The Evolution of Austempered Ductile Iron (ADI)

Austempering was first patented by Bain and Davenport in 1933. Its early application was limited to small batches of steel. Ductile Iron (patented in 1949) was first commercially austempered in the US in 1972.

The initial development of ADI was limited by equipment capabilities and a basic understanding of the material. A flurry of publications in the 1980’s was produced, but there was no consensus regarding material descriptions until 1990 when the ASTM A897 Standard Specification for Austempered Ductile Iron was issued. This document standardized the use of the microstructure description of “ausferrite” (A cast iron matrix, produced by a controlled thermal process, which consists of predominantly of acicular ferrite and high carbon austenite.) for ADI.

For a successful ADI program to launch, a consensus between the end user, casting supplier and heat treater must occur. Early ADI programs experienced mixed success because of poor communication and a basic lack of understanding of the quality of the base ductile iron necessary to make ADI. Castings with insufficient alloy content (hardenability) were heat treated resulting in the production of pearlite or pearlite/ausferrite mixed microstructures. This stunted the growth of the markets for ADI as the incorrect microstructures that were produced were improperly classified as ADI.

When correctly applied to ductile iron with sufficient hardenability and an acceptable graphite structure, the austempering process produces excellent combinations of strength, toughness and wear resistance. The growth in applications of this material continues as the database of its properties continues to develop. ADI components can be found in light vehicle, heavy vehicle, agriculture, railroad, construction, mining and other miscellaneous industrial applications.

This presentation will discuss a brief history of ADI, its application and new developments in the ADI property database.

See Ms. Hayrynen’s Bio on page 8.
As time moves forward, the season starts to change. Moving into Fall, the days get cooler (mostly), the nights get a little longer, and the trees start to show changes in their color. This also means that our ASM Detroit Chapter is starting with the Dinner Meetings.

The Dinner Meeting format has a long history. Initially, small groups interested in discussing science began meeting in the early 1640s in England. The first organized meetings came in 1660 with the creation of the Royal Society of London in 1660. Since this time, societies and meetings have grown jointly. The establishment of our own society was originally organized as a dinner meeting with William Woodside and other heat-treaters of steel in the Detroit area. The value of these meeting lies in having both formal and informal time to interact with colleagues and associates. The meetings have been shown to have a positive effect on the attendees’ work; in one survey:

- 66% of respondents reported learning something that changed the direction of their work.
- Just over half indicated that something they had learned at the meeting had saved them time and money in their own work.
- 60% reported that their meeting attendance led to a new collaborations.


Our Chapter started the season with the annual Student Mixer in Ann Arbor. As you will read about in the coming pages of this newsletter, the event was a great success, with a record 40+ students in attendance. This mixer brings together young professionals and seasoned professionals, allowing the students to gain industry perspectives and connections for networking. A big thank you to the ASM members who spent time with the students. This was followed by a seminar on Advanced Steel Alloys for the Future, where 26 attendees heard presentations on high-temperature steel alloys for processing and automotive exhaust system applications. Our thanks to Rolled Alloys for their sponsorship of this seminar.

Our October meeting returns to the tradition dinner + presentation format. This year, to launch our closer relationship with the AFS Detroit-Windsor Chapter, we will have a joint meeting where Dr. Kathy Hayrynen, FASM, will be speaking on austempered ductile iron castings. In addition, the October Dinner meeting is when we celebrate those chapter members who are Fellows of ASM. This is ASM’s highest recognition, and we are fortunate to have over 18 members who are also fellows. Please join us on Monday, October 7, to hear Kathy and honor our Fellows. I hope to see each of you there!

Finally, a sad transition to note. Dr. Gerald Cole, FASM, a life member and strong supporter of the chapter, lost his battle with cancer in early September. Known as “Dr. Magnesium” for his energetic support of that metal, Jerry volunteered often for our Chapter, most notably as a judge for Future Cities and The Science Fair. Always ready and willing for a strong discussion/debate on any topic, Jerry’s colorful approach will be missed.
Thank You to Our Social Hour Sponsor

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Have YouSubmitted YourNominationsfor ASM Awards?

