

WHM WORKSHOP

Waste Heat Management in the Glass Industry Abstracts

SESSION 1: WASTE MANAGEMENT APPLIED TO PROCESS INPUTS

Overview of Methods to Recover Energy from Flue Gases of Glass Furnaces and Impact on Glass Furnace Energy Consumption *Ruud Beerkens, TNO Science & Industry*

Large part of the energy supplied to fossil-fuel fired glass furnaces is lost through the chimney. Even efficient regenerative or oxygen-fired furnaces typically lose 25-35 % of the total energy through the stack. In this work different types of flue gas heat recovery and other energy saving measures are analyzed by Dr. Beerkens to show energy efficiency improvement potential in glass furnaces.

Advantages and Rationale for the Use of Dry-Batch *John Brown, GMIC*

Full utilization of the available sensible waste heat from a glass furnace is an opportunity ranging from 15 to 30% of today's purchased energy. Mr. John Brown shows how transitioning from wet to dry batch allows practical and affordable return of sensible exhaust heat as pre-heated batch and cullet. The heat returned to the furnace is twice as valuable as the heat saved in removing batched water.

New SORG Batch Preheating System *Matthias Lindig, SORG*

The paper discusses how for at least 40 years the glass industry has been working on the development of a viable batch preheating system, driven by the continuing wish to lower energy costs. Dr. Lindig explains the novel approach that SORG has taken to solve the basic problem of batch preheating. The paper discusses the results obtained in a full scale section of the entire preheating built and tested in SORG facilities.

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Comparative Study of Energy Consumption and Emission Behavior of Container Glass Furnaces and Batch Preheating *Ruud Beerkens on behalf of Ardagh Glass*

Prepared by: **R. Jeschke, S. Seehausen, S.R. Kahl, H. Barklage**, Ardagh Glass GmbH, Nienburg, Germany

Based on the practical experience with existing installations the energy consumption and NO₂ emission of approximately 45 container glass furnaces of difference types is analysed and compared. The Study is based on end port regenerative furnaces, cross fired regenerative furnaces, recuperative furnaces and oxy fuel furnaces. Because the furnaces are running under different conditions, standardization was necessary regarding the differences in size, age, color, cullett and boosting rates. Aging effects for different furnace types are analyzed as well different approaches for the waste heat utilization.

Results of a Technology Recovering Waste Heat to Preheat Oxygen and Natural Gas for Oxy-fuel Furnaces *Joumani Youssef¹, Jarry Luc², Simon Jean-François² Contino Antonella³,*

Douxchamps Olivier³ AIR LIQUIDE & AGC R&D Center

In past Air Liquide presentations, it has been shown how recovering heat from the flue gases of a float glass furnace to preheat oxygen and natural gas is a feasible way to improve the energetic and the economic balance of an oxy fuel glass furnace. AGC Glass Europe and Air Liquide have recently started the first oxy fuel Float furnace in Europe (Boussois, France). This paper will show the main steps of this joint development, the description of the new oxy fuel heat recovery technology and the way this innovative technology has been implemented on the AGC Glass Europe oxy fuel float. On last part, the main results obtained after one year of operation will be briefly presented and summarized.

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Session 2. Waste Heat Recovery Boilers

Cullet Preheating by Steam Generated from Flue Gas Heat of Glass Furnaces *Ruud Beerkens; Andries Habraken, TNO Science & Industry, Glass Group; Niels Rozendaal, OPTIMUM Environmental & Energy Technologies b.v.*

TNO in co-operation with Optimum carried out feasibility studies for the application of a waste heat steam boiler and cullet preheater, using this steam. The study shows how this technology seems to be very cost effective for furnaces using high levels of cullet, typically more than 65 % in the batches. The specific waste heat boiler is proven technology and has already been applied in the float and container glass industry since more than 4 years without maintenance problems. In this presentation, drawings of the waste heat steam boiler and cullet pre-heater, applied to container glass furnace(s), will be shown and typically temperature levels, energy saving potentials will be given. Important aspects such as, preferred size of cullet, carry-over of dry batch charging into the glass furnace, reduction of organic material in cullet during preheating and odor issues will be shortly discussed.

Waste Heat Recovery on Glass Furnaces – A Case Study on Encountered Problems and Solutions *Bhave, Ninad P. and Gawade, Dattatray; Transparent Energy Systems Pvt. Ltd., Pune, India*

This paper discusses the design, installation and commissioning of a commercial waste heat recovery system for glass furnace based on the Rankine Cycle built by Transparent Energy Systems Pvt. Ltd., India. The presentation will touch upon some factors affecting the boiler design and installation in this “first of a kind” unit designed specifically to the glass manufacturing process. Peculiarities like the nature of the flue gas dust and volatiles causing fouling and corrosion and a high sensitivity of the process to pressure drop variations were accounted for in the design of the system and are explained in the paper.

Alternative uses of steam in Glass Plants *Niels A. Rozendaal; OPTIMUM Environmental & Energy Technologies b.v.*

OPTIMUM developed a heat recovery system capable of dealing with fouling flue gas streams of glass furnaces. Over 30 systems have been installed for several applications and industries. In the glass industry the systems are installed in both flat and container glass applications. Initially OPTIMUM mainly focussed on solving the fouling, corrosion and erosion issues. After having those issues under control OPTIMUM developed different concepts combining both the waste heat recovery boiler as well as applications for the steam produced. In the presentation the different applications like: electrical power generation, generation of cold using an absorption chiller, heating purposes, an others will be discussed and illustrated with process flow diagrams as well as budget estimates including savings calculations based on typical cases.