



SFSA CASTEEL REPORTER

Steel Founders' Society of America

a publication serving
SFSA steel casting industry Members

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April — 2017

Casteel Commentary

Last month introduced the idea that to improve our business performance and reputation, we should strive to be smart, clean and friendly. Smart manufacturing is now in fact a current buzzword. Industry 4.0 and the Internet of Things, IoT, are the topic of considerable press and promotion. This month the Casteel Commentary reflects on the opportunities in smart manufacturing for steel foundries.

SFSA Luncheon at Metalcasting Congress

SFSA has several opportunities for members at the Metalcasting Congress or in the Milwaukee area. Join us for a free, docent led tour of the [Grohmann Museum](#) at 5:30 p.m. on Tuesday, April 25th. Through the month of April, the museum's featured exhibition is Steel. Participants will also see the "Man at Work" collection. SFSA will also setup a dutch treat dinner at 7:00 p.m. [Register for the tour and/or dinner here](#). Contact David Poweleit at poweleit@sfsa.org for additional information.

Also, SFSA is hosting a lunch for members and invited guests at the Metalcasting Congress on Wednesday, April 26th. Lunch will be at the Wisconsin Center, Room 101B, starting at 11:30AM. This will be an opportunity to network with other SFSA members and participate in a steel foundry roundtable discussion after lunch. Registration is required: SFSA Luncheon. For more information, please contact Diana David – ddavid@sfsa.org. [Register for SFSA Luncheon here](#).

Spring Leadership Meeting

Please plan to attend the SFSA Spring Leadership Meeting scheduled for May 17th in Pittsburg, PA at the Hotel Indigo. There is no cost to attend this meeting but registration is required. Please register here: [2017 Spring Leadership Meeting](#). For additional information, please contact Ryan Moore - rmoore@sfsa.org.

This year's program will begin with a tour of McConway & Torley and Standard Forge the morning of the 17th followed by presentations of interest to foundry senior management and marketing personnel. Any member is welcome to participate in the marketing committee meeting on May 18th.

Wednesday May 17

8am-12pm – McConway & Torley and Standard Forge Tours (transportation provided)

12pm - 5pm - Spring Leadership Lunch & Meeting

- Dan Salak, ASK Chemicals – Global Perspective of the Casting Markets
- Rob Gorham, America Makes – Current and Future Trends of Additive Manufacturing
- Martha Guimond, Guimond & Associates – Industry Standard of Care for Silica Compliance
- Industry Roundtable

6pm - dinner TBD

Thursday May 18

8-11:00am- Marketing Committee Meeting

Finishing Operations Meeting

Finishing is instrumental to manufacturing steel castings. Cutting off gates and risers, or grinding of parting line or removal of other surface features to shape castings can all be done in the finishing department. Methods range from oxy-acetylene torches, to arc-air gouging, to plasma cutting, to grinding methods, to cut-off wheels, and bandsaws. This meeting will be focused on best practices and opportunities for improvement. Similar to the EAF meeting in 2016, floor supervisors would be encouraged to attend and participate in the collaboration during the roundtable discussion. This subject-focused meeting will be held at the Hotel Indigo in Pittsburgh, PA the afternoon of May 18th with a tour of McConway & Torley the morning of May 19th. Please bring your own safety shoes for the tour. Final details for the meeting will be sent to all registered attendees. To RSVP, please contact David Poweleit at poweleit@sfsa.org (please include an email address for all attendees and if you intend to join the group for dutch treat dinner on Thursday).

Thursday May 18th

1:00pm – Finishing Operations

- David Poweleit (SFSA) - introductions, finishing overview and SFSA services
- Donovan Foster (McConway & Torley) - finishing steel castings using high frequency grinders
- Caleb VanSomeren (Mercury Marine) - robots and finishing metrics
- Alex Tocco (Lincoln Electric) - best practice for equipment selection, setup, operation and safety
- Roundtable on finishing operations

Foundry Welding Meeting and Using ASME Section IX Seminar

SFSA has a [white paper on welding steel castings](#) and is working with specification bodies to reword “repair welding” to terminology that is more technically accurate. At this meeting, we will discuss welding steel castings and offer a unique opportunity for members to partake in a one-day training session by Walt Sperko on the secrets of using ASME BPVC Section IX plus welder qualification. This subject-focused meeting along with Section IX seminar will be held in Milwaukee, WI on July 19th-21st. Contact David Poweleit at poweleit@sfsa.org, with any questions.

