

# Bubble diagnosis

## Introductory training

duration  
2 half days

date  
November 20-21

location  
Online and/or Eindhoven, Netherlands

Bubbles and seeds are the most common cause of rejects in glass production. The course starts with the formation of bubbles during the batch-to-melt conversion and explains the different physical and chemical phenomena leading to their change in composition, size, and removal from the melt. Downstream sources of gases and the formation of bubbles during container and float forming are also described. The course ends with a step-by-step approach to react in case of a bubble upset.

### Contents

- Batch decarbonization, bubble formation, and interaction with the glass melt.
- Bubble ascent and glass flow velocities.
- Gas solubility, chemical fining and refining.
- Physical fining.
- Reboil mechanisms.
- Downstream sources of gases and forming bubbles.
- Practical guidelines in case of bubble upset.

### Training methods

We offer a blended learning approach by mixing e-learning, lectures, open discussions, exercises, and case studies in teams or individually. The number of participants per course is between 8 and 20 to maximize your learning experience. Participants always receive the presentations and a training certificate.

### Intended Audience

This training is meant for batch, furnace and quality team members who must deliver good quality glass, support and make decisions in case of a bubble upset. They will get a better understanding of the phenomenon at stake and sharper troubleshooting abilities.

### Investment

Training costs **€ 1095** per participant. When onsite, price includes 2 lunches and 1 dinner. It excludes tax and duties. The 6th participant from the same company can join for free.

### After the training

- You have a step-by-step approach to identifying the root cause of bubble problems and solving them.
- You have a clear overview of the different sources of bubbles.
- You have an understanding of the different chemical and physical phenomena leading to bubble removal.
- You know how experimental and numerical tools can support root cause identification and resolution in case of a bubble crisis.

Cancellation fees apply. 1 week before training 50%; no show, full price. In case of an unexpected event, we are happy to look for rescheduling or voucher options. CelSian reserves the right to cancel up to two weeks prior to the training, proposing new dates or refunds. Are you registering as a group? You are entitled to a 15% discount on all courses: for 5 registrations, the 6th participant can join for free.



We welcome your questions by e-mail: [academy@celsian.nl](mailto:academy@celsian.nl) Register on [www.celsian.nl](http://www.celsian.nl)

Online access to this training can be offered and the training may be fully given online.