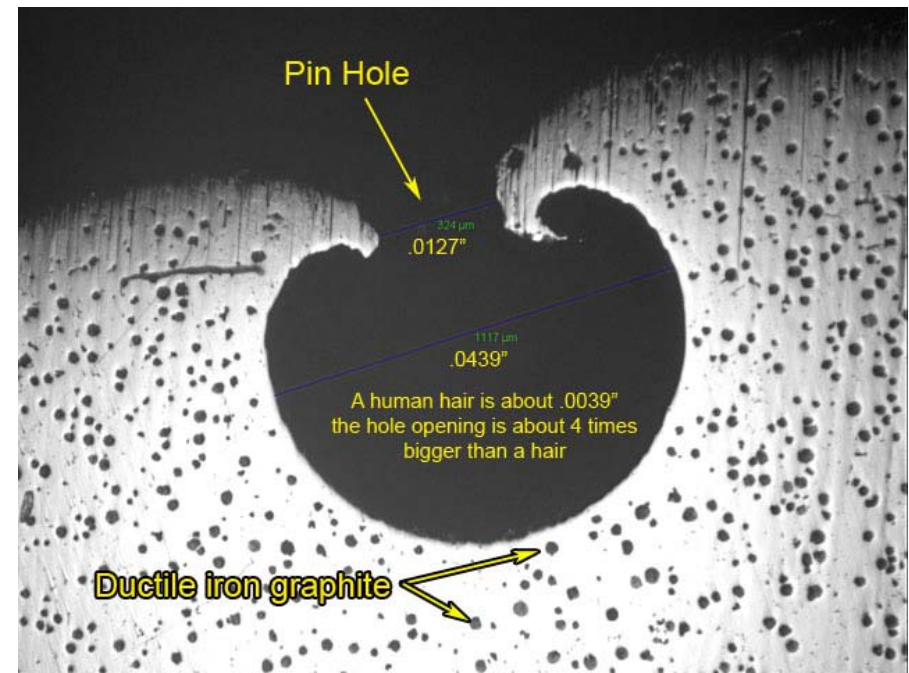


Dotson Dispatch



The Metallurgist as an Alchemist...
Raw Materials to Valuable Castings

The Iron Alchemist

Just when everything is going in the right direction, the high demand for world commodities comes along and changes the variables. Alloys that were made in Norway are moved to Canada and then to China. One binder additive is replaced with another that is “essentially” the same as the first. Higher alloy steels going into the scrap stream mean that charge recipes are changed to control manganese. Carbon raiser that has been consistent for years and years is suddenly different.

All of these challenges land on the desk of the foundry metallurgist who has the very simple task of turning 100 plus materials, with ever changing compositions, into a commercial iron casting. The alchemy of the past (turning iron to gold) is with us today as metallurgists delve into the science to explain the art of making castings.

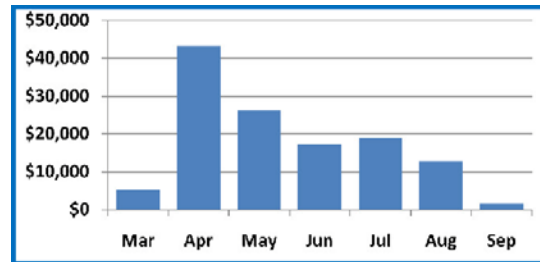


Eric Nelson, Dotson's metallurgist, and Al Alagarsamy, a consulting metallurgist



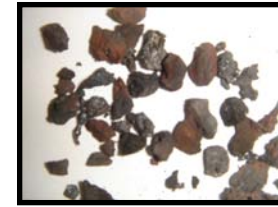
who regularly visits Dotson, are our alchemists and lead our technical team.

The cover shows a typical foundry problem – pin holes. Every foundry sees them and every customer knows the cost when pin holes are exposed in the last machining operation and the casting has to be scrapped. A pin hole is a bubble caused by a gas. The problem comes in identifying the gas. It could be carbon, nitrogen or hydrogen based and each of these has dozens of primary causes. To solve the pin hole problem, the gas must be identified (but like a balloon when it is popped, the gas is gone).



We saw a very dramatic increase in pin holes starting in April 2008. Fortunately they were primarily surface defects we could scrap in our plant keeping the defects from our customers.

Over five months we tried to isolate the problem by looking and tweaking tooling, core processes, sand mulling, molding equipment, and pouring procedures. After eliminating the most logical causes and having some success, we started looking more closely at material changes. We noticed that slag on top of the melt furnaces had a different consistency – small particles with a reddish surface and a black base.



To confirm our thought that the slag substance was undissolved carbon, samples of the pin hole problem were sent to supplier labs for analysis by scanning electron microscopic (SEM) and energy dispersive detector (EDS) analysis. The SEM

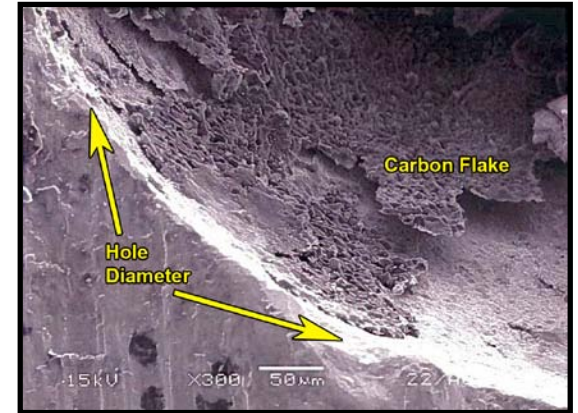


photo shows a carbon based inner wall. This means that the pin hole was most likely caused by a carbon monoxide bubble. Analysis also showed that the ash in the purchased carbon raiser was at 18% rather than the specified 2%.

With this information, our iron alchemists purchased a different material (at double the cost per pound). The graph shows that this finally solved the problem

While this problem has been solved, we know that the next is just around the corner; but, we are confident our technical team is up to the task.

Denny Dotson

denny@dotson.com