



# SFSA CASTEEL REPORTER

Steel Founders' Society of America

a publication serving  
SFSA steel casting industry Members

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## December — 2017

### Casteel Commentary

We make it hard for engineers to design, purchasers to buy, and companies to use steel castings. Strategically, we need to make it much easier and reduce the risk and uncertainty. The Casteel Commentary this month begins the coverage of our new engineering program to develop the tools, properties and specifications to eliminate many of the barriers to the design and use of steel castings.

### Market News

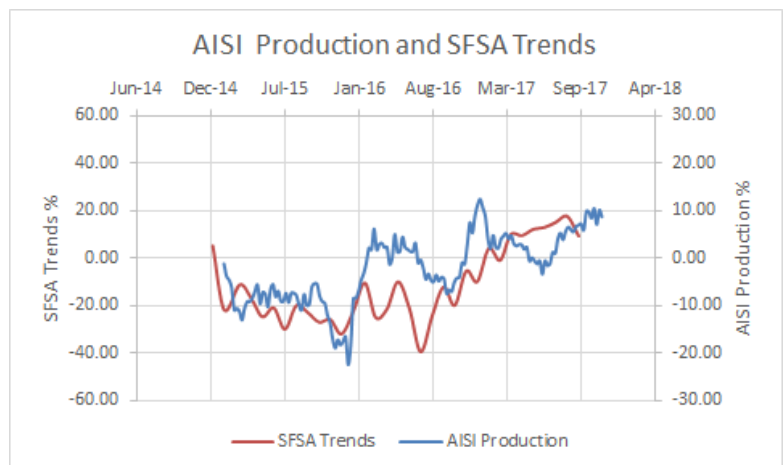
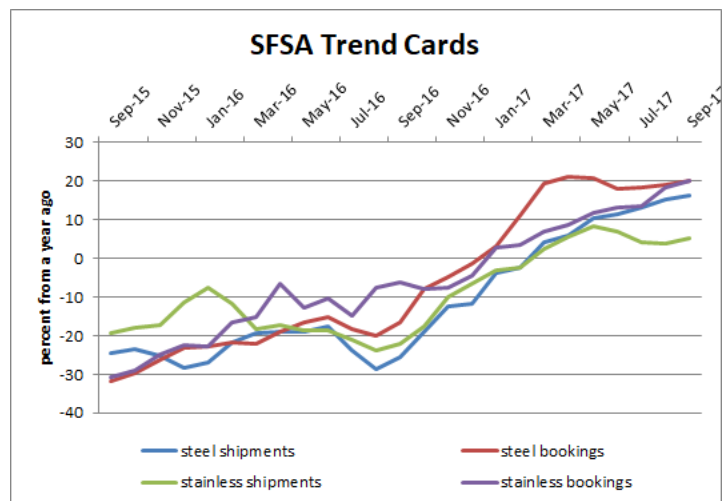
Bookings of all steel castings show significant increases from last year, over 20%. Steel casting shipments are up over 15% and stainless casting shipments are up over 5%. The backlog is the highest in over three years at 9% for all castings. This improved backlog and the stronger improvement of orders over shipments both point to an expanding market.

Steel production continues to show percentage improvement showing a strong recovery from last year but production levels and pricing both are relatively stable at a modest level of production. The stable production and pricing suggests that steel casting demand should continue to remain stable at current levels or improve modestly. Iron and steel casting shipments and orders reported by the Census show ongoing lower levels of demand and activity but this is likely due to softening demand in consumer good and especially auto production.

Other indicators of steel casting demand like oil and copper prices or capital goods orders show improving conditions, indicating improved demand. This is in agreement with our latest look at customer groups projections for sales next year showing modest improvement since the SFSA Forecast presented in September. This forecast will be updated next month at the SFSA T&O conference.

### Steel Casting Technology Course

Registration for the next Steel Casting Technology Course is now open! This is a beginner's class, designed to introduce new technical foundry personnel (which may include engineers, metallurgists, sales personnel, quality technicians, operation managers, etc.) to the fascinating steel foundry industry.



Attendees will need to participate in 3 class sessions coupled with a foundry tour.

- January 23-25, Tempe, Arizona (tour at ME Global)
- February 20-22, Pulaski, Tennessee (tour at Magotteaux)
- March 20-22, Tulsa, Oklahoma (tour AFG-Bixby)

Class size is limited to the first 20 registrants. Early bird registration before December 29 is \$1300 (register here). Registration before the 1st session on Jan 23 is \$1500. We request that only 2 persons from each member foundry location register by December 15. If there are more than 2 persons, contact Diana David ([ddavid@sfsa.org](mailto:ddavid@sfsa.org)) to enlist them to a waiting list. After 12/15, all the remaining seats will be available on a first come, first served basis. Thus, members are encouraged to sign-up early to ensure availability to attend. Please contact Diana David at [ddavid@sfsa.org](mailto:ddavid@sfsa.org) for more information.