Duplex Stainless Steels, Heavy Section Quenching and Future Leaders Meetings

The Duplex Stainless Steels (DSS) offer the corrosion resistance of CF grades but with higher mechanical properties. With advances in the wrought industry, additional opportunity for cast components has been created and their marketplace has been growing over the years. The subject-focused meeting will focus on a seminar by Tom Stevens on the development of DSS through the years to provide a fundamental understanding of the alloys. The Heavy Section Product Group meeting will be on quenching and best practices for quench tank design. The Future Leaders Group will meet in advance of both meetings but also participate in both to learn about quenching and DSS. These meetings are scheduled for September 20th-22nd. Contact David Poweleit at poweleit@sfsa.org, with any questions.

Annual Research Review

The SFSA Research Review will be held on June 13th-15th. The Review covers the latest steel casting research, and is your opportunity to interact with the researchers and provide industry steering. The event features both Carbon & Low Alloy and High Alloy topics; it is the R&D featured at the National T&O. There is no cost to attend the meeting (travel, hotel, meals, etc. are the attendees' responsibility). For questions, please contact David Poweleit at poweleit@sfsa.org.

Specifications Committee

To conclude 2016, the Specification Committee met at the ASTM A01 (Steel) meeting and did a committee virtual meeting. In an attempt to improve the four general requirement standards, revised wording that follows A6 X2.1 will be added to better describe the results from test material.

SFSA has offered support in acquiring material for A370 duplex hardness conversion tables. The new ASTM standard (A1091) for C12A was approved. SFSA offered to solicit members to provide cast material for the A262 ILS. Subcommittee A01.18 will review and update standards for heat treatment terminology. John Griffin (UAB) reported that he was not able to find the original A781 AIN macro images in his SRI documents. The committee will pursue an initial ballot to change “repair welding” terminology, which carries a negative connotation for the industry. Under the next AMC program, SFSA is planning to develop a web search utility for steel casting specifications, which will offer more utility compared to the current Handbook Supplement 2. The committee discussed ISU’s investigation of Barkhausen Technique and how it might be used with A800 ferrite measurement. With the support of John Griffin, the committee will pursue a Gage R&R on NewAge Shear Pin by first initiating an industry survey. The committee also discussed a customer request for J Factor for WC9 and for qualifying to ISO 14021 Environmental Certification. The committee will meet in 2017 in conjunction with ASTM A01 meetings on May 9th in Toronto and November 14th in Atlanta. To join the Specification Committee or for more information, please contact David Poweleit at poweleit@sfsa.org.

Industry White Papers

SFSA has released three new white papers for casting buyers and designers online at <https://sfsa.org/openletters.php>. The topics are Purchasing Steel Castings, Machining and Porosity, and Specifying Steel Castings. The society has now published six of these white papers on the website and plans to draft at least three more in 2017 based on topics identified by the Marketing Committee and SFSA members. The white papers provide an industry standard and can be referenced by foundries when working with customers.

Research Highlight

Iowa State University’s (ISU) research on ferrite prediction for duplex stainless steels was presented and discussed with the High Alloy Research Committee via a virtual meeting on February 16. The objective of this work is to develop a diagram like Schaeffler, specifically developed for castings showing effect of cooling rate. Amount of ferrite for different cooling rates during solidification and homogenization was measured using Feritscope and manual point count method. Results showed that sigma formation was substantial for cooling rates below 200°C/hr.

To compare, an inch diameter bar is calculated to cool at greater than 60000C/hr and a 10-inch bar would cool at a rate of about 50C°/min or 3000C°/hr in a still water quench. A 2-inch bar would cool at a rate of about 50 C°/min in air. Cooling rate during solidification does not seem to affect the amount of ferrite while cooling rate from the homogenization temperature affects the ferrite content. ISU will be conducting additional measurements on actual Grade 6A castings to look at the influence of cooling rate through the section thickness.

SFSA Foundation Scholarships for Member Interns

Recruiting students to join our industry and grow into leadership positions remains a critical need in the steel casting industry and a strategic initiative of the Society. The SFSA Foundation aims to attract the next generation workforce by providing scholarships to student interns. To compete for the scholarships, interns are required to work at a member foundry and carry out a specific task or investigation and selected works are presented at the annual T&O conference. We encourage all members that employ interns in 2017 to give them an opportunity to receive a scholarship by registering these interns using the following forms:

[Peaslee Scholarship Intern Sponsorship Application](#)

[Schumo Foundation Intern Sponsorship Application](#)

The SFSA foundation has two scholarship programs: the Peaslee Scholarship and the Schumo Scholarship. The Peaslee Scholarship was established by the SFSA Board in honor of the late Dr. Kent Peaslee, the Chair of Steelmaking Technology and Curators’ Teaching Professor of metallurgical engineering at Missouri University of Science and Technology. The \$1,000 scholarship is to be awarded to a student intern that has worked at an SFSA member foundry during 2017 in the area of melting or refining.

