



SFSA CASTEEL REPORTER

Steel Founders' Society of America

a publication serving
SFSA steel casting industry members

780 McArdle Drive Unit G, Crystal Lake IL 60014
Tel: 815-455-8240 Fax: 815-455-8241
<http://www.sfsa.org>

February — 2021

Casteel Commentary

Our 2021 steel casting forecast for the market demand was for a slight improvement in the first half of the year with stronger growth toward the year's end. It looks as though the demand is stronger than that so far this year with more improved demand than anticipated. This raises the question of how we should think and plan for the possibility of a much stronger market in the coming year...

Interns & Scholarship Applications

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 Steel Founders' Society 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. If you currently have or plan to have an intern work at your foundry in 2021, be sure to have them complete a scholarship registration form which the Society will distribute via email and on the SFSA website later this month.

T&O 2020 Best Papers Announced

SFSA would like to congratulate the best paper winners from the 2020 T&O Conference. The recipients are:



Founders' Choice Award:

Johan Speekhout, McConway & Torley, for his paper on "Phased Array Ultrasonic versus Radiography"



Rod Duncan Best First Time Paper (tie):

Michael Graebner, Bay Cast, for his paper on "Sand Defects of Steel Castings"



Rod Duncan Best First Time Paper (tie):

Alejandro Cortes, POK, for his paper on "Our Journey to Become the Safest Foundry in the World"



Robert G. Shepherd Runner-up Best Paper:

Ryan Horak, Eagle Alloy, for his paper on "Experiences with Robots 3.0"



Robert G. Shepherd Best Paper:

Mario Terrazas, Matrix Metals - Acerlan, for his paper on "Installation of Porous Plug and Injection of Argon Gas Through the Bottom in Induction Furnaces"

Read Mario's Paper on the [T&O Conference Webpage](#).

The 2021 T&O Conference is tentatively scheduled for Dec. 8 – 11, 2021 in Chicago.

T&O 2020 Casting Simulation Workshop Contest

During the 2020 T&O Casting Simulation Workshop, seven teams presented their unique simulation efforts and rigging strategies for the same cast component. We're pleased to announce the winners selected by our panel of expert judges. Monett Metals took home the prizes for Best Yield, Most Detailed, and Most Innovative, while DW Clark won the prize for the Most Robust Design. Though only two teams took home prizes, the judges were extremely impressed with and appreciative of all of the submissions – all teams submitted extremely high-quality work and made the judging process very difficult. Thank you to all of the teams who participated: Fimex S.A. de C.V., Effort Foundry Inc., Monett Metals Inc., Harrison Steel Castings Company, Howell Foundry LLC, Midwest Metal Products, and DW Clark.

Cast in Steel: Performance Testing & Event Dates

The work of building projects begins. Thirty teams from twenty-three universities, guided by twenty-six industry partners, will participate in the 2021 competition. Performance testing will take place in Chicago on Saturday, April 24th. Ben Abbott from the History Channel's program 'Forged in Fire' will join a team of experts to evaluate each hammer. The online event will be held Friday, April 30th.



In 2020, the Cast in Steel competition claimed 61% of the time viewers spent on the SFSA Website. The 2020 Premier event saw 4,000 views with an additional 2,000 in the months that followed. Sharing the sponsors on each team listing is one of the ways we show thanks to all who support the students. Learn more about supporting the event, or contact [Kimberley Schumacher](#) with any questions.

Bowie Knife Auction Thanks

The 2020 Bowie Knife auction was great fun and benefitted the colleges & universities that participated in the Cast in Steel competition. Following the auction, several winners graciously gifted their bowie knives back to the students who worked so hard to cast the final product. Among those schools receiving their knife back were Pittsburg State (from PSU alum, Steve Sikorski), Cal Poly-San Luis Obispo (from former FEF Professor, Martin Koch), and the University of Northern Iowa (from Nick Gerrits, former FEF Board Member). We look forward to even more auction competition for this year's Cast in Steel Thor's Hammer submissions. -Pam Lechner, Foundry Education Foundation.

