SFSA CASTEEL REPORTER

Steel Founders' Society of America

a publication serving SFSA steel casting industry members

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August — 2020

Future Leaders Virtual Meeting – August 25th

Data and How to Use it

Over the years, SFSA staff have had an opportunity to learn from Raymond about what data means and how to set up a good experiment/research. Knowing signal from noise, things can be true but not meaningful, the meaning of significant digits, and how to do data analysis beyond linear regression; are all important skills that can be used in the foundry by our next generation of supervisors, managers, metallurgists, and engineers. Our "*Data and How to Use It*" virtual meeting will be on Tuesday, 8/25. If you have employees at your foundry that will become your future leaders but are not currently participating in this group, please contact Diana David at ddavid@sfsa.org.

Fall Leadership Meeting - September 26-27

SFSA announced in June that the traditional SFSA Fall Leadership Meeting has been cancelled. However, several members expressed an interest in having the opportunity to meet and network with peers in-person. So SFSA will offer a short Fall Meeting on September 26-27 at The Scott Resort & Spa in Scottsdale, AZ. The meeting will consist of an industry roundtable, the SFSA Market Forecast, and an industry and economic update from Raymond Monroe. There is no registration fee for the meeting - travel, hotel, meals, etc. are the attendees' responsibility. If you are interested in attending, please contact Ryan Moore at rmoore@sfsa.org.

Steel Performance Initiative

SFSA is establishing long-term continuity for research to support the steel industry through a multi-year, DoD-funded Steel Performance Initiative. This initiative will foster the development of new steel alloys, hybrid casting solutions, model-driven design + manufacturing + performance, and the continued development of manufacturing technology. SPI will expand upon the successes of SFSA's Digital Innovative Design (DID) program for steel castings while gaining long-term continuity in funding to solve the common needs of the steel industry across all major product forms (cast, forged, mill). The outcome of the SPI Program will provide commercial steel producers with tools needed to achieve global competitive advantage, and the military with dominant capability. For more information about SPI, contact Hayley Brown at hbrown@sfsa.org.

SFSA Seeking Project Engineer

SFSA seeks to add a project engineer to our staff to support our Steel Performance Initiative (SPI). We are looking for a technically-minded, hard working person to gain a life-time experience in specialty steel design and manufacturing innovation. This position is an ideal opportunity for a new or recent graduate to work with the steel industry and academia on advancing steel technologies. We would appreciate your recommendations for a high caliber candidate to fill this position. Please note that we will not consider current member employees as candidates.

Welcome New SFSA Team Members

Steel Founders' Society of America is happy to inform you of three recent additions to our team. Kimberley Schumacher, Communications Specialist and Administrator, came on board in the midst of the pandemic shutdown. You may recognize Kimberley's work in the Cast in Steel Competition, New 'News' section of the website, and our recent presence on Social Media.

Alexa Smith, Project Engineer, joined the team about a month back and has hit the ground running. Alexa has focused her career on R&D efforts and innovative process improvement. She will be working to advance projects aimed at developing the next generation of model-based tools for casting design. Alexa holds a Bachelor of Science and Engineering from University of Michigan.

Most recently Hayley Brown joins in serving SFSA members in her new role of Mill and Forging Technology Manager. Hayley will support the technical steering and program management leading the organizational development of the Steel Performance Initiative (SPI). She holds a B.S. in Biological Engineering and a Ph.D. in Mechanical Engineering from Mississippi State University.

Research Review: Digital Innovative Design (DID) Update

This year's Research Review was done virtually, and incorporated outreach to designers and users through our DID initiative for reliable steel casting performance. The Review focused on our DID program, which is addressing our primary board goals of enabling designers to use steel castings, customer education and workforce development. If you did not participate, here are a select handful of innovative research projects that will create a strong future for the steel foundry industry.

