

## Energy Efficiency in Glass Production (TC09) – Annual report 2019

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### SUMMARY

The aim for 2019 was to continue to define a uniform approach to define energy efficiency or specific energy use within or across the various glass industry sectors. The existing non-uniformity is compounded by the fact that there is no common approach in the consideration of factors such as the effect of cullet, the efficiency of electric boosting, age, furnace design etc.. Furthermore reported energy data in literature do not clearly explain the validity of the reported data. In first instance TC09 is focussing on glass melting furnaces, the largest energy consumers of a glass factory.

TC09 will develop recommended Best Practices for defining energy use and efficiency so that companies within each glass sector can make useful comparisons. This approach will be used to explain some of the differences in performance between sectors and aid discussions with non-technical and/or external agencies.

The results of this project will be used to explain the energy balances of glass furnaces and to evaluate the methodology of applied energy balance models, measuring techniques and benchmark data. The first step in this study is an energy benchmark study for 6 to 8 float glass furnaces. In this study glass furnace energy consumption of individual glass furnaces will be benchmarked against a database of energy consumption of (anonymous) glass furnaces. We have received active contributions from AGC, SiseCam, NSG and at start Guardian. At the last meeting in Boston AGC once more added a presentation of making a good thorough furnace heat balance (following an earlier presentation in Yokohama). Maybe good to mention the active members in this project?

TC9 Started a round robin comparison of calculating the Thermodynamic Energy Requirement for glass melting for some selected glasses. The simulations are performed by HVG and Sibelco.

Besides this study on the definition of energy efficiency, TC09 exchanged information on running projects and new initiatives to reduce energy consumption in the glass production process. Many

companies apply energy benchmark studies as a starting point of energy reduction programs. To reduce the CO<sub>2</sub> footprint and energy consumption some companies switched from air-fuel to oxy-fuel, while others increased the fraction of electric boosting. New initiatives in the glass industry are for example the application of Organic Rankine Cycle (ORC), Hot-Ox systems to preheat fuel and oxygen, the application of the 'Optimelt' TCR system and the use of smart batches which melt more easily.

## **ACTIVITIES in 2019**

### **1. TC09 Meetings**

In 2019 one TC09 meeting was was organized

During the ICG Boston conference there was held a TC9 meeting with International and American participants discussing different topics, paper and having a detailed presentation from some customers such as NEG (Hiroyuki Itazu), AGC (Fabrice Fasilow)

Agenda points in Boston were:

1. General introduction and welcome
2. Minutes Yokohama Sunday 23.9.2018
3. ICG issues
  - a. ICG 2030 project
  - b. Poster
4. Contributions of members
  - a. Feedback GlassTrend study tour hydrogen combustion – Oscar & Erik/Wolfgang
  - b. 10 – 15 minutes member contributions.**
    - i. Fabrice Fasilow AGC
    - ii. Hiroyuki Itazu, NEG**
5. Discussion on the Energy paper status
6. SSV study energy harmonization (depending on SSV attending)
7. Thermodynamic simulations energy demand batches – update results
8. Webmaster – Dropbox update. Upload presentations
9. Any other business
10. Next meeting

### **2. Energy benchmark project**

As explained in the summary an energy benchmark project has been done for 6 float furnace with the aim to define a uniform approach to define energy efficiency or specific energy use within or across the various glass industry sectors. A draft publication is in progress.

### **3. Calculation of minimum thermodynamic batch melting energy**

There is not a clear standard for what is the actual minimum amount of enthalpy (thermodynamic energy requirement) that is needed to melt a certain soda lime (Container) glass batch. Several batches were defined and HVG and Sibelco calculated the minimum melting energy using a thermodynamic method developed by Conradt and tuned by HVG and the thermodynamic model FactSage 7.0 (applied by Sibelco).

Based on first results, the differences between both models are of the order of magnitude of 5 to 10%.

#### **4. Exchange of information**

A Dropbox folder has been opened on which most past and new information are uploaded to be shared with all active participants

TC09 exchanged information on running projects and new initiatives to reduce energy consumption in the glass production process.

#### **5. Publications & Presentations**

- Draft publication/paper of the Float Benchmark is in progress a first DRAFT is ready, but should be continued
- Poster at ICG conference Boston 2019: 'Technical Committee 9: Energy Efficiency. Expert group of ICG for energy efficiency in glass production'

#### **PLANS FOR 2020 AND DELIVERABLES**

- Organization of 1 or 2 meetings in 2019.
  - Annual meeting is planned in at the ESG/ICG in Krakow Poland (sept 2020)
- Finishing publication of energy benchmark project for float furnaces.
- The paper also will address how energy efficiency is related with glass quality
- Execution of calculating minimum thermodynamic melting energy for more batches
- ICG has awarded a budget to TC09 that was first given to SSV to make some better definition of energy efficiency, finally SSV did not find the time. Now Hans Mahrenholtz from GS will work on it.
- Exchange of information on running projects and new initiatives to reduce energy consumption in the glass production process