# SFSA CASTEEL REPORTER

**Steel Founders' Society of America**

**a monthly publication**
**serving SFSA steel casting industry Members**

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## *March — 2008*

**Casteel Commentary Highlights:**

Supplying castings for others to machine exposes the industry to the unwarranted charge of poor quality. It is a legacy of long ago commercial structures that no longer are justified. If we eliminate this legacy through machining our own castings we can supply on time and at perfect quality the castings required. This would allow us to improve our financial performance and reputation as argued in this month's Casteel Commentary.

**CASTEXPO**

SFSA will have a booth at the AFS CASTEXPO, May 17-20, in Atlanta, Georgia. If you are planning to attend, please stop by and say hello. Our booth is #1262. http://www.castexpo.com

**Molder Training Survey Results**

Detailed results have been supplied to those plants who responded to the survey.

SFSA is interested in how you train your new employees in molding: (24 responses)

1. What molding methods do you use for casting production?

Chemically Bonded (airset, nobake, etc) 22
Green Sand 6
Shell 4
Centrifugal 2
V process 1

2. What binder and equipment do you use for production?

a. Phenolic Urethane 8
Phenolic Ester 6
Furan 6
Sodium Silicate 2
Shell 5
Green Sand 6
Epoxy 1

b. Dependable 2
CE 2
Kloster 2
IMF 3
Gerosa 3
Palmer 2
Simpson 1

3. What positions and training are required?

a. molder- chemically bonded 15
molder- shell 2
senior molder 4
Journey 2
Apprentice 2
Helper 3
coremaker 3
cast machine operator 1
mold finisher 5
core finisher 1
core setter 4
mixer machine operator 6
machine fitter 1

b. training and testing 6
coaches and management 4

4. Do you currently utilize a formal molder journeyman position?

Yes 3 No 17

5. Do you have a formal and detailed training program?

No 8
On the job 13
30, 60, 90 day program 1
Yes 6

6. Where did you obtain materials for this program?

Internal 13
MSDS 2
ISO doc 2
Process Books 4
AFS 2
State and Molders Union 1

7. What does it consist of, and how effective to you believe it to be?

Working on it 2
Formal training and internal workshops effective 6

8. Are you a union shop and if so, what union?

No 13
GMP 3
USWA 4
Local 3
AFL-CIO –CLC 1

9. Did your local union help in developing the criteria/training program for your journeyman positions?

Yes 2 No 8

**Innovation**

A member asked how much sand is needed depending on the casting thickness to avoid mold failure. We asked UI to use MAGMA and modeling to get some suggestions. Attached is a pdf file with the results. As you can see if the mold is twice as thick as the casting it should be conservatively safe. If it is as thick as the casting it should be adequate. I would be interested in your feedback on this issue.

Here is a video of CAT and their recent results:

http://search.cbsnews.com/?source=cbs&q=caterpillar&x=20&y=12

**Specification News**

ASTM material specifications for cast steel grades are normally formulated to require a minimum tensile strength. The ultimate strength, elongation and reduction of area are intended to be easily met if there is not some unexpected chemical contaminant and the test bar is sound. Users of castings routinely use the minimum tensile requirement of the specification as a basis of design. This is a rational and conservative design methodology but often leave designer with the mistaken impression that the cast material is barely meeting the specified requirements. In many grades, the foundry routinely exceeds the requirement substantially. It can be helpful for common grades to keep a rolling average of the last 10 to 30 heats of mechanical properties to share with customers. This is a useful internal check, if the recent values are degrading the properties there is a production issue to be resolved. It is also generally useful with customers, giving them an assurance that the properties they rely on for design are conservative and the production values exceed these minimum confidently.

**From: Economic Census, U.S. Census Bureau**

*If past experience is any indication, there are probably still some businesses in your industry that have not yet completed their 2007 Economic Census forms. But missing the February 12 due date shouldn't relieve their sense of urgency for getting the forms in. Businesses that received a form in December are required by law (Title 13, U.S. Code) to complete and return it.*

*Many trade associations have contacted their members on behalf of the census. Even though the due date has passed, please contact your members again to urge their response in the Economic Census. You can base your email, newsletter blurb, or website feature on the sample editorial shown below, or use some of the ideas shown at http://business.census.gov/media/. Do it now, since some of your members may have missed the February 12 due date.*

*If any of your members are having difficulty completing their forms, encourage them to get help or request a 30-day extension at http://business.census.gov or by calling 1-800-233-6136.*

*In March, we will send a follow-up letter, and in many cases, a second copy of the census form, to any business from which we have not received a response. Help us save tax dollars by encouraging your members to file their form, or get an extension, right away.*

*If you need more information about the 2007 Economic Census, please contact Robert Marske, Laurie Torene, or Paul Zeisset at 1-877-790-1876, or e-mail us at econ2007@census.gov.*

**Market News**

Booking for carbon and low alloy steel castings have risen sharply in our trend card survey at the end of 2007. Shipments for all steel castings are slightly positive. This mirrors the Census data showing that iron and steel casting demand remains stable but off the peak. The shipments of steel long products show the same stability. The same stable but lower levels can be seen in the orders for capital goods. Other industry trends and financial information is found in the SteelGuru document on the Casteel Reporter web page.

I was asked about the comment last month on the strength of the market and have included the question and my response here:

Q. Wow, "The medium term outlook though has improved dramatically and we will likely see the strongest market for steel castings in human history."

Without taking too much of your time I would be curious what conditions make you feel this positive? Also what time frame do you consider as Medium term?

A. My main concern lately was that the weakness in the consumer economy and the limit on credit due to the subprime lending meltdown would dampen the activity for consumers. This could lead to a slowdown and allow prices for oil and copper to moderate. This would cause investors in capital equipment to become hesitant and lead to a slowdown in steel casting demand. This slowdown might be symptomatic that the incremental additions of capacity would meet the global demand and that prices would remain lower and demand slower.

My concern was unfounded it seems. When the markets began to react strongly to the slowdown in housing, the Federal Reserve lowered interest rates dramatically and Congress passed the stimulus package. This strong reaction in the face of rising prices means that the fuel we needed (money) to sustain the demand (prices) was plentiful. The imbalance of supply and demand is seen in the strong up tick in iron ore prices and of course oil and gold.