### **National T&O Conference**

Supported by the steel foundry members that make up the Steel Founders' Society of America, the T&O scheduled for December 6-9 in Chicago is the premiere steel casting event in the world. 2017 marks the 71st conference, which will continue the legacy of technical and operating topics of today that will provide value to the industry for many years to come. This year's conference showcases both a workshop and session focused on pouring & gating, a keynote by Ingo Steller from BDG covering a range of steel casting topics from Europe, a silica update on SFSA efforts, applying Industry 4.0 in a steel foundry, and many more papers covering everything from melting to foundry engineering to molding to finishing to management to quality to technical & featured research.

### **Mexico Benchmarking Tour**

SFSA, the Board of Directors plus Fimex, POK and Fundidora Morelia would like to invite members to tour these three steel foundries in Mexico. Similar to past study group tours of the UK, Poland, Germany, China and Brazil, this tour of Mexico in February of next year will offer a wonderful opportunity to learn from and see firsthand these foundries who have supported numerous T&O papers.

Tuesday, 2/6/18 – arrive in Morelia/group dinner

- Wednesday, 2/7/18 – tour Fundidora Morelia (<https://www.sfsa.org/dir/lookup.php?clink=1628>) and drive to Guadalajara
- Thursday, 2/8/18 – tour POK (<https://www.sfsa.org/dir/lookup.php?clink=1606>)
- Friday, 2/9/18 – tour Fimex (<https://www.sfsa.org/dir/lookup.php?clink=1647>)

The RSVP deadline has passed but if you are still interested in attending, please send an email to David Poweleit ([poweleit@sfsa.org](mailto:poweleit@sfsa.org)) and we will try to accommodate additional participants if at all possible.

### **Digital Innovation Design for Reliable Casting Performance**

SFSA's "Digital Innovative Design (DID) for Reliable Casting Performance" program is creating a material property database to allow designers to select alloys as cast grades with confidence. We need your heat data for Cr-Mo 4100, Ni-Cr-Mo 8600, and carbon steels, which will be kept with anonymity. Please contact Diana David ([ddavid@sfsa.org](mailto:ddavid@sfsa.org)) for more information.

### **Customer Education Resources**

The SFSA Board and Marketing Committee have identified a need for the Society to expand its online customer education resources to promote the use of steel castings. The SFSA website has a dedicated section for casting buyers and designers that contains a wealth of information for customers in the form of white papers, publications, articles, and specifications. Building on the success of the monthly training webinars, SFSA is now delivering monthly customer education webinars and posting the recorded webinar to the SFSA customer education page. The webinars are only 10-15 minutes in length to provide buyers and designers a quick and efficient resource to learn about steel castings. The first webinar in October was 'What are Steel Castings?' and the November webinar was on 'Source Selection'. A variety of other topics are planned for the coming months, including additive, machining, alloy selection, specifications, etc. SFSA encourages you to invite your customers to use

this resource. If you have a specific topic covered for in a future webinar, please e-mail Ryan Moore – [rmoores@sfssa.org](mailto:rmoores@sfssa.org).

### **New SFSA Tech Resources**

Available now to SFSA members are two updated resources:

- Handbook Supplement 2 - covers specifications and is great to share with your customers to help them design and purchase steel castings. The latest revision (<http://wiki.sfssa.org/images/c/ca/Supplement2.pdf>) includes updates in the standards and a couple of new standards.
- Hardenability spreadsheet - presented at the 2016 T&O workshop by Dave Van Aken of MS&T, the spreadsheet calculates ASTM A255 hardenability. The latest revision (<https://www.sfssa.org/folio/downloads/ASTM%20A255%20Hardenability%20Calculator%201.2.xlsx>) has a modification to the tempering decrement, D, which is a factor in calculating tempered hardness (this will be presented by Dave at the 2017 T&O).

### **Awards**

SFSA would again like to congratulate our three board-selected 2017 award winners:

- Lorenz Medalist – Ed Kaczmarek
- Briggs Medalist – Vasile Ionescu
- Barlow Award – Jim Gossett

### **Casteel Commentary**

Let's make it easy and sensible to buy common steel castings to the next generation of engineers designing steel structures.

If you are a new engineer, mechanical or civil, and are designing a steel structure with a complex connection that is difficult to fabricate you might consider using a steel casting, but...

The common steels that you use in your operation; plates, bars, sections, all are steels that have a minimum yield strength of 50 ksi. They can be fabricated into the structure using pre-qualified weld procedures in AWS D1.1 with welded joints that include the design allowables for performance. Your 50 ksi carbon steel welded in the base material typically has a design allowable of 16 ksi and 3-16 ksi in the weld area for structures with some fatigue loading.

You look around at steel castings to get the elegant and clever design you imagine and see that WCB would be the common carbon steel used in these types of welded structures.

