

WHM WORKSHOP

Waste Heat Management in the Glass Industry Presenters Abstracts & Biographies

Thursday October 21, 2010

9:30 a.m. to 4:30 p.m.

Session I Waste Management Applied to Process Inputs

9:30 a.m. – 9:45 a.m. **Introductions**

Scott Ryan, Corning Incorporated – Session Chair

About the Chair

Scott Ryan is the Operations Manager for Corning's Global Energy Group and Energy Manager for its Business Services Division. Corning initiated the Global Energy Management Group in 2005 and has been making significant improvements in its energy productivity since the inception. Scott is responsible for engaging with division sand plants worldwide in the rollout and implantation of their energy reduction and reliability programs. Scott has been with Corning for 16 years and has held various management positions in Corporate Engineering and Procurement before becoming the Global Operations Manager for the Global Energy Group. Scott is a member of AEE and is a Certified Procurement Manager. Holds a Bachelor of Science in Business Administration from Elmira College.

9:45 a.m. – 10:30 a.m. **New SORG Batch Preheating System** – *Matthias Lindig, SORG, Germany*

Abstract

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.

About the Speaker

Matthias Lindig has experience of many aspects of the glass industry. He studied at the Technical University in Clausthal, where he obtained a Masters and Doctorate in glass science. He joined the industry to work for Schott, occupying the posts of Manager of Special Projects and General Manager for melting in Mainz. Since joining SORG in 2001 as Research and Development Manager, he has been responsible for the significant advances made by the Company in the field of mathematical modeling.



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10:30 a.m. – 11:15 a.m. **Advantages and Rationale for the Use of Dry-Batch** – *John T. Brown, Glass Manufacturing Industry Council, USA*

Abstract

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.

Consider a soda lime glass with 4% batch water (2-5.5% is common) represents about 6% of the total purchased energy. This energy is split into 40% latent heat to vaporize the batched water and 60% to raise the water vapor to the exhaust temperature at the rear of the furnace.

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. The combination of these two opportunities resulted in the above stated 15 to 30% energy reduction.

- An additional 25% is available for oxy-fuel fired furnaces due to the cost of purchased oxygen.
- Any reductions in fuel are reductions in carbon dioxide, the next hurdle to Glass manufacturing

About the Speaker

John T. Brown began his career as an engineer in 1963 with Corning Glass Works, not Corning Incorporated in the melting Technology Department of Technical Staffs Division. He worked with plant melting problems as a petrographer, with furnace repair inspection, refractory testing and plant melting service responsibilities. As a liaison with Research, he participated with development of the galvanic oxygen rebuild theory and implanted the practice in several glasses, most importantly fusion glass for automotive windshields.

In 1969 he transferred to the Electronics Products Division, with three plants, to lead the produce development group located in Bradford, PA. There with his team of engineers and technicians he developed very low ohm resistors that were the basis of AT&T's first touch tone telephones. He and his team later developed UV cured coatings that allowed manufacturing of precision resistors to increase from 70 per minute to 700 per minute, as well as a series of sensors and actuators for the automotive industry.

In 1974 he returned to corporate development to work with a new acquisition Zircoa. He developed several methods to apply platinum coatings on a partially stabilized zirconium (PSZ) and to define the ionic oxygen carrying characteristics of the material. Using the PSZ material and precious metal coating techniques developed by John, and his team resulted in sensor survival in automobile exhausts as well as boilers and glass furnaces.

Current Activities

After nearly 40 years with Corning, John began a second career as Technical Director of the Glass Manufacturing Industry Council (GMIC), in 2002. His approach to life continues to be one of continuous learning and investigation, to find new and better ways to solve the challenges of manufacturing glass. John is retiring from GMIC at the end of October 2010. John is the recipient of many glass awards including the Phoenix Award in 2003.

He is a graduate of The Ohio State University, Bachelor of Ceramic Engineering, 1963 and MAB from Syracuse University, 1972.

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11:15: a.m. – 12:00 p.m. **Overview of Methods to Recover Energy from Flue Gases of Glass Furnaces and Impact on Glass Furnace Energy Consumption** – *Ruud Beerkens, TNO Science & Industry, Eindhoven, The Netherlands*

Abstract

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.

About the Speaker

Ruud Beerkens started to work on Glass Technology in 1982. In 1986 he received a PhD on the chemistry of flue gases from glass furnaces at the Eindhoven University of Technology in the Netherlands.

Between 1986 and 2001 he worked at TNO in the field of modeling of glass melting processes, energy and environmental aspects of glass production, thermo-chemistry of glass, fining and refractory behavior.

In 1997 (until 2003) he started as part-time professor at the Eindhoven University of Technology. In the period 2001-2003 he was department leader of the glass technology group of LG Philips Displays.

In spring 2003, he went back to TNO in the Glass Group as senior scientist. He became TNO Senior Research Fellow in June 2005.

Current Activities

Consultant for EU and Netherlands glass industry sector, chairman of TC 18, Glass Trend, member of ICG Coordinating Technical Committee, Senior Scientist at TNO, member of several advisory boards, Founder and Chairman of Glass Trend. Working for more than 30 glass companies world-wide on a regular basis.

Awards: He received in 1992, the German (DGG) Glass Industry Award, in 1997 the Otto Schott Award and in 1994 the Gottardi Award from the International Commission on Glass (ICG). In 2008 he received the ICG Turner Award.