In one way my "bold" statement is trivial, more population = more demand; the largest population in history = the largest demand in history. In another way it is substantive, the easing of credit and the injection of money while prices are rising will provide the profits and capital needed to stimulate demand now and not later.

Medium term is a waffle-wording to say that the current slowdown in demand will continue but probably not more than a year and likely only a few months. Medium term means that within 18 months I would think that the higher prices of commodities and the accurate analysis of customers that supply is limited will lead to strong demand growth. Production will be capacity limited.

**Casteel Commentary**

Legacy systems continue to be used and become difficult to replace over time. Our commercial configuration of casting production and machining has some of the characteristics of a legacy system and needs to be replaced.

Ties and buttons on suit coats are legacy systems. At one point they may or may not have been needed but they continue to be used only because we expect them. Most manufacturing plants have some legacy systems; processes or materials that they have used that are unique to them. Often and almost inevitably, these unique systems are not a competitive advantage but represent a legacy cost. Many times the legacy coating technology or ladle lining was a plant solution to a common problem in industry. It worked and became a part of the manufacturing system but… the rest of the industry found a more economically efficient solution and has moved on. The legacy system prevents progress in the plant.

Companies that participate in foundry organizations like AFS or SFSA and open their shop and visit others eliminate legacy practices over time. Insolated plants that think they have secret technologies are most often institutionalizing their competitive disadvantage and making their legacy practices a monument to their own increasing obsolescence. Adopting market solutions is the remedy to the elimination of legacy costs.

In steel casting commercial arrangements, castings are mostly sold to another entity for further processing. The biggest obstacle to market growth for steel castings I think is the reputation for poor quality earned in no small part by features of the casting uncovered in machining. Often a lot of non-value added surface inspection and remediation (grinding, welding, and heat treatment) is added and does not eliminate the problem. If the legacy commercial system is changed, then this problem can be eliminated.

Value added strategies got a deserved poor reputation when we had excess capacity in the past 20 years. Adding machining services meant that we could make an inadequate return on a larger investment. Now that we are in short supply in many markets we have an unprecedented opportunity to fix this systemic legacy problem. The only way I know to eliminate the reputation and frustration of customers over the uncovering features on the machined surface is to supply the machined casting.

If we machine then we eliminate the unneeded and unproductive surface polishing. If we machine then the customer can get the casting on schedule with assurance that no unexpected problems will occur. Customers try to eliminate castings because they are late, expensive, and full of porosity. Machining our own castings will eliminate unwarranted blame from others, unexpected upgrading at the customer, and uncontrolled delays from outside sources. And we should make sure that we realize the full value of our new perfect castings.

