Ductile Iron News

Ductile Iron Society

To Promote the production and application of ductile iron castings *Issue 1, 2003*

Details of this event

Located in Strongsville, Ohio, USA

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To Promote the production and application of ductile iron castings
Issue 1, 2003

Associations Join to Promote Castings to Transportation Industries

The AFS Marketing Division, Diecasting Development Council (DDC) and Ductile Iron Marketing Group (DIMG) joined together for a "Metalcasting: Giving Form to Innovation" exhibit at the 2003 Society of Automotive Engineers (SAE) World Congress & Expo in March. The 400-sq-ft exhibit featured a display of award-winning transportation castings as well as the distribution of Engineered Casting Solutions magazines and other materials for engineers and purchasers. The AFS Technical Dept. also coordinated a 23-paper metalcasting track as part of the SAE Congress.

Pictured from left are Gene Muratore, DIMG; Mike Lessiter, AFS; and Leo Baran, DDC.

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Auditing Sand Profiles for a Quality Green Sand System (Developing a Database)

by George DiSylvestro
DiSylvestro Videography Service

Abstract
The successful progress in casting metals with silica sand as its basic mold or core molding material, has been continuous and profitable. This has made surviving metal casting plants improve in quality production and growth. Achieving these goals, has been gratifying for those who have committed themselves to a continuous search and implementation of excellence.

Production research and dissemination of information regarding the control of a green sand molding system, has been in separate reports of various areas of the casting process.

Listed here, are the most important testing, control and standardization issues for those who wish to evaluate, compare, improve, or profile their entire existing sand system. This can be used to identify problem areas causing poor production, increased costs and barriers for needed quality improvements.

Auditing and Control

The control and auditing of a green sand system has been on a continuous improvement incline. Progressive foundries confirm the need for correct information from sources that influence quality and ultimately can reduce casting losses.

Using a molding sand form such as per Form #1 confirmed that many foundries have limited auditing and testing, until a serious problem occurs. Then they immediately grope for answers and sometimes find they have no standards for reference, when quality castings had been produced previously.

By using a daily reporting form similar to Form #2, developed and acted on by experienced production personnel, process abnormalities can be revealed quickly. This information should be reviewed by all who attend daily scrap meetings for analysis of previous casting cycles. This will encourage immediate action to be taken when necessary.

A step further in the search for excellence, would be to combine metallurgy and pouring information with data gained from Forms #1 and #2. Having a similar surveillance form for metal production to synergize with sand reporting could put all of the valuable current operating information in the hands of the decision makers.

Define the Existing System

To develop a data bank, we use the foundation of current accurate information that characterizes the molding sand. A research study can be very rewarding to deter abnormalities that occur of consequence.

To understand and pinpoint the critical auditing areas for maintenance and engineering, an up-to-date sketch of the entire sand system (including dust collection) should be made available as is. Unfortunately many times changes or improvements, in equipment, processing or transporting, are made and never reported. This has been known to cause major problems, including safety and environmental mishaps.

An article published in the Ductile Iron News, Issue #3, 1998, on "Prioritizing of Green Sand Testing," reveals a complete description of primary and secondary tests that can be performed. Reviewing this article is a prerequisite for the following information to standardize and document casting quality when it is at the optimum level, to achieve your goals for excellence.

Profile the Sand System

The following listing of tests, auditing areas, and procedures are suggested as raw material evaluation, material specifications and certification, mulling and molding equipment performance.

- Raw material evaluation
- Material specification and certification
- Mulling and molding equipment performance
- Mulling cycle and consistency
- Compacting characteristics during molding
- Effectiveness, efficiency and control of dust collectors

This review does not coerce the quality control department to run all of these tests and auditing documentation. To know your sand systems limitations, it is suggested consideration to complete a one time testing with accurate documentation of critical areas. Especially at a time of acceptable level of production, quality and low scrap. Be certain of the accuracy and establish ranges of acceptance or tolerance.