12:00 p.m. – 12:15 pm **Lunch Served**

12:15 p.m. – 1:00 p.m. **(Working Lunch) Comparative Study of Energy Consumption and Emission Behavior of Container Glass Furnaces and Batch Preheating** – *Ruud Beerkens, TNO Science & Industry, Eindhoven, The Netherlands on behalf of Ardagh Glass Prepared by: R. Jeschke, S. Seehausen, S.R. Kahl, H. Barklage, Ardagh Glass GmbH, Nienburg, Germany*

Abstract

Based on the practical experience with existing installations the energy consumption and NO₂ emission of approximately 45 container glass furnaces of difference types is analyzed 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, cullet and boosting rates. Aging effects for different furnace types are analyzed as well different approaches for the waste heat utilization.

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In the standardization process the data were normalized to 50% cullet and a gross melting rate of 112.000 t/a, defining a standard furnace size for the different furnace types. Parameters like the melting rate based on electric boosting were standardized.

The aging effect for different furnace types is analyzed as well as the influence of different design parameters.

Different approaches for the waste heat utilization have been analyzed. The most efficient approach is the batch preheating process with direct reutilization of the energy in the melting process. The NO₂ emissions of the different furnace types are analyzed and compare against BAT emission levels (BATEL). By multiple regressive the dependency between the NO_x emission and different design parameters is studied.

About the Author

Dr. Jescke is head of the technology department of Ardagh Glass in Europe. He studied at the Aachen University: RWTH in Germany. For 20 years he has worked for Ardagh Glass (former names: REXAM and PLM). His fields of expertise: glass furnace technology, glass technology. He heads a group responsible for furnace designs, furnace construction and maintenance in the Ardagh Group. He is located in Bad Muender, Germany

1:00 p.m. – 1:45 p.m.

Results of a Technology Recovering Waste Heat to Preheat Oxygen and Natural Gas for Oxy-fuel Furnaces – *Joumani Youssef, Jarry Luc, Simon Jean-Francios Contino Antonella, Douxchamps Oliver, Air Liquide, France*

Abstract

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.

About the Speakers

Ph. D in Mechanical Engineering, *Youssef Joumani* is graduate of Ecole des Mines in France. He joined Air Liquide in 2002 as R&D Engineer of the modeling team in which he participated to the simulations of combustion processes for the glass industry. During five years, he studied the phenomena of oxy-combustion in full-oxy furnace (Flame interaction, model validation, corrosion and volatilization, glass flow patterns...) and started to work on the development of heat recovery technology. In 2007, he became Project Manager of ALGLASS SUN technologies and, the year after, leader of the project aiming at developing heat recovery technology in Float furnaces

Contino Antonello, PhD since 2006. Began his career at AGC Glass Europe in November 2006. Since then, He has worked in the process department on topics related to combustion and followed the project related to oxy combustion with heat recovery technology.

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1:45 p.m. to 4:30 p.m.

Session 2 Waste Heat Recovery Boilers

1:45 p.m. – 2:00 p.m. **Introduction**

Mike Strohscher, Libbey, Inc. – Session Chair

About the Chair

Bachelors of Science Toledo University, Toledo Ohio. 10 Years Life Safety Engineer; 12 years at Libbey Glass as Electrical Engineer

2:00 p.m. – 2:45 p.m.

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.*

Abstract

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.

2:45 p.m. – 3:30 p.m.

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*

Abstract

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

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About the Speaker

Ninad Bhawe joined Transparent Energy Systems Pvt. Ltd. in 2010 as the Assistant Manager – Business Development. He is involved with sales & marketing of TESPL's Waste Heat Recovery Systems, Waste Heat Recovery-based Power Plants and Co-Gen systems for the Cement, Glass, Steel / Ferrous Alloy and Waste Incineration fields for export markets including the Americas and Europe. He is responsible for strategic business development, techno-commercial analysis of proposed projects and technical / commercial negotiations with clients and vendors.

Prior to joining TESPL, Ninad worked as an Intellectual Property Analyst for Plantronics, Inc. in Santa Cruz, CA where he was involved with developing the company's IP portfolio in the Unified Communications / Consumer Electronics field. He also worked as a Heat Transfer specialist in the Semiconductor Manufacturing and Aerospace fields at major Silicon Valley companies such as Applied Materials, and has published papers on those subjects. He moved to India in late 2009 to work in the Green Energy field in the second fastest growing economy in the world.

Ninad studied at San Jose State University and Stanford University to earn Bachelors and Masters degrees in Aerospace Engineering and Mechanical Engineering.

Dattatray Gawade is the Assistant Manager (Service) and has been with the Site Engineering department of Transparent Energy Systems since 2005. since then worked on erection / installation and commissioning of numerous waste heat recovery boilers and thermic fluid heaters, including TESPL's largest and most critical projects in India like Cement Waste Heat Recovery Boilers / Power Plants at Ultratech Cement and Shree Cement . In 2009 he was the lead Site Engineer for TESPL's first Glass Waste Heat Recovery-based Power Plant, the 1.2 MW Project at Saint. Gobain Glass, Chennai. Among other projects, he is currently leading site efforts for TESPL's next Glass Waste Heat Recovery-based Power Plant, the 1.3 MW project at Hindustan National Glass, Kolkata.

Dattatray holds a BE in Production Engineering.

3:30 p.m. – 4:15 p.m.

Alternative Uses of Steam in Glass Plants –Niels A. Rozendaal;
OPTIMUM Environmental & Energy Technologies b.v.

Abstract

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, and others will be discussed and illustrated with process flow diagrams as well as budget estimates including savings calculations based on typical cases.

4:15 p.m. – 4:30 p.m. **General Questions & Answers**

4:30 p.m. **Adjourn**