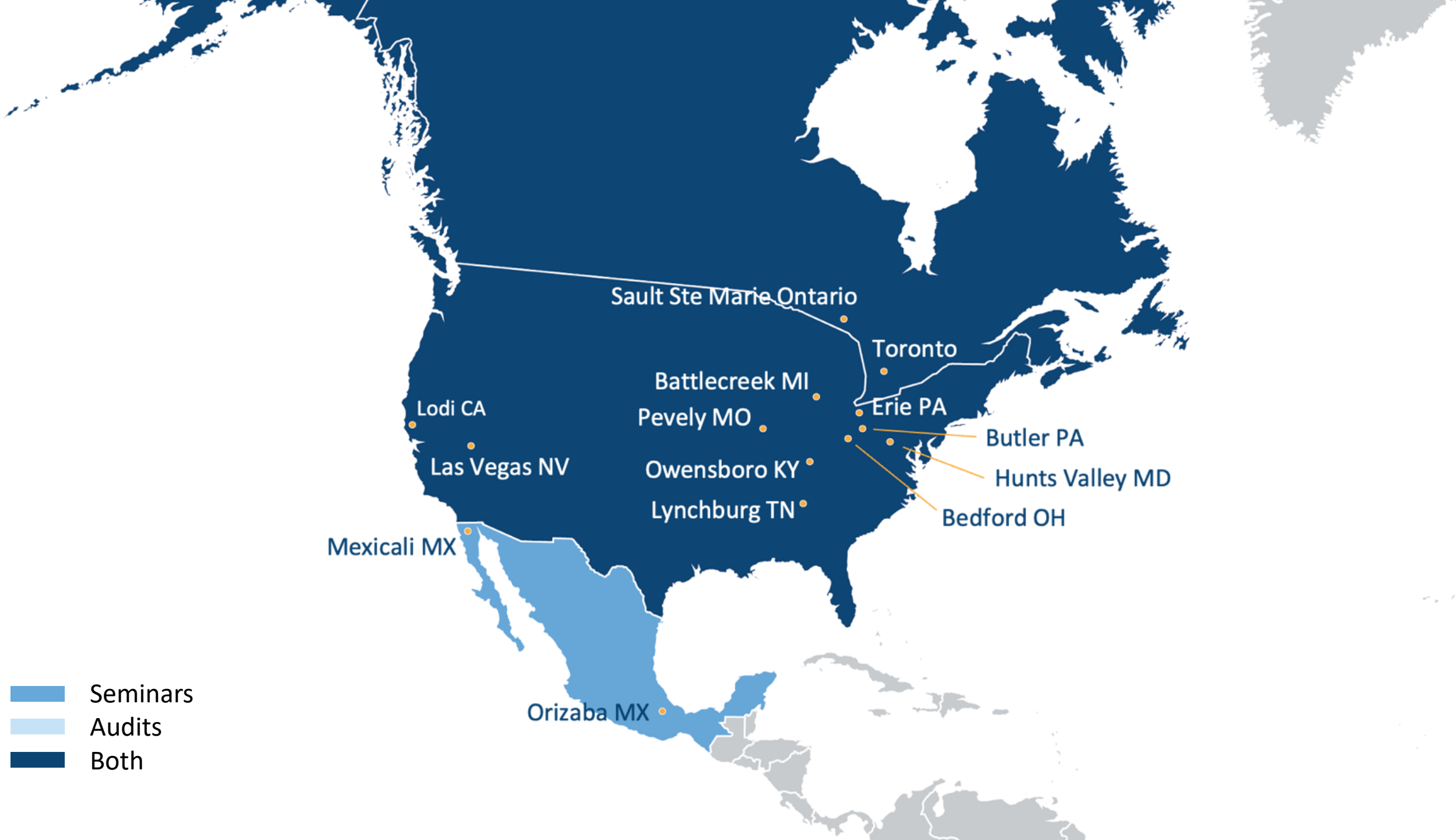
Product Sustainability - Lightweighting

Agr offers a complete solution for your lightweighting process

- Bottle design with FEA Analysis
- Line audits
- Proof of Design testing
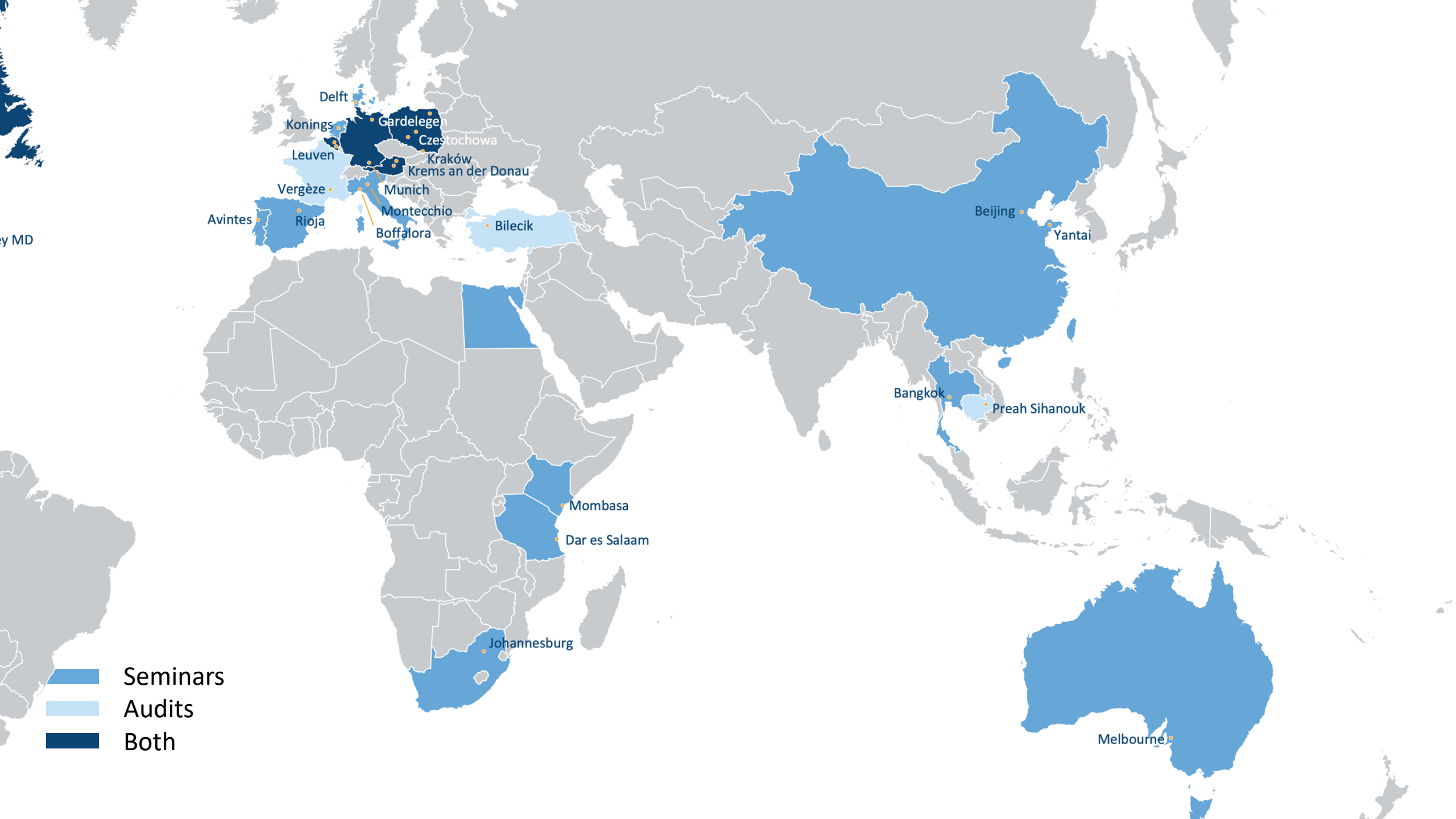- Production process verification requirements
- Training

Seminars
Audits
Both

Sault Ste Marie Ontario
Toronto
Battlecreek MI
Pevely MO
Erie PA
Lodi CA
Butler PA
Las Vegas NV
Owensboro KY
Hunts Valley MD
Lynchburg TN
Bedford OH
Mexicali MX
Orizaba MX

Delft
Konings
Gardelegen
Czestochowa
Leuven
Kraków
Krems an der Donau
Vergèze
Munich
Avintes
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Seminars