1. ISU - automated foundry grinding: Supports our Next Generation Manufacturing (NGM) group's "smart automation" objective. Smart automation works for job shop manufacturing in a steel foundry environment. This technology will enable the use of automated grinding by marking a part for features that need to be worked.
2. Lehigh - neural network alloy design: Creates a means for a foundry to assess a "sweet spot" to achieve the desired properties. Whether it is determining upper and lower bounds, or investigating a new chemistry, foundries can take advantage of their small batch, specialty steel melting and this NGM "smart data" technology. Smart data covers both Artificial Intelligence and the Internet of Things.
3. UNI - sand strength testing: A fundamental part of sand control has historically been the "dog bone" tensile test. Unfortunately, this test has poor repeatability; thus, making it hard to know if there is a sand system issue or it is just the normal variation of the test itself. Through three-point or four-point bend testing the repeatability is improved. The setup for testing along with a reference commercial specification will be available soon, which will enable replacing steel foundry dog bone tensile testing.
4. ISU - digital surface standards: Provides two critical capabilities. First it resolves the historical challenge of the repeatability and reproducibility for visual inspection (how many times does your customer rate the casting different from you?) Next, and maybe more important, it enables a way to consistently rate a casting, which can then be attributed to performance. Under another ISU project, the initial data already demonstrates that surface roughness does not affect fatigue life.
5. Lehigh - production welding: Addresses the concern of welding castings during the production of castings. The welding of castings as part of the manufacturing process at the foundry is commonplace but no longer understood as being a best practice for manufacturing the casting. This project is providing data to support the practice along with working on incorporating castings into AWS D1.1.
6. Iowa – rigging for clean steel: There have been several clean steel initiatives. This one will focus on the pouring and gating of steel castings with a specific focus on the use of filters. The project will leverage another Iowa project on modeling air entrainment. Improving the ability of foundries to utilize simulation that is grounded on engineering and backed by trials will provide new capability to look at the trade-offs in foundry engineering.

PDFs of the presentations are on the Steel Casting Wiki's Research Project page for members. For questions, please contact David Poweleit, poweleit@sfsa.org.

Cast in Steel: Bowie Knife Awards

In this challenging season, all teams submitting an element of project completion can be ***'#SFSAProud'***! The 2019/20 Cast in Steel Challenge was to design and produce a functioning Bowie Knife using modern casting tools and processes. Steel Founders' Society Foundation is proud to announce that a total of $7,800.00 in scholarship money was awarded. Winners include:

- Main Awards

Best Performance - Virginia Polytechnic Institute

Best Technical Report - Texas A & M University

Best Project Video - University of South Alabama

- "Ben's Best" Recognized for special attributes and creativity:
    - Most Period Correct Handle - Mississippi, Team 2
    - Most Ambitious Casting & Intricate Design - Missouri State University
    - Unique Design - Instituto Tecnologico de Morelia, Mexico
    - Best Cast Guard & Pommel - Pittsburg State University - Fist Pommel
    - Most Surprising Knife Cast - Penn State University

Project Technical Reports, Team Videos, Bowie Knives and Industry Partners can all be found at: https://www.sfsa.org/castinsteel, under the tab [Cast in Steel 2020]. Many thanks to our project sponsor Magma Foundry Technologies, all university professors, and industry partners.

Registration for 2020/21 is Now Open! The Project: Thor's Hammer, find out more HERE.

If you are interested in participating, working with a university team as an industry partner, or assisting the foundation by sponsoring the event, contact: kschumacher@sfsa.org.

Acknowledgements for Years of Service

At Steel Founders' Society of America, our employee mission is to make friends and solve problems. We do this together, working as a team, engaging industry, and partnering with academia to improve on the many years of experience that have brought the steel industry to where we are today. Committed to this mission, SFSA wishes to acknowledge the following employees for their service:

David Poweleit has shared more than twenty years of good humor, warm presence and engineering expertise while leading projects working alongside our members.