Raymond

# STEEL FOUNDERS' SOCIETY OF AMERICA

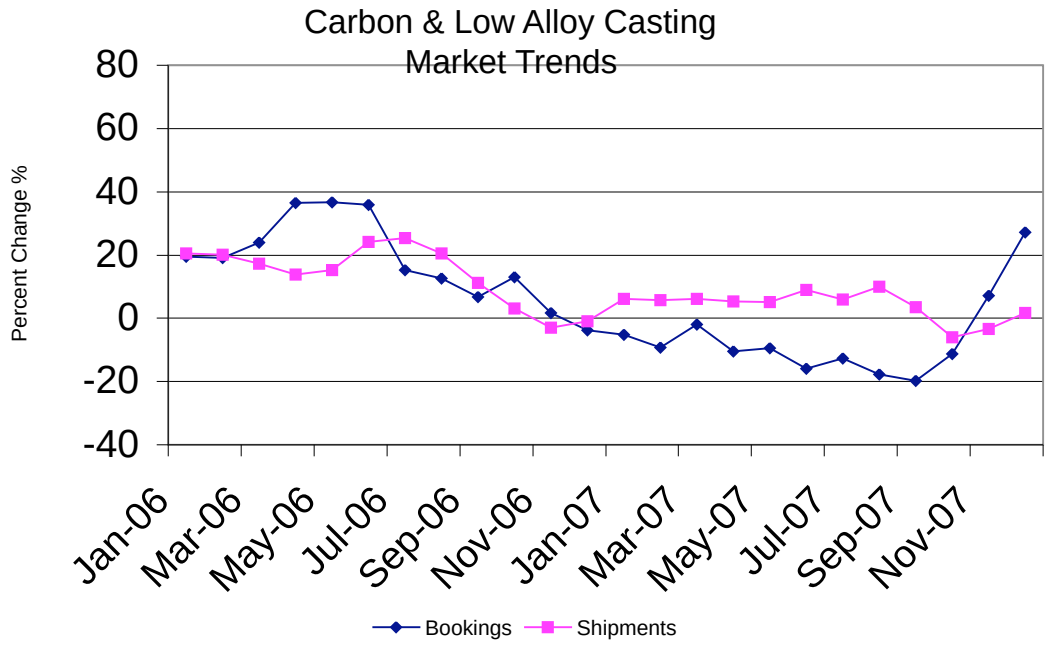
## MEETINGS CALENDAR

**2008**

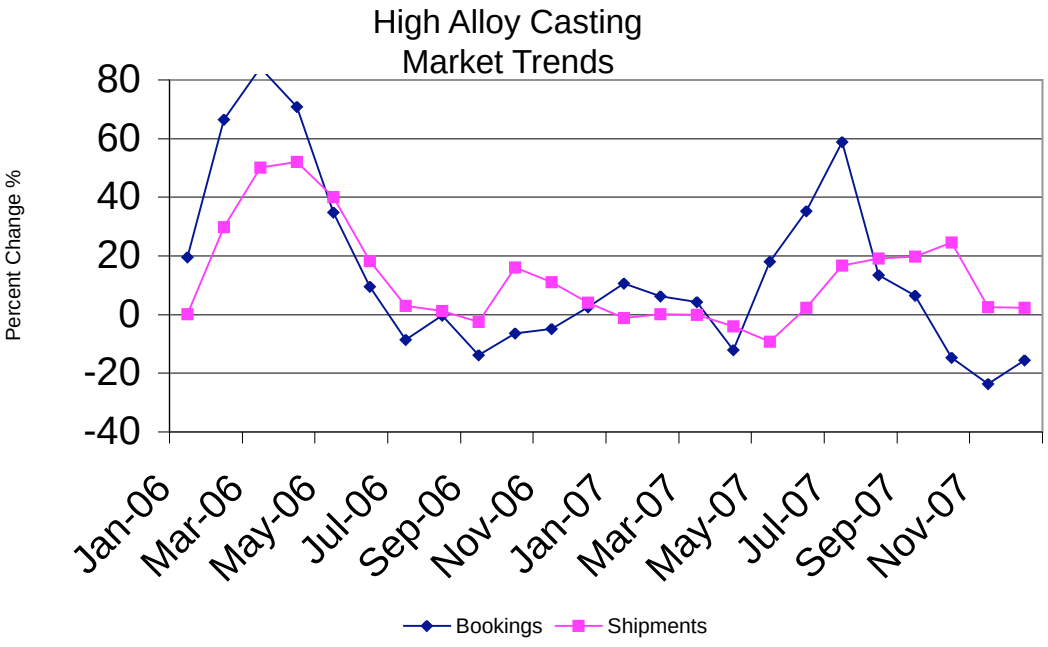
| | | |
|---|---|---|
| March | | |
| 27 | T&O Meeting | San Juan Del Rio, Mexico |
| April | | |
| 6-16 | Foundry Study Tour | Brazil |
| September | | |
| 9-6 | SFSA Annual Meeting | Charleston, SC |
| December | | |
| 10-13 | National T&O Conference | Chicago, IL |

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

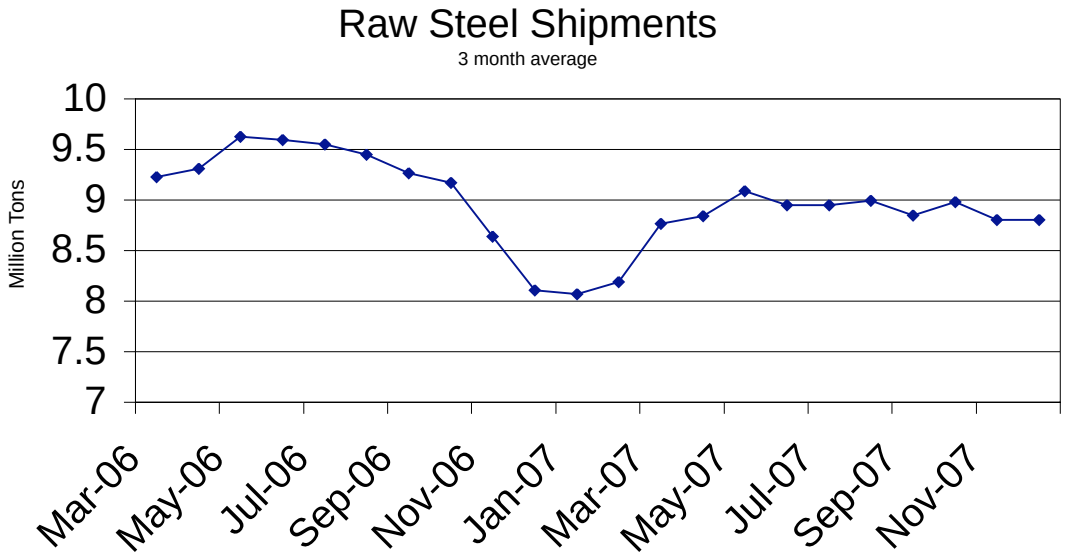
| **SFSA Trend Cards** (%-12 mos. Ago) | 12 Mo Avg | 3 Mo Avg | Dec | Nov |
|---|---|---|---|---|
| **Carbon & Low Alloy** | | | | |
| Shipments | 5.1 | 1.8 | 9.0 | 13.0 |
| Bookings | -2.6 | 27.2 | 45.0 | 19.5 |
| Backlog (wks) | 10.6 | 10.1 | 9.5 | 10.5 |
| **High Alloy** | | | | |
| Shipments | 6.1 | 2.2 | 12.1 | -58.0 |
| Bookings | 7.7 | -15.5 | 31.6 | -50.0 |
| Backlog (wks) | 11.2 | 10.5 | 10.5 | 11.0 |
| **Department of Commerce Census Data** | | | | |
| **Iron & Steel Foundries (million $)** | | | | |
| Shipments | 1,588.8 | 1,594 | 1,618 | 1,612 |
| New Orders | 1,583.4 | 1,594 | 1,587 | 1,603 |
| Inventories | 2,486.8 | 2,573 | 2,588 | 2,564 |
| **Nondefense Capital Goods (billion $)** | | | | |
| Shipments | 66.5 | 67.8 | 68.4 | 67.4 |
| New Orders | 75.7 | 76.8 | 81.2 | 76.1 |
| Inventories | 121.5 | 125.4 | 126.7 | 125.6 |
| **Nondefense Capital Goods less Aircraft (billion $)** | | | | |
| Shipments | 61.1 | 62.3 | 63.0 | 62.0 |
| New Orders | 62.2 | 62.5 | 64.4 | 61.6 |
| Inventories | 98.5 | 100.3 | 100.7 | 100.5 |
| Inventory/Orders | | 1.60 | 1.56 | 1.63 |
| Inventory/Shipments | | 1.61 | 1.60 | 1.62 |
| Orders/Shipments | | 1.00 | 1.02 | 0.99 |
| **American Iron and Steel Institute** | | | | |
| Raw Steel Shipments (million net tons) | 8.8 | 8.8 | 8.5 | 8.7 |



