



SFSA CASTEEL REPORTER

Steel Founders' Society of America

a publication serving
SFSA steel casting industry members

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September — 2020

Casteel Commentary

Our current situation is difficult, the near future is uncertain, but the industry is likely to have a bright future based on the needs and changes in technology. The Casteel Commentary looks at the impact of electric vehicles (EV) are likely to have on our industry. The need for mining and infrastructure that is essential to the technologies being commercialized will require steel castings. As always, I welcome your thoughts and challenges.

Future Leaders Webinar Series: Data and How to Use It Part 3 – Oct 20, 10AM CDT

A webinar series about data analysis is being hosted with the Future Leaders Group. Raymond Monroe presents about what data means, how to set up a good experiment/research, knowing signal from noise, and how to do data analysis beyond linear regression. Part 3 of this “Data and How to Use It” webinar series will be on Tuesday, 10/20, 10AM CDT. If you missed Part 1 and Part 2, the recording is available to all members at

[https://wiki.sfsa.org/index.php/Steel_Casting_Technology_Videos#Future_Leaders - Data Analysis](https://wiki.sfsa.org/index.php/Steel_Casting_Technology_Videos#Future_Leaders_-_Data_Analysis).

The Future Leaders Group is intended for people who are new to the steel foundry industry and who have the potential to hold greater responsibilities in the foundry. The FL Group provides an opportunity for these individuals to meet and interact with peers from other member foundries. If you have employees at your foundry that will become your future leaders but are not currently participating in this group, we encourage you to introduce them to the FL group. For more information about FL and this webinar series, please contact Diana David (ddavid@sfsa.org).

Cast in Steel: Registration /Call for Industry Partners



As students return to college, they face many new challenges, including the 2021 Cast in Steel Competition. Students will build Thor's Hammer. Competition details, flyer to share, and specification are found on the website at <https://www.sfsa.org/castinsteel>. SFSA is now accepting registrations, industry partners, and team sponsors.

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Students & Professors: Register Your Team [HERE](#).

SFSA Members: Email Kimberley Schumacher (kschumacher@sfsa.org) to confirm your interest in partnering with a student team, or to request information about event sponsorship.

Steel Founders' Society Foundation works to secure a future for the steel casting industry by encouraging students to work in the industry. The 2020 Cast in Steel Competition paid out more than \$7,800.00 in scholarships. In spite of overwhelming unknown odds, many of last year's competitors prevailed. This year, we look forward to the same creativity and excitement.

National Technical & Operating Conference

This year's T&O will be virtual (not in-person). Our industry, tough as the steel we cast, is working to come together even through these challenging times. The conference will be held the week of December 7th. More information will be available in the near future. This member event will be a success because of those expecting to attend, being willing to provide a paper. To check if your foundry has made this commitment alongside your fellow founders, please contact Dave (poweleit@sfsa.org).

Research Highlight

Lehigh University is starting a research project to investigate Monel (Ni-Cu) alloys. Using modern simulation and characterization tools, they are evaluating effects of alloying elements such as Ni, Cu, Si, and Nb on microstructure and weldability to optimize the properties, weldability, and manufacturability.

If your foundry used to make or is currently making any Monel grade, we welcome any input and suggestions you have to ensure this research addresses current challenges with these alloys. If you also have extra material, whether it is sound material or samples with indications that need to be investigated further, we encourage you to donate this to Lehigh for this research. For more information, please contact Diana David.

Keeping the Team Sharp

SFSA partners with thinkers and decisions makers to lead the steel industry. Behind every good leader is a strong and knowledgeable team. For this reason, I would like to direct you to the Education page (<https://www.sfsa.org/education.php>) on the SFSA website. The information here was developed with your customer in mind, the designer and buyers of steel castings.

In application, these trainings might be used in support of the sales effort, as continuous learning for production employees, or in Human Resources to introduce the industry to non-production employees. This month, I bring your attention to the video "What are Steel Castings?"

(<https://www.sfsa.org/education.php#what>) For a more in-depth study the video might be followed up with the reading of "Overview of the Casting Process."

(<https://www.sfsa.org/castingprocessoverview.php>)

I invite you to share this knowledge with your team. I would also invite you to keep us sharp! Send us your thoughts on what we can do better and how we can best support your organization's continuous learning and professional development efforts. Kimberley Schumacher, kschumacher@sfsa.org.