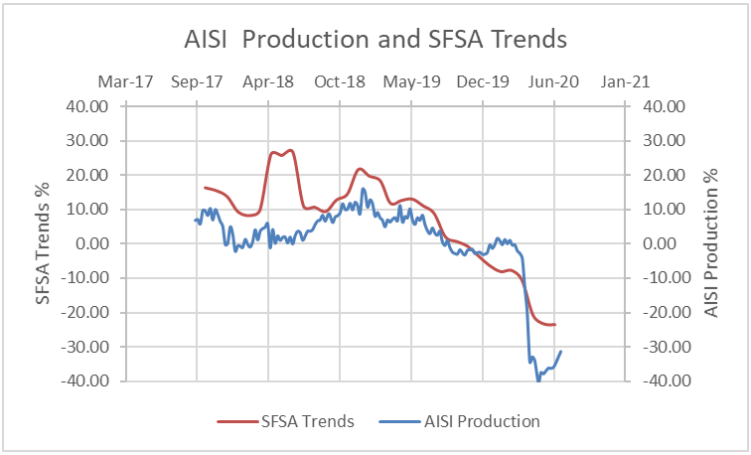
Rob Blair has brought over twenty years of his welcoming smile, resourcefulness, and computer information management talents to the association.

Raymond Monroe's leadership, people management, and teaching abilities have enriched partners for more than thirty years.

SFSA would like to honor and thank each of these above for their continuous contributions.

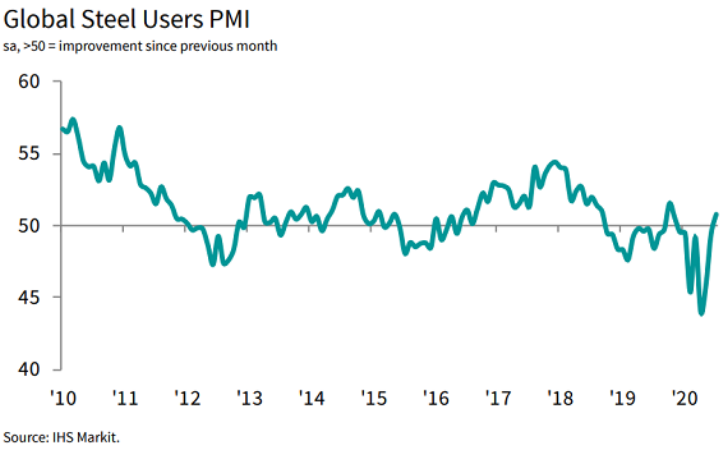
Market News

SFSA Trend Cards show the continued decline of activity in steel castings through May. Carbon and alloy steels are down more than 20% in both shipments and bookings. Stainless castings are down with bookings falling more than shipments suggesting slower future activity. As expected, backlogs are shrinking and stand at less than 9 weeks. The numbers are included in our Business Report at the end of this newsletter.



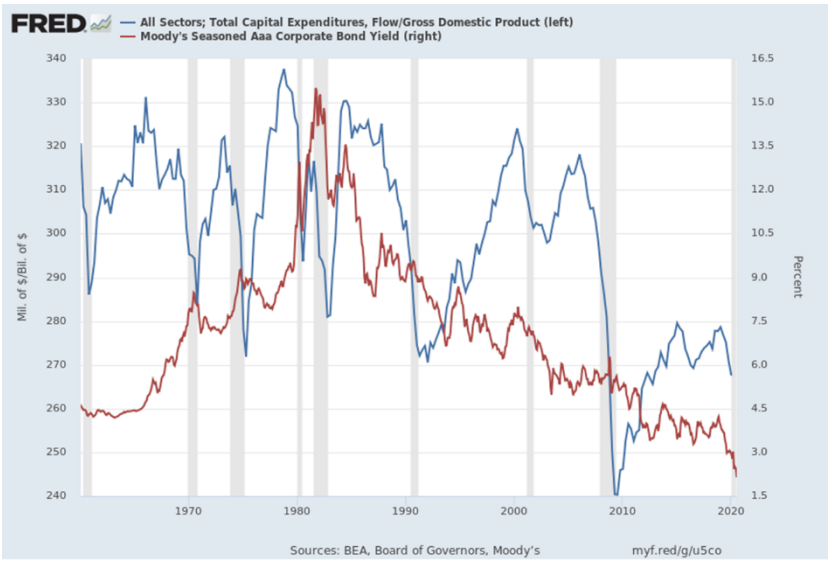
This continued drop in business is painful but expected. The graph shows how steel casting trends track AISI reported steel weekly production. We are generally behind their trends with longer lead times and custom parts that must be individually ordered. Encouraging is the bounce and beginning recovery. In fact, the global steel users' PMI has shown a sharp rebound and is above 50% indicating increasing demand.