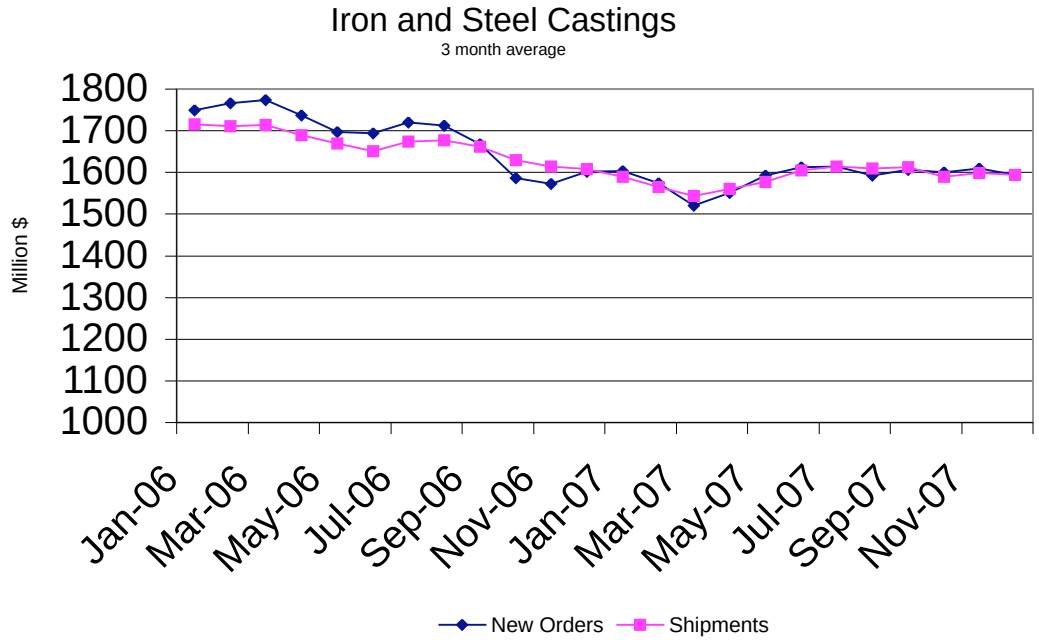

SFSA Postcards




SFSA Postcards




AISI Data

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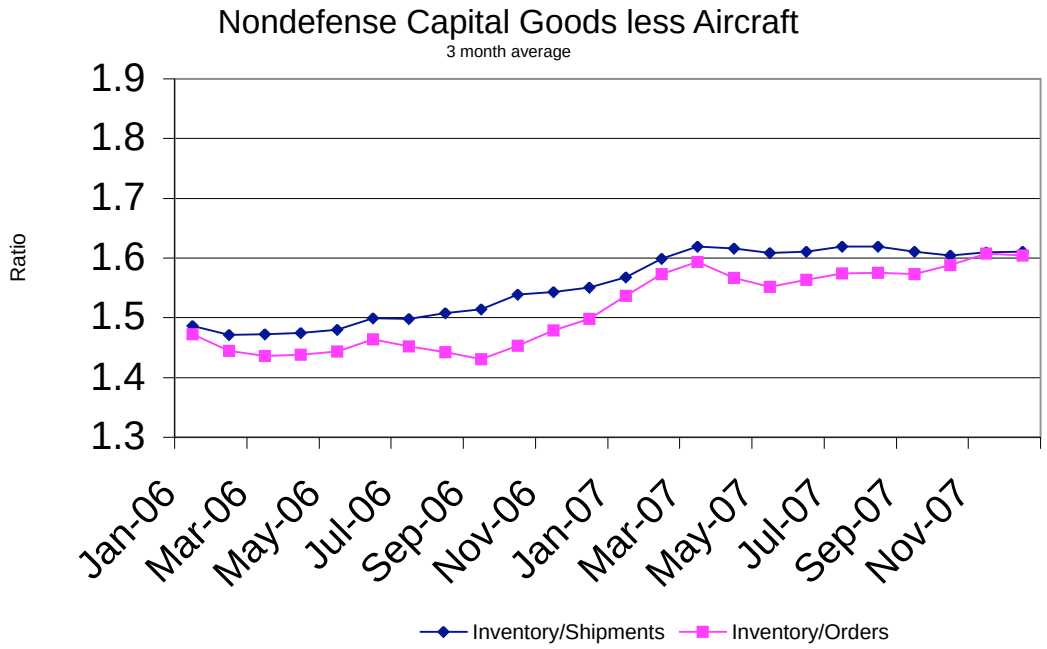
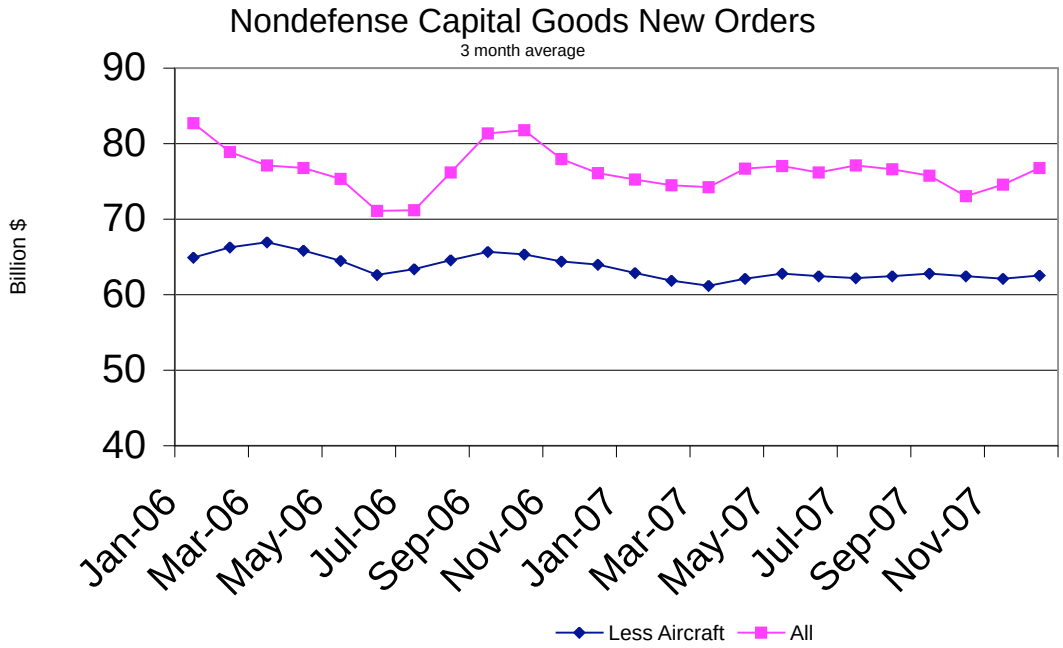