SFSA Safety Awards

The steel foundry industry's safety record has improved significantly in recent years and SFSA would like to recognize members that have contributed to this ongoing improvement.

It is time to participate in our Safety Award Program! To be eligible for safety awards, participants must report a safety record DART for 2018 that is equal to or less than 2. This is the composite average for all manufacturing industries. We will be awarding "Perfect" and "Outstanding" awards. The formula used is as follows:

Days Away from work, Restricted, or job Transferred (DART) rate: This includes cases involving days away from work, restricted work activity, and transfers to another job. It is calculated based on $(N / EH) \times (200,000)$ where N is the number of cases involving days away, and/or restricted work activity, and/or job transfer; EH is the total number of hours worked by all employees during the calendar year; and 200,000 is the base number of hours worked for 100 full-time equivalent employees.

For example: Employees of an establishment including management, temporary, and leased workers worked 645,089 hours at this worksite. There were 22 injury and illness cases involving days away and/or restricted work activity and/or job transfer from the OSHA 300 Log (total of column H plus column I). The DART rate would be $(22 / 645,089) \times (200,000) = 6.8$.

Remember, this is the previous year's data - 2019. You do not need to sign up for this program, you need only to fill out the application (<https://www.sfsa.org/safety>) and return it to SFSA no later than

October 15, 2020 to be eligible for a safety award. Member companies achieving a safety record less than or equal to 2 will receive a certificate; companies achieving a perfect record will receive a plaque.

Grainger Discount Program for SFSA Members

SFSA recently renewed the Society’s Grainger Discount Program for members to provide larger discounts on frequently purchased products and free standard ground shipping on all orders in the contiguous US. Additional program details are on the attached flyer. To enroll in this program, visit

<https://www.grainger.com/content/sfsa>. Not sure if you are already enrolled? Please contact Ryan Moore – rmoore@sfsa.org for assistance.

Market News

SFSA Trend Cards show continued contraction as expected with the massive shutdown response to Covid 19. Steel castings are down over 20% in shipments and over 30% in bookings in July. Stainless casting bookings are down more than 15% while shipments remain 10% down.

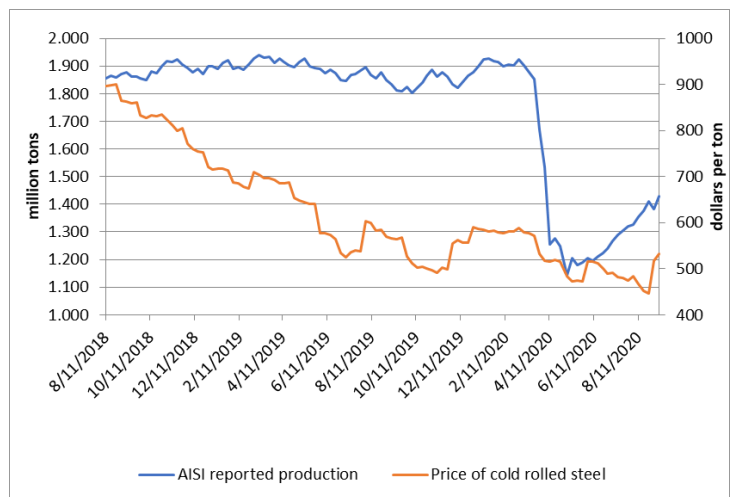
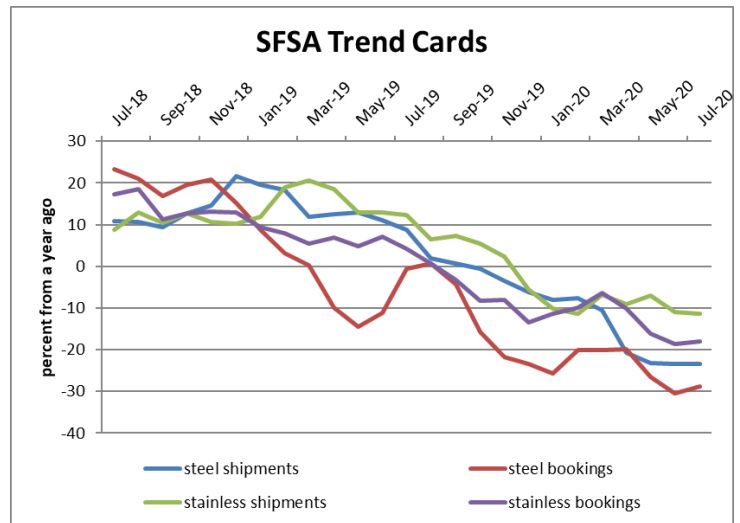
Backlogs for both types of castings are shrinking to 8 weeks.