Research Highlight

Alternate Heat Treatment for Increased Toughness and Strength in HY-80: The University of Maryland (UMD) has now concluded their work under the DID program on creating alternative heat treatments for HY-80 to simultaneously increase toughness and strength in thick sections of HY-80 through inter-critical heat treatments. Critical temperatures were determined by comparing literature studies with Calculation of Phase Diagrams (CALPHAD) modeling and experimental trials using Differential scanning calorimetry (DSC). Their experimental results showed the ductile to brittle transition temperature (DBTT) decreased without any significant loss in tensile strength. An increase in impact properties at -100F was observed when a second austenitization step was replaced with an inter-critical heat treatment just below the upper critical temperature (Ac3). The believed mechanism for the improved mechanical properties at low testing temperatures, is the stabilization of the austenite phase during inter-critical heat treatments, allowing it to be partially retained in the microstructure after quenching, and transforming to martensite only upon the application of sufficient stress.

MS&T Hardenability Calculator: An updated version (v3.0) of the Hardenability Calculator which was developed by Prof. Dave Van Aken (MS&T) is now available [on the wiki](#). The modifications include estimation of tensile properties for quenched and tempered samples based on hardness and the user can now define any value of quench severity, H.

Becoming a Master: The SFSA Artisan Program

"The best yardstick for our progress is not other people, but ourselves." – [Chris Matakas, My Mastery, 2013](#). Member company employees with five years of qualified experience are ready to take on the challenge of personal mastery of their job function. [The SFSA Artisan Program](#) is intended to be used at the plant level for this purpose. The program sets the bar to assure that companies are competitively staffed and the steel industry remains vibrant.

Programs exist for finishers, welders, rigging engineers, pattern makers, molders, melters, maintenance craftsmen, investment casters, heat treaters, and Master Founders. If you are interested in becoming a Master, or if you have an employee to nominate for Masters recognition in their specific job, contact [Ryan Moore](#).

Specifications Committee

The committee meets twice a year and works with ASTM A01.18. The following are on-going activities being worked:

- Changes to four general/common requirement standards for consistency have been drafted
- Request to add “production welding” definition to A941
- Add definitions for repair welding and fabrication welding, and amend text in spec for production/repair/fabrication in A488
- Develop a new structural steel casting standard for cast counterparts to wrought grades with equivalent requirements
- Look to drop “N” and “Q” from grades of A757
- Applicability of using a thermocoupled casting in lieu of a furnace survey
- Development of Positive Material Identification (PMI) practice
- Development of standard for 440 grades
- Revision to E10 has resolved immediate concerns regarding benchtop v. portable hardness testing (E10 and E18 allow portable testing)
- Monitor future changes to A370 related to benchtop/movable/portable hardness testing
- Additional user sponsors for specs

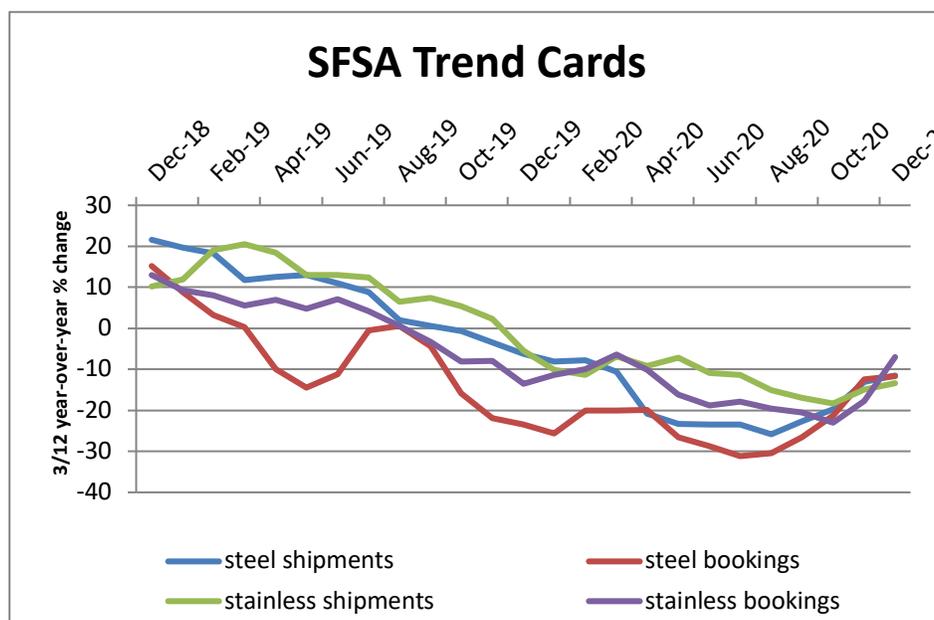
To join the committee, please contact [Dave](#).