Non-Defense Capital Goods Orders are down 10%, a huge drop for this gross measure of economic activity. This is a direct measure of the need for our steel products. Encouragingly (actually a real word, I looked it up to make sure), the price of copper and oil have rebounded from their lows. Oil had fallen below zero for one day and now is at $41 a barrel, down from over $60 but well above the $20 that marked levels in the decline. Copper prices had fallen from $2.8 a pound to almost $2.1 and now has also rebounded to $2.9 a pound. The producer price index for steel castings has not shown a significant decline, likely due to the embedded cost of steel casting production compared to the conversion cost of materials pricing of mill products.



The near-term outlook remains uncertain with the continued lockdown of the economy accompanied by the injection of money to support the fixed costs of the economy during the lack of business and employment. The curtailment of production of the wide range of products due to slowdowns in demand and capability is likely to create strong demand as conditions are able to return to a more normal operation. A likely outcome is that our industry is again pushed from underutilization to capacity.

Our industry saw some of its best days when interest rates were high and rising in the 1970s. Rising interest rates make the time value of money higher and rewards capital investment. Low and falling interest rates eliminate the time value of money and discourage investment. We are suffering through an unprecedented decline to low interest rates, some areas with negative interest rates. While low interest rates reduce the cost of capital for capital intensive industries like ours, it also eliminates the incentive to make risky capital investment for future returns. Low interest rates have the perverse



effect of increasing the value of profitable capital assets and reducing the willingness to take the risk of new capital investments. The FRED graph shows the fall of capital expenditures as a fraction of the GDP and Moody AAA interest rates. When interest rates were over 10% the total capital expenditures never fell below $280 million/$billion GDP. When interest rates fell below 6%, total capital expenditures never rose above 7.5%. Rising interest rates when the economy is expanding increases the time value of money encouraging investments with a future return. Low interest rates incentivize current transactions that gain a short-term profit.

The inadequate capacity globally for steel castings will be more keenly felt in North America where the financial sectors, and our dominance in the world economy, led many OEM and large Government organization to import using globalization to reduce costs and access rapidly growing markets. This has resulted in a more severe capacity reduction in our region and in other developed countries as well. The pandemic exposing the economic, military and political risks of global strategies will likely lead to a rebalancing of policies and strategies. This will move production back to more domestic sources.

The reality that public policy, not economic competitiveness, drives global trade will need to be sorted out. There is still a legacy economic policy that promotes “free” trade while ignoring the market, distorting effects of national public policy on global transactions. Given the preference for financial and services embedded in our fiscal and monetary policies, the re-adjustment will be painful and will be avoided if possible.

So, the future of our industry will depend on whether the realities of trade and economic policy result in a reconfiguration to allow market forces to determine trade outcomes. If not, then either a protectionist policy to inefficiently favor domestic sourcing or a global policy to hollow out the economy will damage our potential growth and prosperity. Unfortunately, in our current partisan political environment, there is little knowledgeable discussion of the effects and consequences of current or proposed policies on trade and domestic prosperity.

Casteel Commentary

Uncertainty. Our current challenge is how to manage the unknown future. The pandemic is a unique event. Historically, we would have suffered fully the fatalities and sickness but would have had little ability to shut down the economy. The wealth of our current society allows us to feed, house and care for our community while distancing and shutting down. This is a real blessing.