Department of Commerce




Department of Commerce

# Calculation of Minimum Mold Thickness in Steel Casting

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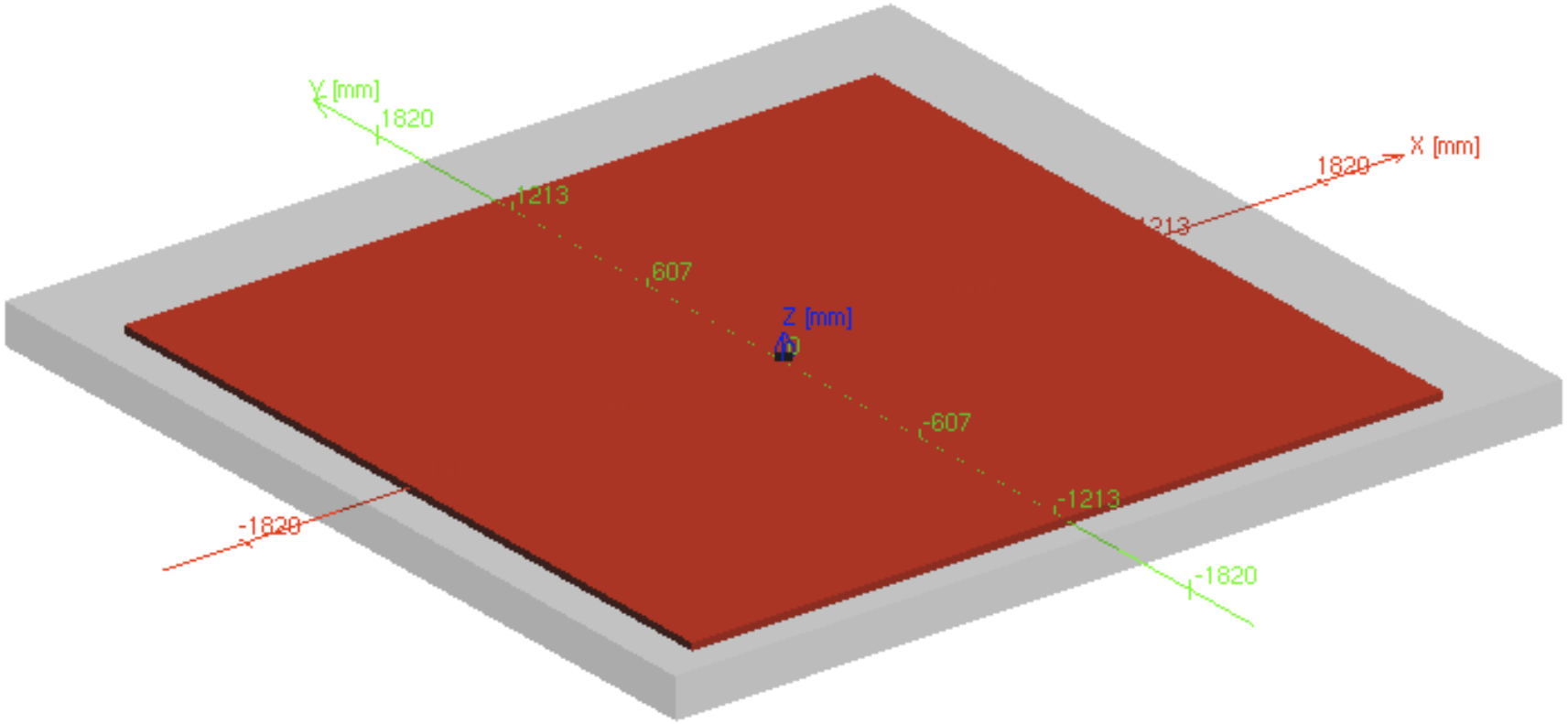
University of Iowa
Department of Mechanical and Industrial Engineering

January - 29 - 2008

# Objective

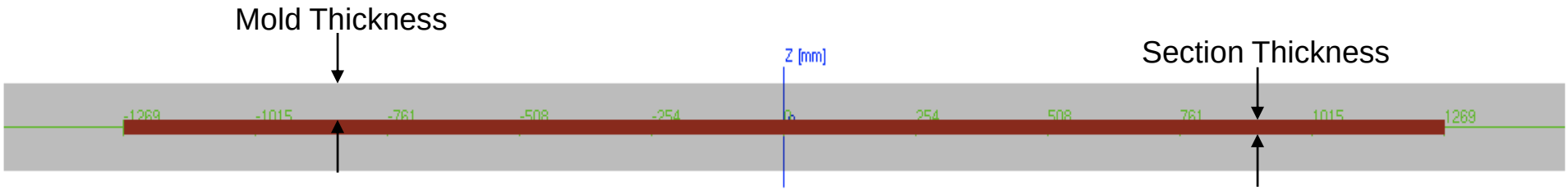
- Calculate thickness of sand required to keep the surface temperature of the mold below 100˚C until a 5 mm thick solid steel shell has formed in a steel casting section of a given thickness.

# Geometry

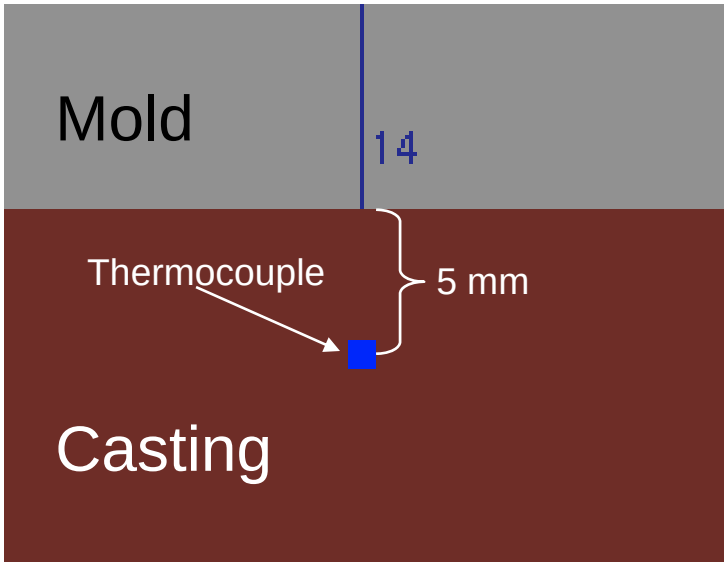



ISO view of the 1” x 100” x 100” steel casting.
Varied thickness of plate from 1” to 10”.