You look at the properties of WCB in ASTM A216 and similar to other old steel specifications like A36, the yield strength minimum is 36 ksi. A36 has a ductility of 23% but ASTM A216 WCB has only a 22% ductility, is it more brittle than plates? You think, cast steel must be an inferior product to even old plate standards. You look in your structural steel book and there is no help. You decide to use the same allowables as A36 but are uncertain if the cast steel will be ductile? Will it be weldable? Will it fail?

As you look for cast steel on the internet you find lots of stories and found a confusion of stories, what is the difference between cast steel and cast iron?

You look and ask an older engineer that is leery of steel castings and he tells you, make sure to use the right casting factor. You find a casting factor paper and it shows that you have different factors for design based on the NDT you require. The highest casting factor applied to the allowable stress is 2. So you take your design and assign casting properties, 16 ksi like A36 and a casting factor of 2 and evaluate the part with a strength of 8 ksi.

It still looks okay so you contact a local foundry. They have some design changes to improve the casting process and then ask the tough question, what kind of inspection do you want and what is acceptable? You ask, what kind of inspections would be typical for a similar part and they say, RT and MT on the first article with a level 3 RT and no indication over ¼ inch in MT. You ask, what properties will I get from my part if I accept these NDT recommendations and the foundry says, that is for you to determine. You ask, why don't we make the part with no RT or MT indications? The foundry responds, that is expensive and unnecessary, the part will perform well with these NDT levels. You ask, how do you know? The foundry says, we have used these type levels for decades with no

problems. As an engineer you ask, can I see some data to gain confidence? How do I include this in my design?

SFSA has successfully gained support for a large research program to create a design environment to allow new engineers in a model based setting to design and use steel castings. The SFSA leadership identified new product development as a strategic area of interest for our future. Our Digital Innovative Design (DID) program is funded to address the problem embedded in the story, how does an engineer design and use steel castings with confidence? How do we make it as easy and comfortable to buy a steel casting design as a fabricated or machined part from mill products?

Our program has two major thrusts, the first we will consider here. How do I verify and technically support using our common current commercial guidance so user groups are confident and capable of steel casting design?

One step is to do the testing and analysis to verify that our NDT recommendations support the design and performance requirements of customers and designers. Mill products have NDT requirements but they are hidden in the product requirements so the designer and user do not need to know or decide what they should be. We need first article and production NDT standards and acceptance that supports a design code for use of steel castings. We need to institutionalize this so the designer does not have to decide and the foundry knows at quotation what the requirements will be.

We also need to analyze our current grades and either modify the specifications to show we are as capable as mill products in our properties or develop new grades with process or composition changes that match the current mill products used in fabrication.

Our goal for this key part of the program is to make the use of custom designed castings available to creative engineers without any barriers compared to the use of mill products. We want to be integrated into the AWS D1.1 code for design and fabrication, allowed to use their pre-qualified weld procedures and have the NDT for our base metal and welds.

We want the design engineer in the story above to find steel castings in the AWS D1.1 standard. We want him to be able to specify a grade of cast steel that has the same property requirements and uses the same weld procedure as the mill products he already uses for all his other products.

We need to make it as easy to design and buy a steel casting as to buy an iPad on Amazon prime.

Raymond

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

<b>SFSA Trend Cards</b> (%-12 mos. Ago)	12 Mo Avg	3 Mo Avg	September	August	July
<b>Carbon &amp; Low Alloy</b>					
Shipments	4.5	14.0	9.3	17.6	15.0
Bookings	14.1	20.3	21.0	19.0	21.0
Backlog (wks)	7.9	8.9	9.5	9.3	8.0
<b>High Alloy</b>					
Shipments	2.4	6.8	10.0	9.5	1.0
Bookings	7.9	15.8	6.9	30.0	10.5
Backlog (wks)	7.9	9.3	10.0	9.0	9.0
<b>Department of Commerce Census Data</b>					
<b>Iron &amp; Steel Foundries (million \$)</b>					
Shipments	1,333.5	1,282.7	1,281	1,288	1,279
New Orders	1,378.6	1,346.3	1,335	1,362	1,342
Inventories	1,979.3	2,005.3	2,014	2,008	1,994
<b>Nondefense Capital Goods (billion \$)</b>					
Shipments	71.3	72.7	73.7	71.9	72.6
New Orders	71.8	71.2	75.1	70.6	67.9
Inventories	175.3	178.7	179.9	178.6	177.6
<b>Nondefense Capital Goods less Aircraft (billion \$)</b>					
Shipments	63.4	64.7	65.4	64.8	63.9
New Orders	64.0	65.2	66.3	65.1	64.3
Inventories	121.4	123.9	124.6	123.8	123.2
Inventory/Orders	1.9	1.9	1.88	1.90	1.92
Inventory/Shipments	0.0	1.9	1.91	1.91	1.93
Orders/Shipments	0.0	1.0	1.01	1.01	1.00
<b>American Iron and Steel Institute</b>					
Raw Steel Shipments (million net tons)	7.4	7.7	7.6	7.9	7.5