Distribute and educate all departments and inspectors so that they have complete knowledge of what these test values are and how they may affect operating conditions, especially, when safety is compromised. When a significant change from normal occurs, it becomes urgent to re-audit and make a complete routine comparison of any one of these six profiles.

Recommended Profiles

The profiles are listed in order of their priority and can be used as a bench mark for introducing a new material or making a major change.

1. Base sand and system sand quality.
2. Evaluation & characteristics of bentonite
3. Evaluation & characteristics of sea coal, carbons and additives.
4. Mulling, mixing & effect of water
5. Molding sand compaction tests
6. Dust collector and controls

Molding Sand Quality Profiles

1. Grain size distribution and base sand quality of system sand.

A. Suppliers certificate of analysis as shipped

B. Unwashed and washed sand sieve analysis
C. Percentage of sand balls, clay balls, core butts and waterproofing test
D. "The silica program" sand autopsy.
E. Autopsy of fines from dust collector system

See Reference #1

Base Sand Quality

Since approximately 90% of the mold is sand, a major effort should be given to this profile for your database. The standardization and testing of sand is fairly simple. The effects of minor changes can be very influential and affect most all other sand characteristics. Changes can be gradual and not detected easily. Look for changes in casting finish, bond and water requirements, permeability and sand compaction. Cost differences for a quality sand that fits the casting needs, are mostly due to plant geography. The sand fineness and size frequency with uniform compaction, is basic and determines the casting finish and casting dimensions.

Evaluation of the bentonite Bond

- List specifications of bentonite(s) used, trade name, description, chemical and physical analyses
- Bond activation time and durability tests, air set, dry, hot and baked retained strengths can be obtained from supplier or performed internally.

Viscosity and gel profiles of bentonites in water separately and in composition of the premixture with water at different solids content.

See Reference #2

Dialogue on Bonding Requirements

The profile for bentonite clay, the second main constituent in molding clay, has much influence on the molding characteristics and determines the thermal properties at casting temperatures. The casting weight or mold weight as poured, pattern configuration or design, usually determines the type of bentonite or blend required. The combination of sodium and calcium bentonites can assist greatly in producing consistent shakeout if the water content is controlled. This is a must to prevent the loss of sand from lumps in the sand system and to keep the hoppers full as much as possible. There can be a great influence on mulling energy and time needed when blending clays. Sodium bentonite requires the most. For these reasons, confirming the clay bond and its consistency is very important in achieving and maintaining best production and casting dimensions.

Evaluation of Carbons and Additives

- Suppliers specifications of carbon or cellulose additives
- Test and record volatile content and loss on ignition
- Ash content of sea coal at 1850oF for 1 hour
- Approximate production of lustrous carbon oxidizing or reducing atmosphere of additives
- Develop calculations for control of an adequate reducing atmosphere.

See Reference #3 and #4

Application of Seacoal Carbons & Additives
The removal of sand from the casting is a great expense in the casting production cycle. The function of carbons such as seacoal, gilsonite or seacoal replacements, play a major role in developing the degree of casting peel, shakeout and casting defects. The distinguishing features in these profiles can produce very favorable economics of operation, especially when they affect the foundry atmosphere and environment. Most cast irons require a consistent carbonaceous volatile at casting temperatures to overcome the oxidizing effect of steam, which results from sand moisture. This control can reduce and prevent burn-on, burn-in, and chemical penetration on the surface of the casting.

See Reference #5

Mulling tests and the Effect of Water

- Bond vs. temper water, bond development during mulling to evaluate bentonite clay or pre-mixtures. Degree of mulling required
- Friability and moldability tests
- Mulling cycle profile and standardization of moldability controller (maintenance)
- Aerator settings and condition of sand at molding station (sand balls)
- System sand temperature profile from shakeout, through muller and a point of use
- Standardization of water used and use of black water for environmental reasons.