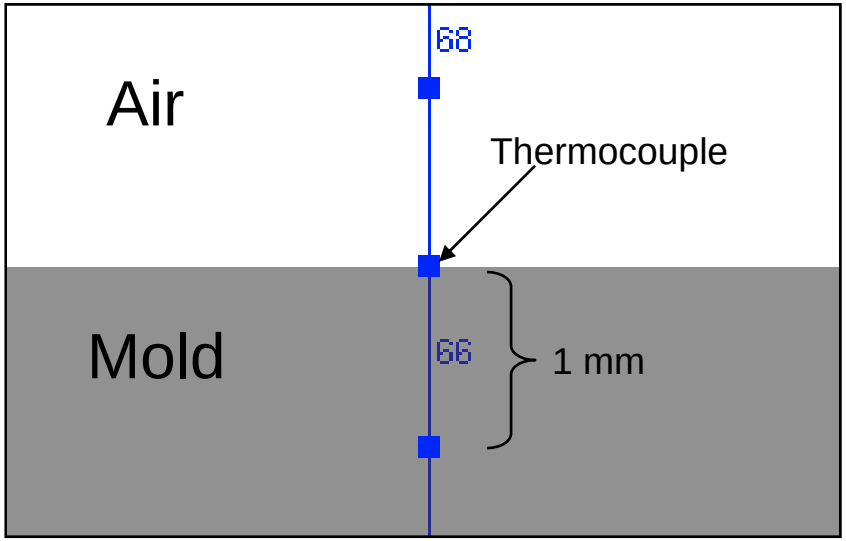
# Thermocouple Locations




Scale view of a 1” x 100” x 100” casting




Thermocouple placed 5 mm into steel casting.

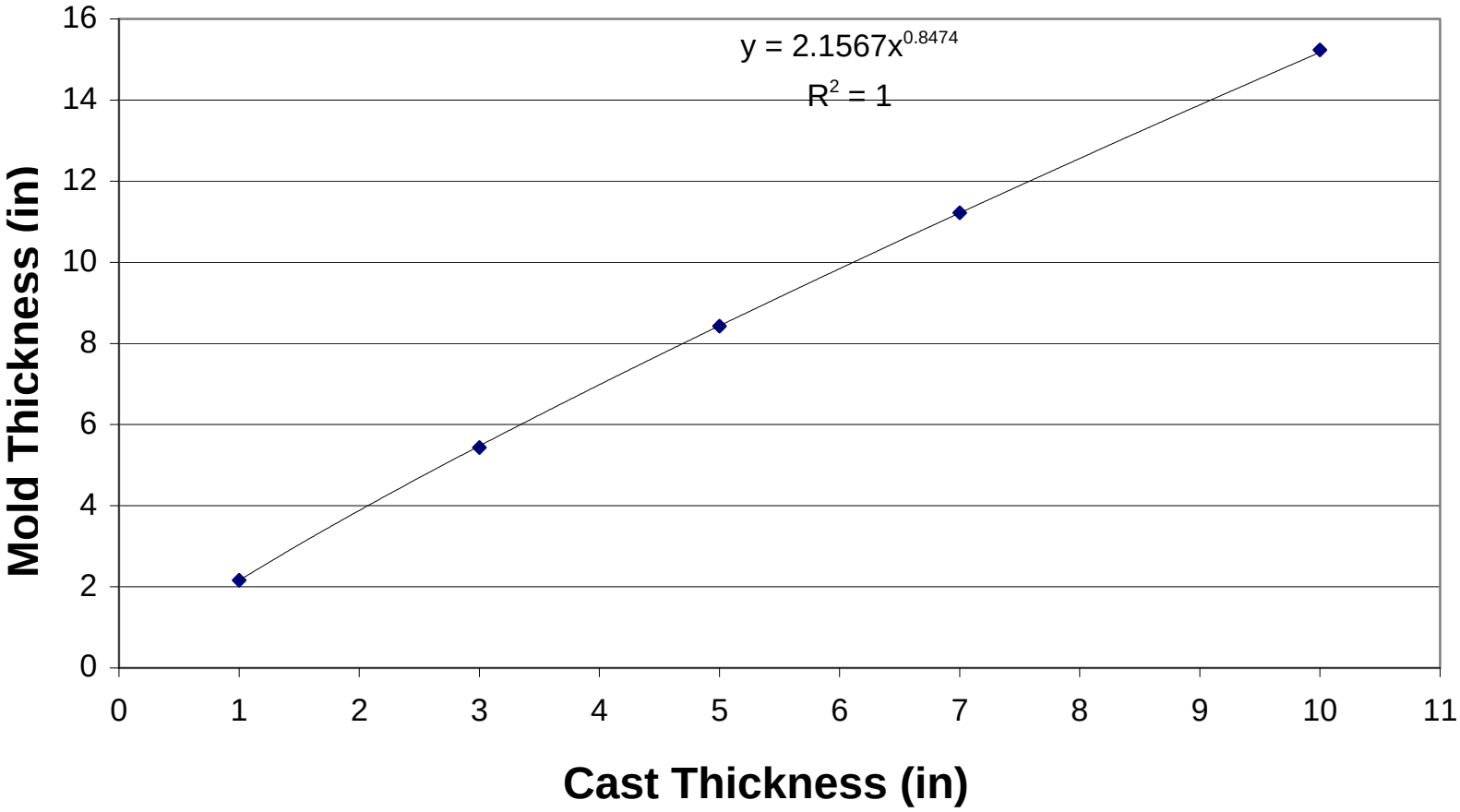



Thermocouples placed at the surface of the mold.