The Schumo Foundation scholarship program awards \$1,000 scholarships to interns that submit papers based on their projects. The scholarships are competitive; each applicant is required to submit a paper and PowerPoint presentation on a particular project they have completed during their employment.

Internship registrations are due by July 3, 2017.

Market News

SFSA trends support manufacturers' optimism in improving business conditions. While steel and stainless shipments were down slightly at 2% from the year prior, bookings for both steel and stainless are up significantly. Backlogs continue to edge up back up towards the typical 7-8 weeks from last year's bottom at 6 weeks.

Improving business conditions are also evident in steel mill shipments, up 6% in the first two months of 2017 over the prior year, and nondefense capital goods less aircraft, posting modest gains in shipments and new orders since the end of last year.

The price of oil and copper, both highly correlated to steel casting sales, have stabilized after a slight decline from their highs in February.

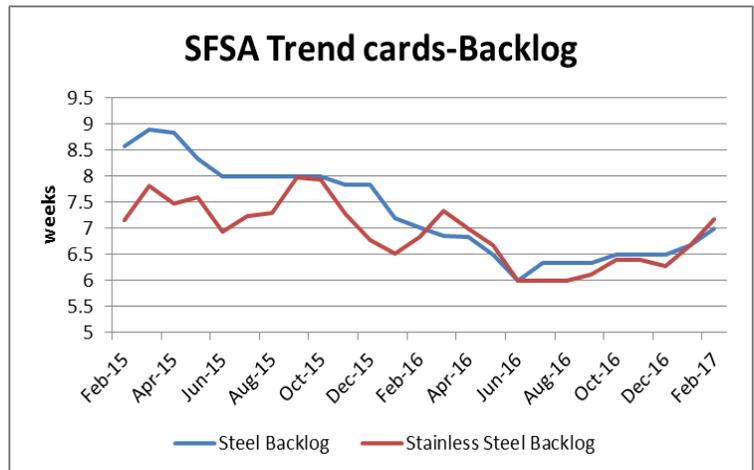
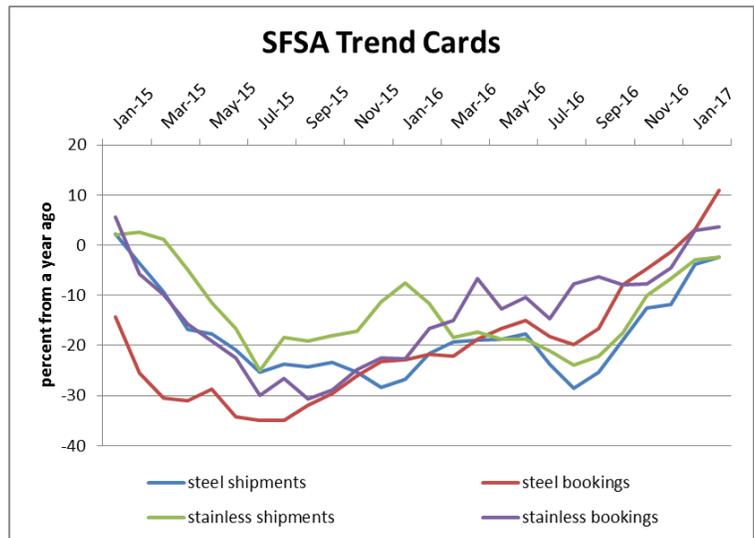
Casteel Commentary

Historically, production has moved from being centered on an artisan, the product, the capital equipment, the process and now the information. We moved from:

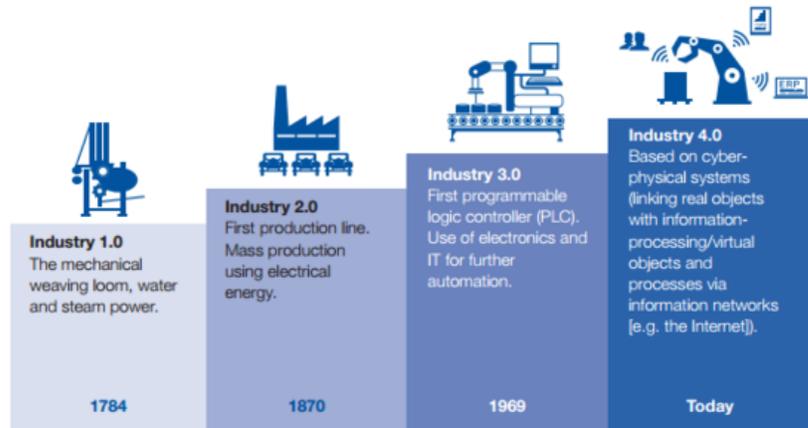
1. skilled craftsman,
2. to plants focused on bringing the craftsman and tools to the product,
3. to the production dependent on large monuments of capital equipment to process the product,
4. to production flow of the product through production for efficient processes,
5. And now to managing and using the information about the process and product as the key element to exploit for our competitive advantage.