The falloff in steel mill products is more severe. Production in May was off 40% before bouncing up to around 25% down. Pricing shows a similar trend off over 35% hitting bottom in May/June and bouncing back in September. Capacity utilization at the mills fell from over 80% to a low of 50% in May. Capacity is now back to over 60% in September.

The good news is mining, where the price of copper has moved positively compared to a year ago. WTI oil prices have recovered from negative numbers to around \$40 a barrel.

New Orders for Non-Defense Capital Goods are off 10% in May which is large given the size of that sector in the economy and its stability. Iron and steel casting shipments are off over 20%.

The fundamental dynamic in the economy remains uncertainty, with the continued challenge of Covid, the potential for a second or third wave or a viable and effective vaccine, the civil unrest in major cities, and the looming presidential election. While the economy is showing improvement, it is unlikely that there will be a quick resolution that returns the demand for castings to mid 2019 levels prior to mid 2021.



Casteel Commentary

As challenging as our current times are, the future of steel castings is bright. The best guess for the future will include increasing technology for an interconnected future with seamless and instant access to family and friends, information and entertainment, smart cars and houses, etc. We as steel founders will be incorporating sensors and automation to improve our productivity and product performance. Design will be done virtually and include production and performance of a new part.

But...

This future vision depends on a massive investment and development of infrastructure that will rely on steel castings.

Many casting producers have a legitimate concern that a future that depends on electric vehicles (EV) will drastically reduce the demand for casting production. Aluminum die castings and ductile iron structural castings have a lot of their market in automotive production. Much of it ties to the internal combustion engine power train components. Many of you know I have a wager with a member on whether the introduction of EV will be evolutionary and become dominant (me) or transformational and disruptive (him). We agree that this will largely depend on the ability of battery technology to support the EV industry. The capital cost, life, and recharge rate need to make EV affordable and widely useful. EV technology has fundamental advantages over internal combustion but will also rely on the production of electricity.

While ductile iron producers and aluminum die casting plants will lose traditional parts due to a shift, steel foundries should see improving business. While an interconnected future with personal devices in smart homes and small communities is hoped-for among futurists, this future will need massive capital investment and a maintained infrastructure to be realized. Those devices and technologies will have to be made, maintained, and hopefully recycled in a sustainable way.

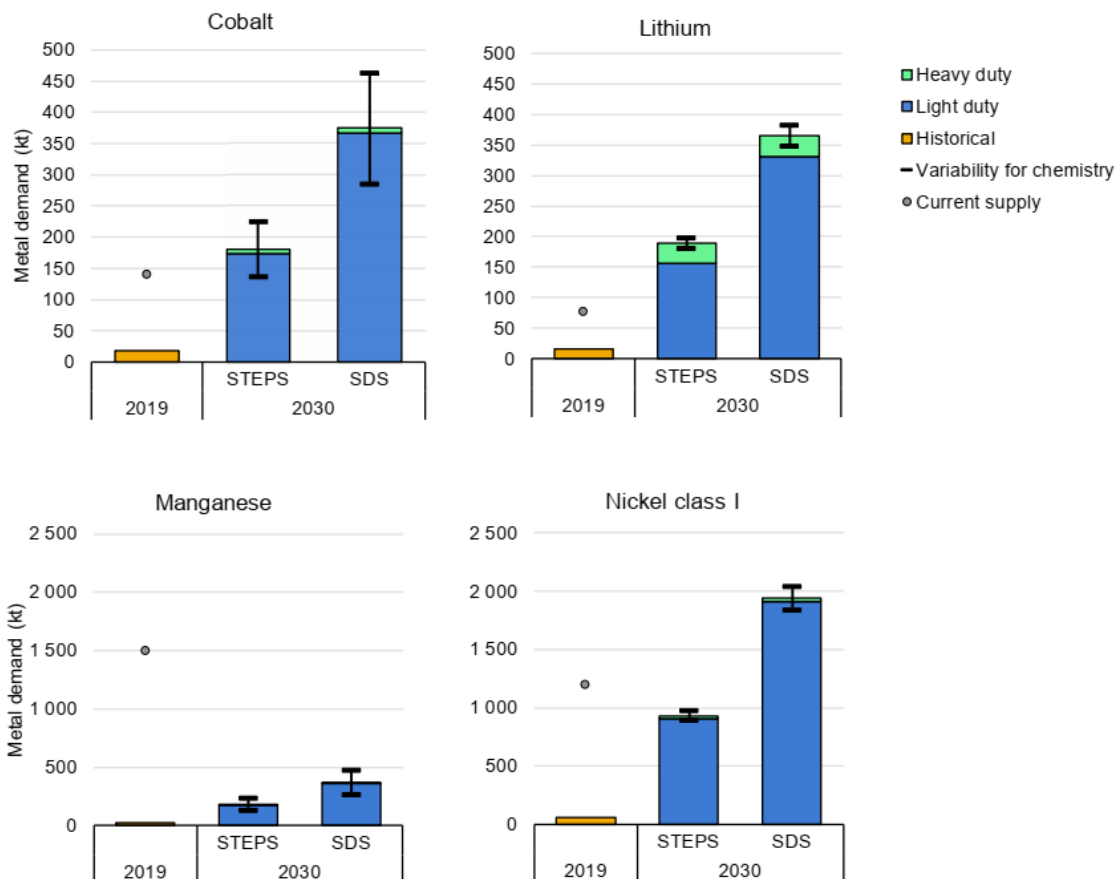
To look at EV and its impact on steel castings we can review the Global EV Outlook 2020: Entering the decade of electric drive? (<https://www.iea.org/reports/global-ev-outlook-2020>)