ASM International recognizes the achievements of members and their organizations through the annual ASM Awards. Learn more about each award and how to nominate an ASM member or colleague. Please refer to our website for complete information including rules, past recipients, and sample nominations forms.

Learn More

2019-2020 Chapter Season

Oct. 7, 2019 – Fellows Night/Joint Meeting with AFS
Dr. Kathy Hayrynen, FASM
“The Evolution of Austempered Ductile Iron (ADI)”
The Burton Manor, Livonia

Nov. 11, 2019 – National Officers Night
Dr. Zi-Kui Liu, FASM
“ICME”
The Livonia Marriott, Livonia

Feb. 10, 2020 – Membership Night
Dr. John Bonnen
“Glass Technology”
Southfield – St. John’s Banquet Center

March 9, 2020 – Sustaining Membership Night
Dr. Elizabeth Buc, FMRL “Forensics”
The Livonia Marriott, Livonia

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CONTACT OUR TRIBOLOGY EXPERT
On September 20th, 2019 at the Engineering Society of Detroit Building, 26 attendees heard presentations on high-temperature steel alloys for processing and automotive exhaust system applications. Thanks to our speakers for the event, John Catterall from AISI, Marc Glasser from Rolled Alloys and Richard Duncan from Rolled Alloys. Our thanks also goes to Rolled Alloys for their sponsorship of this seminar.

From Left to Right: Richard Duncan and Hugh Thompson from Rolled Alloys, James Boileau, ASM 19-20 Detroit Chapter Chair and Marc Glasser from Rolled Alloys.
Another Remarkable 2019 Professional/Student Mixer at Conor O’Neill’s

The Detroit Chapter thanks all of the professional and student members who joined us on September 20th for our 7th annual University Night at Conor O’Neill’s in Ann Arbor. This year we had a total of 61 students and professionals who spent their evening discussing the latest trends in materials science and engineering. The chapter would like to thank and acknowledge our evening sponsors, AFC Holcroft and Joyworks, both of whom have been strong and consistent sponsors of this event. The chapter would also like to recognize the hard work of MMS President Nathan Ng, and Rishav Choudhury, MMS External Affairs Officer and the other student members at the University of Michigan which made this event possible and another successful event!

SPEAKER BIO: Kathy L. Hayrynen, PhD, FASM
Kathy has a BS, MS and PhD in Metallurgical Engineering from Michigan Technological University.
Kathy joined the Applied Process Companies in 1995 as the Technical Director and now serves as the Vice President of Research & Development. The Applied Process Companies are a group of commercial heat treat facilities that specialize in the Austempering process.
Kathy is a past-Chair of the Detroit ASM Chapter and has co-organized the annual ASM Teachers’ Camp in Ann Arbor since 2004. She is a Fellow of ASM and a past recipient of the ASM Education Foundation’s George Roberts Award.
Kathy is a past-Chair of the AFS Cast Iron Division and a Director of the Detroit-Windsor AFS Chapter where she serves as the Education Chair.
Kathy has been honored with several AFS awards including the 2019 Women in Metallcasting Award of Excellence, a Ray H Witt Management Award, a Service Citation, an Award of Scientific Merit and five Best Paper Awards within the Cast Iron Division.
Kathy served as the first female President of the Foundry Educational Foundation in 2012/2013. While in industry, she has been a passionate advocate of maintaining a link to university programs that have active metal casting programs. For the past 18 years, Kathy has taught a week of the fundamentals of metal castings class at Michigan Tech. She is also an Emeritus member of the Michigan Tech External Advisory Board for the Department of Materials Engineering and a member of the Michigan Tech Materials Science & Engineering Academy.