This information centered production approach has is at the heart of what is called Industry 4.0 in Europe. In North America, this is more commonly discussed as smart manufacturing. Smart manufacturing can be thought of as two different activities such as the digital thread and the Internet of Things.

The digital thread is the desire and effort to collect all the production, process and materials data on each component made and its service life to tie production and performance together. System integrators, our large OEM customers, not only desire this life story data to improve their products and designs, they would like to secure the production and process information to assure a robust supply



chain. If the current supplier is no longer capable of providing a needed component a full description of the process and materials used would allow other plants to make the product. This is a sort of enhanced ERP system for our customers. It is problematic since the data needed included proprietary and confidential production data that could be used to qualify alternative suppliers to not only assure supply but also to bring market forces to bear on the supply chain to manage costs. It is unlikely that steel foundries as suppliers are willing to participate in this type of information sharing with their customers without new commercial arrangements to guard the value of their expertise.



The Internet of Things, IoT, is a different idea and one with great opportunities for steel foundries. Most of our parts are custom limited production parts. Our ability to track these parts through the production process to assure quality and to confirm the effort and cost of production is limited. IoT can be seen in three improvements:

1. Sensor intensity on all equipment
2. Internet data collection
3. Clever analysis of data for process and product improvement.

One area SFSA has been considering for a research project is to sensor and connect the finishing area to collect data on the effort and cost of production of custom products. If we had a bar code traveler that allowed the worker to log in and out for each job, then we could get the labor time used for production. This is already possible but in an IoT environment we can go further and instrument the manual or automated equipment with amp/volt meters, thermocouples and gate switches to track the actual touch time and effort used. This information could be put into a data base through the network. In fact all the equipment in the plant including all the control sensors already installed could be networked to give a picture of the plant operation for each product.

This data would require a clever and subject matter expert to look for improvements but this data then would be uniformly available. Immediately, we could assess the cost of production that eludes us and our current manual methods today. We could compare different processing routes, staffing, equipment, standards, products, etc.

This wiring of the factory as a network of data automatically collected and used for improvement will occur. We can gain the benefit competitively if we are smart in making this investment incrementally and intentionally starting now. This making our plants smart will make them more profitable, our products higher in quality and cost effective and make our plants more attractive modern places to work.

Raymond

**STEEL FOUNDERS' SOCIETY OF AMERICA
BUSINESS REPORT**

SFSA Trend Cards (%-12 mos. Ago)	12 Mo Avg	3 Mo Avg	February	January	December
Carbon & Low Alloy					
Shipments	-15.6	-2.3	-1.0	4.0	-10.0
Bookings	-7.6	11.0	18.0	15.0	0.0
Backlog (wks)	6.6	7.0	7.0	8.0	6.0
High Alloy					
Shipments	-13.8	-2.5	1.7	1.0	-10.0
Bookings	-6.1	3.7	6.0	5.0	0.0
Backlog (wks)	6.6	7.2	7.5	8.0	6.0
Department of Commerce Census Data					
Iron & Steel Foundries (million \$)					
Shipments	1,450.6	1,424.7	1,408	1,432	1,434
New Orders	1,487.8	1,434.7	1,419	1,405	1,480
Inventories	2,056.2	2,020.7	2,014	2,025	2,023
Nondefense Capital Goods (billion \$)					
Shipments	71.6	72.1	72.1	72.1	72.2
New Orders	70.2	69.9	73.0	70.1	66.5
Inventories	170.5	170.7	170.9	170.5	170.7
Nondefense Capital Goods less Aircraft (billion \$)					
Shipments	63.0	63.9	64.3	63.6	63.9
New Orders	63.4	64.7	64.7	64.8	64.7
Inventories	118.8	119.6	119.9	119.6	119.4
Inventory/Orders	1.9	1.8	1.85	1.85	1.85
Inventory/Shipments	0.3	1.9	1.87	1.88	1.87
Orders/Shipments	0.2	1.0	1.01	1.02	1.01
American Iron and Steel Institute					
Raw Steel Shipments (million net tons)	7.3	7.4	7.2	7.7	7.2