Audits

Both

Product Sustainability - Recycling

For every ton of glass recycled, over a ton of natural resources are conserved, including 1300 pounds of sand, 410 pounds of soda ash, 380 pounds of limestone and 160 pounds of feldspar.[2]

Multistream recycling – separated from other recyclable materials - provides about a 90% rate of being made into new products. [3]

Issues such as stones arise if contaminants are mixed in with the cullet when it reaches the melting process. Uncontaminated cullet offers cost and energy savings.
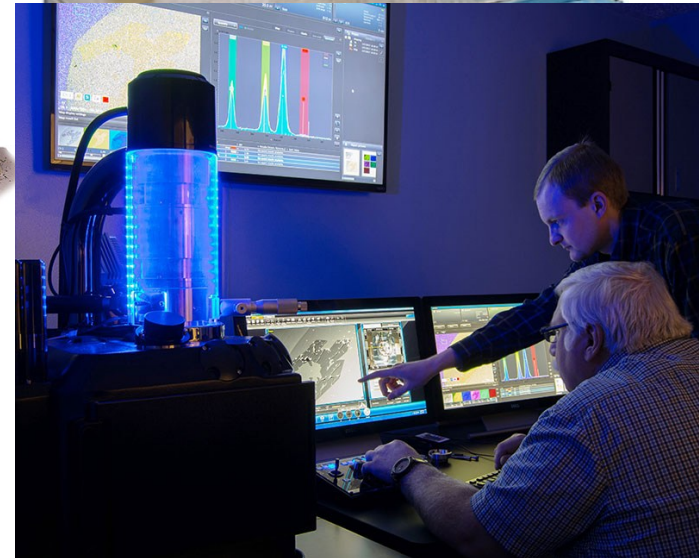
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REUSE