# Simulation Set-up

- User defined STEEL used for casting.
- Initial temperature of steel: 1620˚C.
- Solidus temperature of steel: 1420˚C.
- User defined furan.new sand used for the mold; initial temperature: 20˚C.
- C1000 heat transfer coefficient.

# Calculated Mold Thickness



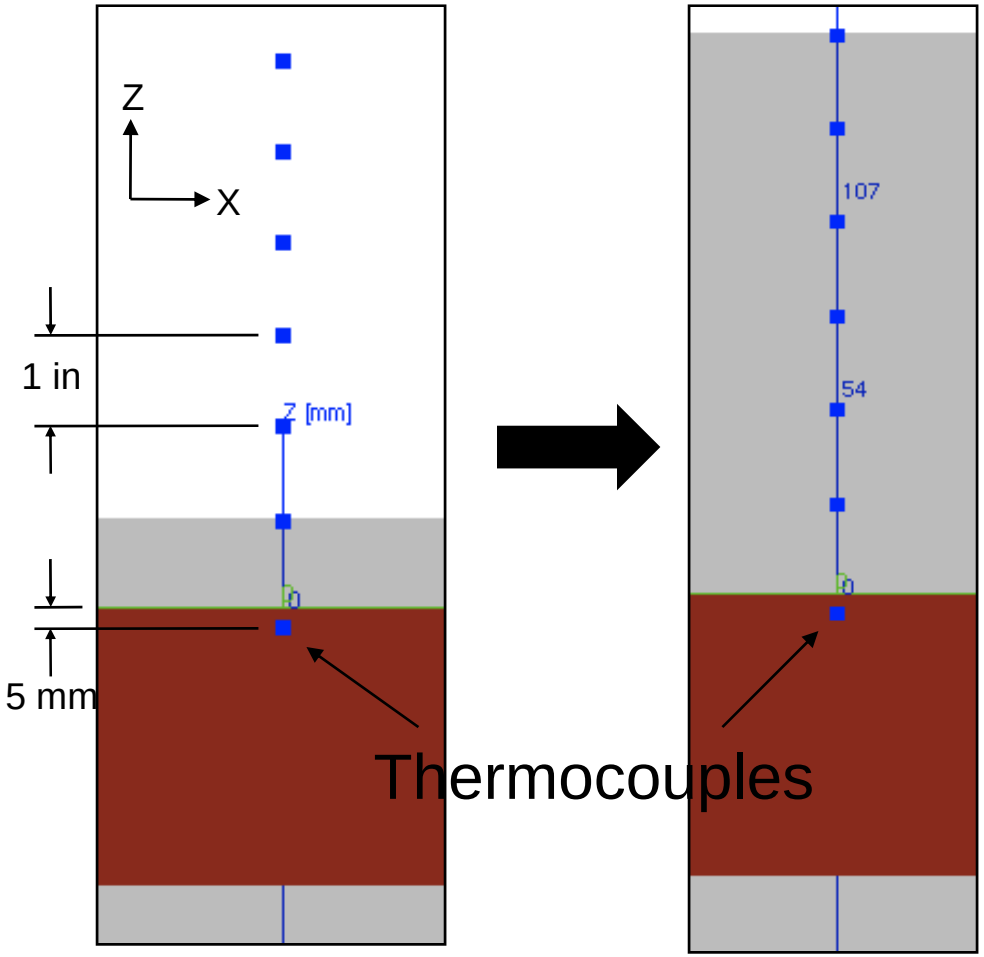
# Discussion / Conclusion

- For example, for a 3” thick section, calculations indicate a 6” mold thickness is needed to maintain the mold surface temperature below 100˚C.
- Using the present criterion to determine necessary mold thicknesses would result in overly conservative values.

# New Objective

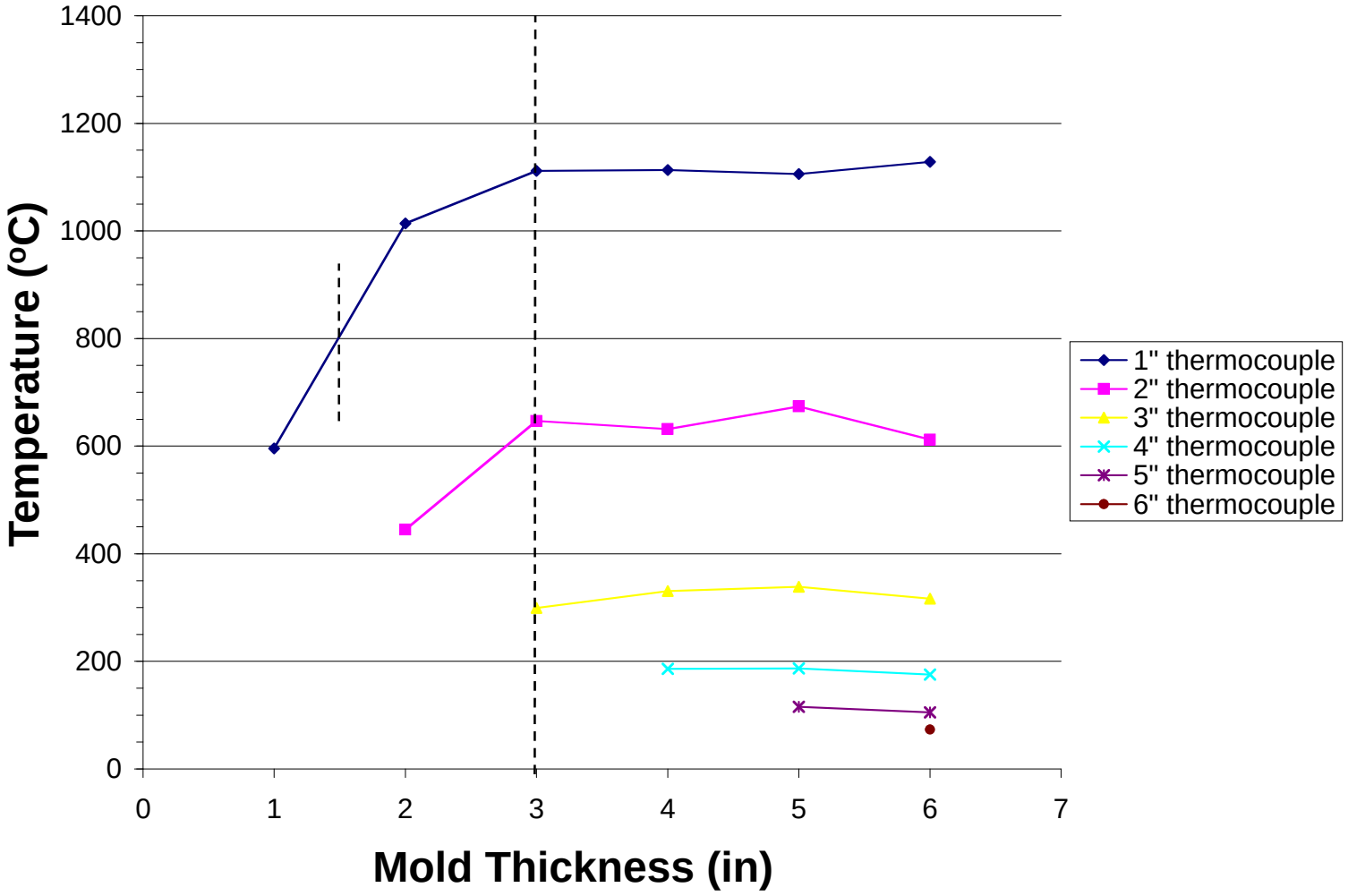
- Determine temperatures within the mold, at the point in time when a 5 mm thick solid steel shell has formed, for various mold and cast steel section thicknesses.