Staying Sharp, Raymond Monroe, PhD

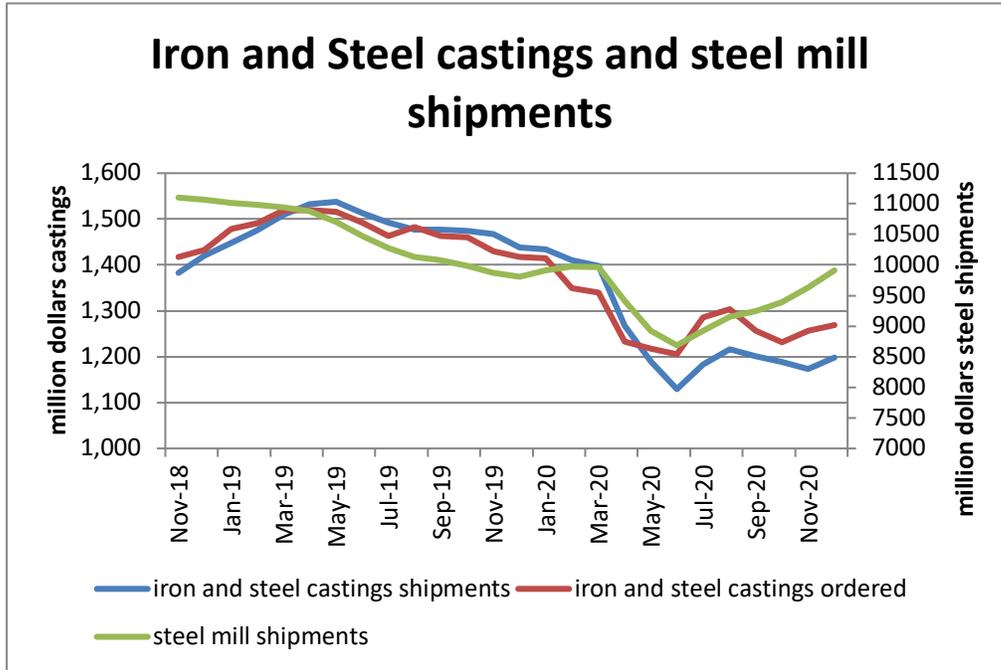
Raymond successfully defended his dissertation, titled “*Developing Data Driven Tools to Enable Rationally Designed Steel Casting Alloy Production*,” on November 19th, 2020. He graduated in December with a PhD in Manufacturing Engineering from Worcester Polytechnic Institute. With great respect and appreciation; Congratulations Raymond, and thank you for inspiring your team, and others, to push ahead in these challenging times.

Market News

The results of the December SFSA business trends survey showed signs of ongoing recovery as bookings for all steel castings exceeded December 2019 levels, with no decrease anticipated going into the first quarter of 2021. The backlog for steel castings is holding steady at 8 weeks and stainless is climbing towards 10 weeks from its 8-week plateau. Shipments are also trending upward closer to year ago levels.



Similarly, the Department of Commerce numbers for iron and steel casting orders and shipments are showing signs of recovery as well as steel mill shipments which are at parity with year ago levels. All of the indicators we track continue to remain positive for our steel casting markets.



Casteel Commentary

While it is not clear or sure that we will see significant demand and difficulty in staffing and production, this could occur. For example, inflation is currently expected at higher levels than has been seen for years but still modestly below 2%. Inflation and market demand may move up more quickly than financial markets anticipate. COVID stimulus money and low interest rates have dramatically increased savings. Shutdowns early in 2020 from COVID limited normal production. The lack of supply, the reduction of capacity, and the possibility of renewed demand could quickly change the marketplace conditions.