See Reference #6

Dialogue on Mixing and Mulling
The Muller or mixing equipment is a key factor for producing sand consistency to approach homogeneity with the returned sand, bonding clay, additives and water. The compactability of the molding sand distinguishes the uniformity achieved in the mold and compliments the molding process and molding machine. The amount of water required is determined by the sand, bentonite and additive profiles. Mulling performance can be monitored automatically, if other profiles are held as constant as possible. The returning sand temperature is the most difficult to control and is influenced greatly by the sand to metal ration, cooling equipment (if any) and the storage inventory and transportation method. The quality and temperature of the water used can change the molding sand characteristics, especially very cold and hard water. Good muller and aerator maintenance should be mandatory and audited.

Molding Sand Compaction Studies

- Three to six rammed standard compaction tests comparing density, permeability, mold hardness, and green compression strength vs. rammed energy at optimum moisture level. Sand should be taken as received at the molding station and graph curves made for documentation of molding sand characteristics.
- Lateral movements tests
- Resistance to compaction tests

See Reference #7

Molding Sand Compaction Tests
Casting to size with a very minimal deviation in casting dimensions can reduce machining, and is welcomed by casting buyers. Casting reproductability is governed mostly by the uniform density of the mold and the casting stresses incurred by the casting geometry and gating or risering restrictions. Conducting compaction profiles can detect changes that may be occurring that otherwise cannot be measured accurately by other methods. The influence of compacted density (especially non-uniform) affects sand expansion, mold permeability, mechanical penetration, run-outs, casting distortion, and the ease of shakeout. These factors can have a great impact on the amount of cleaning and grinding, casting abnormalities and scrap. Mold testing, such as mold hardness, mold strength and mold permeability is now a new dimension in control and is becoming universally accepted.

See References #4, #6, #8, #9, #10

Dust Collector Profile and Controls

- Maintain a detailed and up to date sketch of the present dust collector system and settings.
- Audit dust collector fines for wet and dry dust collector for bonding clay and carbons.
- Ultimate responsibility for dust collector performance can benefit environmentally and be cost effective.
- Develop an inspection and reporting schedule for possible OSHA inspections.

Dialogue on Dust Collection Systems
More than ever, the foundry environment and any pollution to the atmosphere is becoming increasingly important and costly. Reduction and compliance can be monitored by the surrounding community and OSHA. All of the previous profiles discussed here, can be changed substantially by the dust collection system. This compulsory equipment that detracts from profitability, can significantly alter the consistency and performance of the molding sand, casting finish and quality. This profile, or "silica program" should be the responsibility of management to maintain a clean and healthy working environment for its personnel. Training is necessary for the maintenance department to know the importance for auditing and documenting the tests made in the laboratory. This team effort can also keep replacement and repair costs at a bare minimum.

Conclusions
Metalcasting plants that cannot confirm from their operation where they were, when good production and quality occurred, will find it difficult to make correct decisions to bring the and system into compliance when problems develop. It takes days or weeks to bring some systems back to an acceptable level, depending upon cycling time and the degree of change(s) made. Having a detailed accurate database from your research of the profiles listed is like an insurance policy against costly problems before they become serious. If the foundry engages and develops a daily auditing and quality surveillance procedure that synchronizes with maintenance, engineering, molding, metal production, and training, wide variations in scrap rates can be improved and reduced.

The Search for Excellence

The important questions for growth of a profitable operation are; where were we? where are we now? and where do we want to be? The incentive for answering and taking correct action on these questions can reduce costly breakdowns that retard production, and improve safety and morale of the dedicated personnel. It encourages training in achieving continual excellence through communications.

Determine an approved second source of raw materials that meet your general specifications. This could prevent shut downs or production slow downs in case of strikes, shipping problems, weather conditions, suppliers problems or acts of God. It can also be used incase of the cost increases that are not justifiable. Be sure the change has been production tested to confirm its acceptance.