# Method

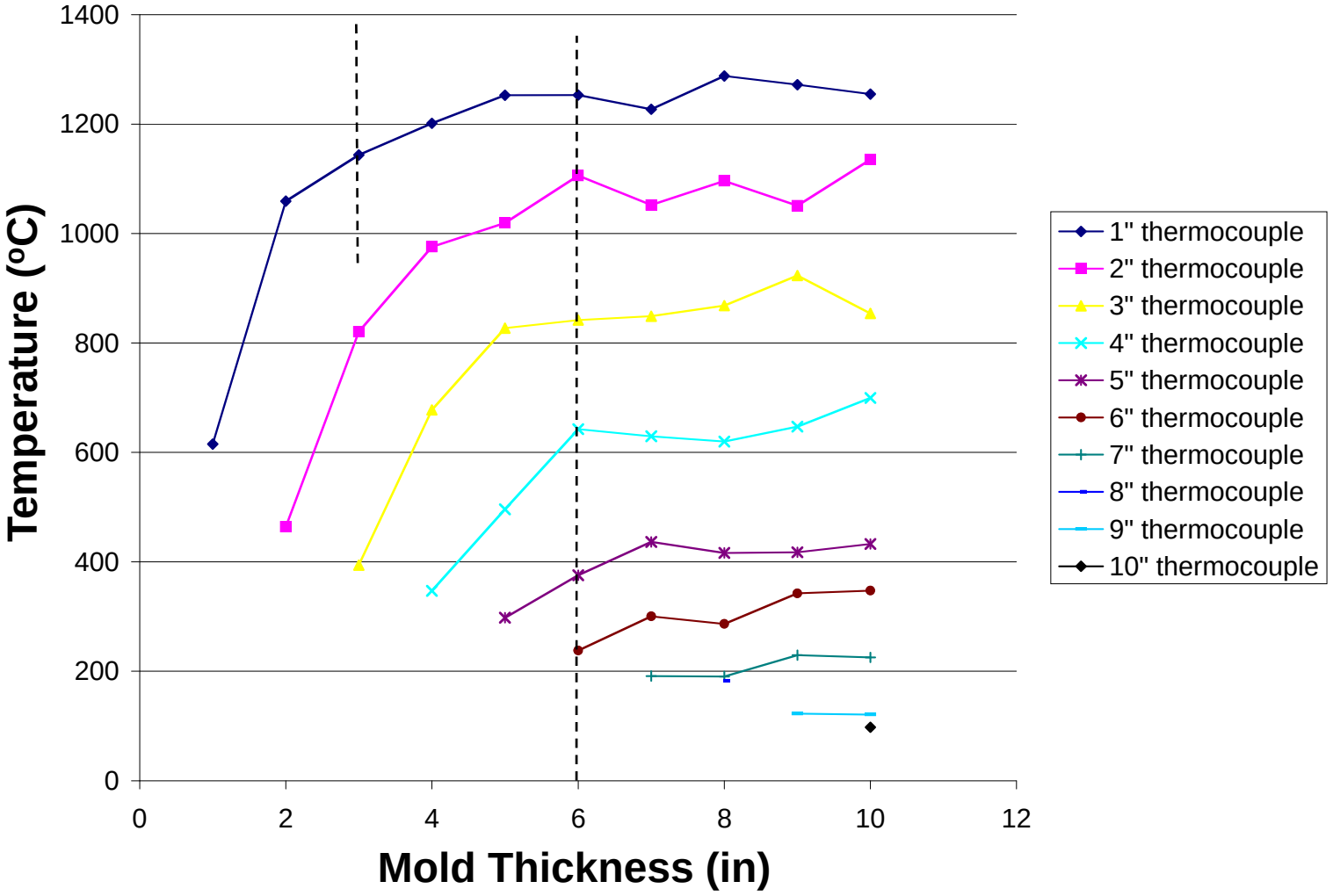



- Varied mold thickness in 1” intervals.
- Investigated two cast section thicknesses: 3” and 6”.

# Calculated Mold Temperatures for a 3” Cast Section



# Calculated Mold Temperatures for a 6” Cast Section



# Discussion

- Mold thinner than cast section:
  - local temperatures in the mold strongly increase with increasing mold thickness.
- Mold thicker than cast section:
  - local temperatures in the mold do not change upon a further increase in the mold thickness.

# Conclusion

- Making the mold thicker than the cast section seems unnecessary.
- In fact, the temperature at one inch from the casting surface does not change significantly for mold thicknesses greater than half of the cast section thickness.
- Currently, we only have results for 3” and 6” thick cast sections.