But…

It comes with a cost and real sacrifice. We depend on a vast array of hard-working people put at risk to maintain our lives. From the emergency room doctor to the grocery store clerk to the policeman to the delivery driver; we depend on these valued people keeping the system going and providing the necessary things and services we need to live.

Our steel casting business is deemed essential and we are able to operate even with state-imposed shutdowns almost everywhere. While we are deemed essential parts of the economy, we are not valued by the policy makers and financial sectors. We live in the unknown. A presidential election appears to offer sharply different public policies and economic conditions. The pandemic has receded and is now increasing. A vaccine is promise soon but may be of limited effectiveness and many people have already indicated an unwillingness to be vaccinated.

How are we supposed to operate and make key decisions? We don’t want policy makers to dictate how we run our business but without a reasonable public agreement on how we manage the pandemic and the associated financial impacts, uncertainty reigns.

As an industry, we in the Steel Founders’ do have an advantage over many if not most businesses. We have experienced excruciating volatility cycling between dramatic drops in business followed by demand that exceeds our capacity. In this sense we already have practices and plans that allow us to survive the dramatic business downturn. So, in one way, we just do what we have been doing in the past; retaining key employees, managing our business to conserve resources, looking for improvements that are possible while business is slow, actively collaborating with customers to maximize current and future opportunities.

In another way we need to recognize the unique character of this pandemic and economic collapse. In our production plant, how do we automate to continue to reduce the labor required? How do we allow,

manage and profit from added flexibility to office employees that can work effectively from home? How do we engage with customers, employees, neighbors, suppliers when trips and face to face relationships become Zoom meetings? Most fundamentally, how do we find and develop relationships with valued people that are capable for the future?

The trite saying is that employees are our most important asset. I would propose that our friends in business are key to our success. At SFSA, we have adopted the slogan that we do two things. One, we make friends. Two, we try to help people solve problems.

I would suggest this strategic vision as critical to the future of our industry. If we can be seen as valuable contributors to helping customers solve their problems with steel castings, we will succeed. We must do this by developing a network of friends who are suppliers, customers, neighbors and employees.

Raymond

STEEL FOUNDERS' SOCIETY OF AMERICA
BUSINESS REPORT

SFSA Trend Cards (%-12 mos. Ago)	12 Mo Avg	3 Mo Avg	June	May	April
Carbon & Low Alloy					
Shipments	-9.9	-23.5	-17.5	-23.0	-30.0
Bookings	-19.1	-28.7	-26.5	-31.0	-28.6
Backlog (wks)	8.8	8.3	10.0	7.0	8.0
High Alloy					
Shipments	-4.0	-10.9	-9.0	-8.8	-15.0
Bookings	-10.5	-18.7	-15.2	-21.0	-20.0
Backlog (wks)	9.4	8.0	8.0	8.0	8.0
Department of Commerce Census Data					
Iron & Steel Foundries (million $)					
Shipments	1,361.3	1,132.0	1,173	1,142	1,081
New Orders	1,355.8	1,203.0	1,300	1,187	1,122
Inventories	2,160.6	2,164.7	2,138	2,158	2,198
Nondefense Capital Goods (billion $)					
Shipments	71.5	64.1	66.0	63.2	63.1
New Orders	65.1	54.6	52.2	62.3	49.4
Inventories	193.4	191.6	193.0	191.6	190.2
Nondefense Capital Goods less Aircraft (billion $)					
Shipments	66.9	62.4	64.1	62.0	61.1
New Orders	66.9	62.6	64.3	62.2	61.3
Inventories	129.3	128.9	128.7	129.0	129.0
Inventory/Orders	1.9	2.1	2.00	2.07	2.10
Inventory/Shipments	0.0	2.1	2.01	2.08	2.11
Orders/Shipments	0.0	1.0	1.00	1.00	1.00
American Iron and Steel Institute					
Raw Steel Shipments (million net tons)	7.4	5.7	6.0	5.5	5.6