Training personnel by sending them to the Ductile Iron Society's Metalcasting Seminars, Technical and Operating Meeting, and reviewed video training tapes listed in the report, where made live, at previous DIS Training Seminars. If you are in the know, confidence and success in managing can be very rewarding. *See Reference #11*

The significance of these recommendations of profiling and the molding sand system research, can document the operating conditions of present castings produced. It is as important as the database and records kept by the melting and processing of metal that is required by high quality castings buyers for insurance against failures in the field.

References

For those who wish to enhance any of these suggested profiles for greater understanding or for training purposes, the following are complete videotapes presented at Ductile Iron Society T&O Meetings, Training Seminars or in previous "Hot Topics" publications.

No. 1 - Training - DIS Video #6 on raw materials, Part 1, Sand
No. 2 - Video - same as above, Part 2, "Bentonite Bonds"
No. 3 - Video - same as above, Part 3, "Seacoal and Carbons"
No. 4 - "Controlling Green Sand Finish" DIS Hot Topics, Issue #1, 2002
No. 5 - "Experiences in Defect Diagnosis - Metal Penetration", DIS Video #1
No. 6 - "Mixing and Mulling Molding Sand", DIS Video #17
No. 7 - "Critical Molding Factors Affecting the Production of Ductile Iron Castings", DIS Video #3
No. 8 - "High Density Molding Technology", DIS Video #5
No. 9 - "Prioritizing Green Sand Testing" by George DiSylvestro, Ductile Iron News, Issue #3, 1998
No. 10 - "Factors That Affect Compactability and Consistency in Green Sand", Ductile Iron News, Issue #3, 2002
No. 11 - "Reproducing Casting Dimensions in Green Sand, DIS Video #18", 2002 T&O Conference

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MOLDING SAND SURVEY FORM #1

Type of metal poured ______________________________

Molten metal source ______________________________

Pouring temperature ______________________________

Pouring height ______________________________

Casting description

Size ______________________________

Weight ______________________________

Description ______________________________

Sieve analysis of new sand

For molds as received ______________________________

For cores as received ______________________________

For system sand washed ______________________________

Sand storage capacity ______________________________

Sand temperature at

Molding station ______________________________

Sand to metal ratio ______________________________

Flask size ______________________________

Molding sand properties ______________ ______________ ______________

______________ ______________ ______________

Core process used,

Core dilution and distillate

Evolved ______________________________

Mulling practice & tons/hour ______________________________

Percent new sand addition ______________________________

Molding sand composition

(bond + additives) ____

DAILY QUALITY SURVEILLANCE REPORT

REPORT BY ____________________________ CONFIRMED BY _______________________

ITEM #	AUDITING POINT	REPORTED CONDITION
1	CONDITION OF SHAKEOUT	1 2 3 4 5 good ----------------------bad
2	CASTING PEEL @ SHAKEOUT	1 2 3 4 5 comments _______________________
3	PERCENT NEW SAND ADDITION	1st shift lbs________or tons________ 2nd shift lbs________or tons________
4	PERCENT M.B. ACTIVE CLAY	Today__________% yesterday_______%
5	% LOSS ON IGNITION % VOLATILE CONTENT	L.O.I.____________________% V.C.M.____________________%
6	DUST COLLECTOR ABOVE 100, US 140&DOWN, COARSE/FINES RATIO	% above_________% 140 sieve_________ % on _________% 140 thru pan_________
7	3 & 6 RAM SAND COMPACTION TESTS	Density 3 rams_________6 rams________ Perm. 3 rams________6 rams________ Mold hdns 3 rams ______ 6 rams________
8	PREPARED MOLDING SAND CONDITION AT FLASK	1 2 3 4 5 comments _______________________
9	MOLD HARDNESS OR MOLD STRENGTH @ SOFTEST POINT	from ________ to _____________MH
10	OPERATIONAL COMMENTS i.e., maintenance or operating barriers	
11	MOLDING MACHINE COMPACTION SETTING	