REDUCE

RECYCLE

Product Sustainability - Recycling

Partner with Agr for an effective program

- Composition analysis
- Coating Process review
- Container testing and measurement

Process Sustainability – Testing needs

Impact

Vertical Load

Pressure Strength

Thickness

Dimensional Attributes

Coating Application

Fill Height and Volume

Strain and Stress

Process Sustainability – Automation

What is automation?

Anything that reduces human intervention and makes operations efficient and easier!!

When is automation necessary?

- Increased volume or speed
- Required precision / intolerance to variation
- Increased efficiency
- Better quality

Automation is needed for high speed, repeated, consistent operations

Process Sustainability - Automation

How does it relate to glass bottle manufacturing?

- High volume / high speed demands to satisfy customer needs
- Tighter budgets – produce more output with less resources
- Lightweighting
- Efficient use of personnel
- Go green – sustainability goals

Pushes us into automation to increase efficiency…

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Process Sustainability - Digitalization

How can digitalization help?

- Removal of manual work

- Reduce error

- Quick results

- Consistent measurements

- Quick and unbiased response options

- Traceability

- Prepare for Industry 4.0

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Process Sustainability – Automation & Digitalization

Laboratory

- Quick and reliable results without manual entries

- Monitor and track production performance

- Validate design / production

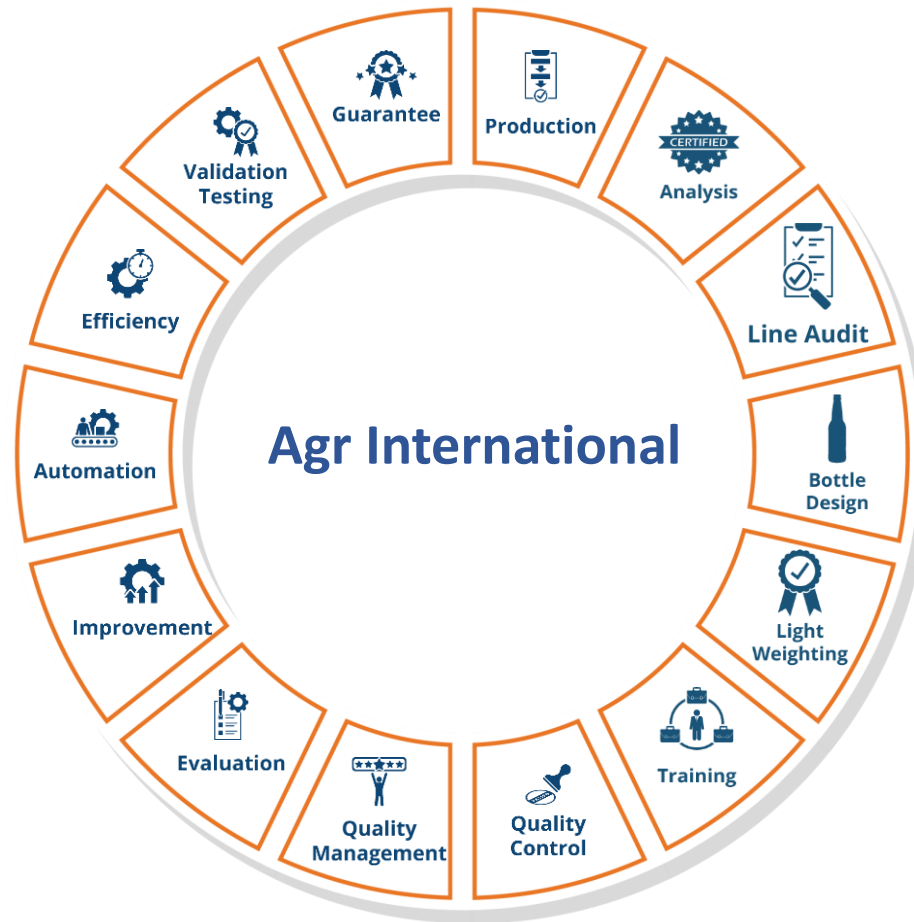- Traceable results for production runs

Process Sustainability – Automation & Digitalization

Sampling

- Perform specialized measurement and testing

- Automate test runs with no user intervention

- Receive immediate feedback to address any process drifts

- Increase profitability

Sustainability – complete solution

Sustainability – glass container manufacturing

Are you ready?

Don't be left behind!

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