A decade of low interest rates, unprecedented monetary policy protecting all forms of financial investments in instruments like equities and debt, globalization distortions as China positioned itself to become the dominant supplier, and the decline of domestic capital investment in plant and equipment (hidden in part by investment in software) have set up a dangerous imbalance in the North American economy. Unsustainable trade policy has made the economy reliant on global suppliers that are unlikely to remain capable of meeting our domestic requirements. Nationalistic trade policies are inevitable since our competitive position in the global marketplace is an artifact of national economic and regulatory practices and not manufacturing value and efficiency.

The trade policy's need to correct for the market distortion of different national public policy regimes to allow the global transactions to discover the best value. Domestic sources that are necessary for security and prosperity need to be supported by regional agreements that allow market-based trade competition. This requires the elimination of national policies that distort the market and trade agreements that are fundamentally mercantilist. While policymakers advocate free and fair trade, the current trade agreements are neither. The evolving consensus of challenging China's trade practices appears to be publicly supported enough that policymakers are grappling with the best path forward.

Some of this was seen in the PPE shortages in the COVID needs that were hard to meet early in the pandemic. With the pandemic shutdowns, domestic manufacturing capacity could be shifted to meet those needs. But between the unsustainability of continued shutdown and unemployment, the reduction of capacity and production capability due to the low business levels, the unprecedented expansion of debt and money supply, and the recognition of hostile peer economies who represent a danger to our future; our current trajectory is problematic.

The current market wisdom that is seen in the unsustainable high equity valuations and debt levels based on low interest rates and low inflation is premised that with the resolution of the pandemic, economic growth will be dramatic and justify the current market values. I think this is unlikely.

But the demand for infrastructure and the need for basic goods and services will result in a renewed demand for steel casting production. While the economy as a whole may struggle with inflation and stagnation, steel foundries may be at capacity struggling with recruiting a capable workforce and finding the equipment and materials needed for the demand.

Now is a good time to consider the need for automation and other investments to reduce labor content and improve operations. While this is a constant consideration, we may need to be prepared to adapt to radically different market conditions over the next few months.

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

SFSA Trend Cards (%-12 mos. Ago)	12 Mo Avg	3 Mo Avg	December	November	October
--	--------------	-------------	----------	----------	---------

Carbon & Low Alloy

Shipments	-17.1	-11.5	-3.6	-10.0	-21.0
Bookings	-21.7	-11.7	0.6	-15.5	-20.0
Backlog (wks)	8.1	7.7	8.0	8.0	7.0

High Alloy

Shipments	-12.0	-13.3	-10.0	-10.0	-20.0
Bookings	-13.1	-7.0	14.0	-10.0	-25.0
Backlog (wks)	8.8	9.7	11.0	10.0	8.0

**Department of Commerce
Census Data**

Iron & Steel Foundries (million \$)

Shipments	1,231.6	1,197.7	1,192	1,199	1,202
New Orders	1,267.8	1,269.3	1,206	1,314	1,288
Inventories	2,121.4	2,046.3	2,049	2,032	2,058

Nondefense Capital Goods (billion \$)

Shipments	69.9	73.2	74.4	71.8	73.4
New Orders	63.4	71.2	70.5	71.9	71.1
Inventories	192.9	194.7	194.3	196.1	193.7

**Nondefense Capital Goods
less Aircraft (billion \$)**

Shipments	66.6	69.9	70.3	69.9	69.6
New Orders	67.4	71.4	72.0	71.5	70.7
Inventories	128.1	127.7	128.3	127.8	126.9

Inventory/Orders	1.9	1.8	1.78	1.79	1.80
Inventory/Shipments	0.0	1.8	1.82	1.83	1.82
Orders/Shipments	0.0	1.0	1.02	1.02	1.02

American Iron and Steel Institute

Raw Steel Shipments (million net tons)	6.8	6.9	7.0	6.8	6.7
--	-----	-----	-----	-----	-----