A. List any auditing points out or range by item number_________________________________

B. Assignment and action to be taken to bring into compliance___________________________

C. Percent Range of Productivity from Normal _________________%

D. Scrap Report – Three highest ranking defects
1) __________________________________
2) __________________________________
3) __________________________________

E. Distribution for follow-up ____ URGENT ☐

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Intermet Introduces New Ferrous Material at 2003 SAE World Congress

Technical paper one of three presented by INTERMET at annual Congress

Troy, Mich., March 6, 2003 - In a groundbreaking study presented at the 2003 SAE World Congress in Detroit, INTERMET Corporation (Nasdaq: INMT) unveiled a new ferrous metal that allows for the production of high-strength, safety-critical iron automotive cast components at a much lower cost than competing materials and processes.

Dr. Alan P. Druschitz, INTERMET's Director of Material Research and Development, and David C. Fitzgerald, Director of Product Engineering and Design, delivered a technical presentation introducing "MADI™" (Machinable Austempered Ductile Iron) ferrous metal, which gives automotive engineers the flexibility to design suspension and power train components with the strength of steel forgings, but at the cost and machinability of as-cast ductile-iron castings.

According to Druschitz, the MADI material addresses one of the major stumbling blocks to the efficient casting of suspension control arms and crankshafts in austempered ductile iron: they are difficult and costly to machine. "The machining of hardened, or austempered, ductile-iron castings has been a problem in the past because of the cost of the special tools necessary to mill the material," he said. "With the MADI material, we use a special iron chemical composition and heat-treat cycles that produce a unique microstructure more favorable to normal, less costly machining methods," Druschitz said. "This is a major breakthrough, especially for high-volume automotive applications, which demand continuous improvement in performance as well as higher value."

The study, titled "**MADI™: Introducing a New, Machinable Austempered Ductile Iron**," was presented on Tuesday, March 4, 2003 at Cobo Center in Detroit. In addition to this report, INTERMET engineers presented two other technical papers at the SAE World Congress. A brief summary of each follows:

Bolt Load Compressive Stress Retention Testing of Magnesium Alloys (Paper 2003-01-0178)
Authors: Dr. Alan P. Druschitz, Eric R. Showalter, INTERMET Corp. Presented Monday, March 3, 2003.
For years, the automotive industry has been using magnesium castings for structural applications, such as seat backs, seat pans, brake-pedal brackets and instrument panels. But acceptance of magnesium has been slower for more demanding power train applications like oil pans, transmission cases and cylinder blocks, which encounter higher temperatures. This paper looks at a number of new magnesium alloys that have been developed to address these issues at more competitive costs when compared with aluminum and gray iron.

New Approach in Non-destructive Evaluation Techniques for Automotive Castings (Paper 2003-01-0436)
Authors: Thomas E. Prucha, Nanda Gopal, INTERMET Corp., Robert H. Nath, Quasar International Inc. Presented Wednesday, March 5, 2003.
Automotive castings increasingly are being utilized in structurally demanding and safety-critical applications. The need for reduced weight, near-net shape and more cost-effective components has resulted in a desire by automotive designers and component manufacturers to explore the reduction of conservative safety factors used for design criteria. This presentation reviews past requirements and testing approaches and sets the background for introducing an NDE (Non-Destructive Evaluation) method that evaluates parts not in terms of specific indications, but in terms of structural properties - a much better way to determine component fitness.

With headquarters in Troy, Michigan, INTERMET Corporation is a manufacturer of power train, chassis-suspension and structural components for the automotive industry. INTERMET's strategy is to be the world's leading supplier of cast-metal automotive components. The company has approximately 6,000 employees at facilities located in North America and Europe. More information is available on the Internet at www.intermet.com.

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FEATURES

DEPARTMENTS

Eliminating Carbides in Ductile Iron

By James Mullins, Mullins Professional Services
DIS Technical Director

Fortunately for ductile iron producers and consumers, carbides are becoming an increasingly rare problem. This is mostly due to diligence on the part of most foundries, because ductile irons are much more prone to carbide formation than gray iron, even though the composition may appear to be similar. The treatment alloys that we use to convert gray to ductile iron are usually a big part of the problem.