If we look at the future of EV for example, the demand for added electrical power production is a reasonable concern. Even with a dramatic increase in EV use, the increasing demand is modest as seen in the table.

Country/region	2019	Stated Policies Scenario, 2030	Sustainable Development Scenario, 2030
China	1.2%	3%	3%
Europe	0.2%	4%	6%
India	0.0%	2%	3%
Japan	0.0%	1%	2%
United States	0.1%	1%	4%

Sources: Electricity demand from EVs was evaluated with the Mobility model (IEA, 2020); total final electricity consumption from (IEA, 2020) and IEA (forthcoming).

The graph below shows the current supply and demand for batteries compared with two scenarios for EV of cobalt, lithium, nickel class 1, and manganese. For 2030 (9 years from now), without a breakthrough in battery chemistry, there will be an inadequate supply of lithium and cobalt. Depending on the growth, nickel class 1 has an inadequate supply. While many of our other devices use lithium batteries, they will only account for 11% of the battery demand.



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Notes: kt = kilotonnes; STEPS = Stated Policies Scenario; SDS = Sustainable Development Scenario. Future demand for materials for battery manufacturing relative to the scenario projections is based on the global battery capacity shown in Figure 3.7 and the following assumptions of the shares for cathode chemistries in LDVs. For the low cobalt case: 10% NCA, 10% NMC 622 and 80% NMC 811. For the high cobalt case: 11% NCA and 76% NMC 622, 13% NMC 811. The central value is an average of these two cases. The share of cathode chemistries for heavy-duty vehicles is assumed to be 95% LFP and 5% NMC 622 in the low cobalt case, while 80% LFP and 20% NMC 622 in the high cobalt case. The share of metals in the battery for the types of chemistry analysed is indicated in Table 6.1 in the *Global EV Outlook 2018* (IEA, 2018a). The current supply of nickel refers to class I nickel.

The total capacity for lithium in 2017 was 447 kt and a total production of 214 kt with 87 kt for all batteries. The production required for 2025 for a base case in 2025 is 669 kt with batteries at 509 kt. For cobalt, the 2017 demand was 136 kt which was at the capacity of the industry including mining and recycling. The base case for demand in 2025 is 223 kt with battery demand at 117 kt.

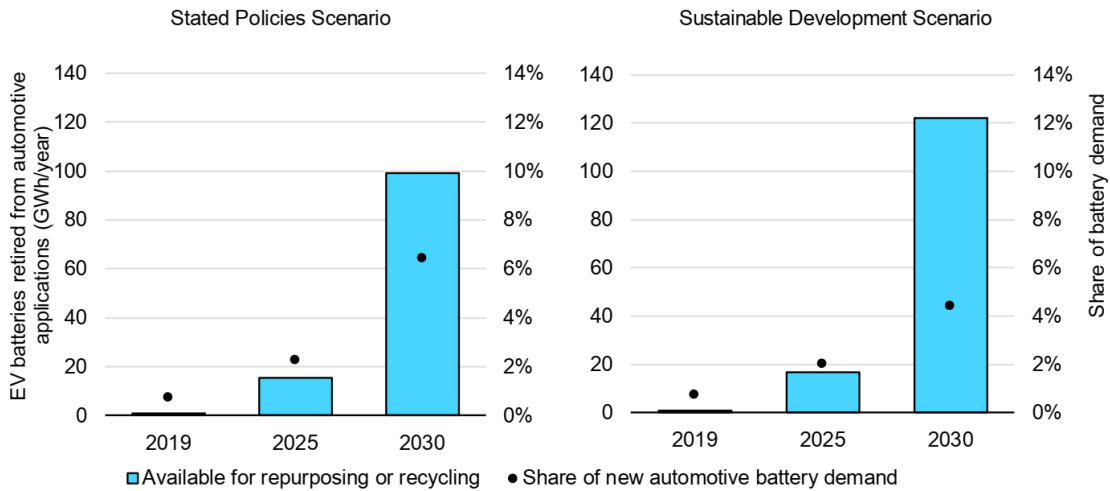
(<https://www.mckinsey.com/~media/mckinsey/industries/metals%20and%20mining/our%20insights/lithium%20and%20cobalt%20a%20tale%20of%20two%20commodities/lithium-and-cobalt-a-tale-of-two-commodities.ashx>)

Annual primary nickel production is about 2000 kt up to 2017. Most of the nickel, around 75%, is used to produce stainless steel. Battery manufacturing requires the availability of Class I. Roughly 55% of the nickel produced is Class I. (<https://nickel institute.org/media/1190/thelifeofni.pdf>) Battery production for nickel formulations will have to compete with other markets for nickel. It looks like nickel will also be capacity limited. (http://insg.org/wp-content/uploads/2019/03/publist_The-World-Nickel-Factbook-2018.pdf)

Another infrastructure challenge that will require steel castings is recovering the materials from the spent batteries. There is no current process or system to repurpose or recycle the spent batteries. The volume of batteries that need to be managed will equal the new battery production in 2030 according to the analysis.

So, the public policy hoped-for future may be small town like integrated communities and large densely packed urban centers, this future will depend on a massive capital infrastructure that will fundamentally depend on steel casting production.

Raymond



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Notes: Batteries for LDVs are assumed to have the same lifetime as the vehicle, while for heavy-duty vehicles, an average of 1.5 batteries per vehicle lifetime is assumed. Vehicle lifetimes vary according to region and are taken from the IEA Mobility Model (IEA, 2020). LDVs have lifetimes of roughly 15 years, HDVs around 20 years and two-wheelers about 8 years. Vehicle lifetimes are assumed to follow a normal distribution around the average lifetime.

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

SFSA Trend Cards (%-12 mos. Ago)	12 Mo Avg	3 Mo Avg	July	June	May
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Carbon & Low Alloy

Shipments	-13.3	-23.5	-30.0	-17.5	-23.0
Bookings	-23.1	-31.2	-36.0	-26.5	-31.0
Backlog (wks)	8.7	8.2	7.5	10.0	7.0

High Alloy

Shipments	-6.3	-11.3	-16.0	-9.0	-8.8
Bookings	-11.9	-17.9	-17.6	-15.2	-21.0
Backlog (wks)	9.2	8.0	8.0	8.0	8.0

**Department of Commerce
Census Data**

Iron & Steel Foundries (million \$)

Shipments	1,339.6	1,181.7	1,238	1,165	1,142
New Orders	1,348.6	1,286.7	1,366	1,307	1,187
Inventories	2,158.2	2,125.0	2,086	2,131	2,158

Nondefense Capital Goods (billion \$)

Shipments	70.9	65.7	67.6	66.2	63.2
New Orders	63.6	57.7	58.1	52.7	62.3
Inventories	193.6	192.5	193.1	192.8	191.6

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

Shipments	66.6	64.1	65.9	64.4	62.0
New Orders	66.7	64.4	66.1	64.9	62.2
Inventories	129.1	128.4	127.8	128.4	129.0

Inventory/Orders	1.9	2.0	1.93	1.98	2.07
Inventory/Shipments	0.0	2.0	1.94	2.00	2.08
Orders/Shipments	0.0	1.0	1.00	1.01	1.00

American Iron and Steel Institute

Raw Steel Shipments (million net tons)	7.3	5.8	6.0	6.0	5.5
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