Carbides will cause machinability complaints and may even increase the shrinkage tendency of an iron, since some of the carbon needed to form graphite which will produce part of the expansion needed is not available.

Treatment alloys contain varying amounts of magnesium and rare earths, both of which are quite strong carbide promoters. So it very necessary to control the final levels of these elements according to the cooling rate of the casting sections being produced. Magnesium and cerium are additive in creating nodules, so only looking at magnesium levels will only tell part of the story. Thin sections require much less magnesium and tolerate more cerium than heavy sections. Some foundries use too much of each and many foundries use more of one or another than they need. Doing this can lead to carbide problems, especially when cooling rates are high and inoculation additions may be marginal. See figures 1 and 2.

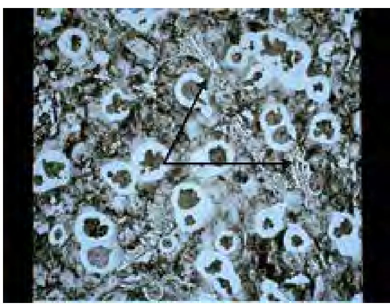

Figure 1 Eutectic or chill carbides. Usually found in rapidly cooled areas such as corners, where fins attach to the casting, at chill locations, etc.

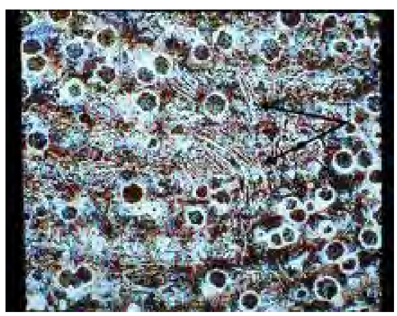

Figure 2 Inverse chill carbides in the center of the casting section. Note the shape of the carbides - acicular or needle like.

The two most common carbides are eutectic or chill carbides and inverse chill carbides. Eutectic carbides (figure 1) are usually found on the casting surface and near fins and corners. They occur because of rapid cooling and insufficient inoculation to over come the undercooling created during treatment. Of course the carbon equivalent level plays a part if carbon and silicon contents are too low.

Of course other elements, such as chromium, molybdenum and titanium can also be responsible, but they often cause a different type of carbides to form and these are usually found in the grain boundary areas and are called segregation carbides. These are normally found in areas where the cooling rate is slow, but with high pouring temperatures even quite thin sections can have these, when carbide promoting element concentrations are too high. See figure 3.

Figure 3 Segregation carbides. Found in heavier casting sections in grain boundaries. May have to use a higher magnification power (200 X) to see them clearly.

Eliminating the problem

The first step is careful monitoring of charge materials. It is very common these days for some alloyed steel scrap to creep into the scrap stream. More and more steel is made from recycled scrap as well and many of the carbide promoting elements are hard to oxidize out.

Chromium and molybdenum should have a maximum content of 0.05% in ferritic irons. Titanium should not exceed 0.025% as it has other consequences of promoting graphite deterioration as well. Even manganese can segregate when concentrations go above 0.40%. The problem is not with the concentration in the melt; it is the fact that these elements move in the solidifying iron and can cause concentrations in the intercellular regions to be up to 10 times higher, hence the carbide promotion capability.

The important base elements in controlling chilling tendency are carbon, silicon and sulfur. C and Si should be correct and maintained for the section size and grade of iron. The base S content should always be above 0.005% before treatment. Low S contents lead to poor nucleation and low nodule counts.

Magnesium is also a strong carbide-promoting element. Consistent magnesium treatment is important to controlling it to as low a level as required to produce a good nodular structure. Many, many producers use too much and with normal variation in the process, the upper end of the range may easily be too much.

Sufficient inoculation will most often cure many chill problems. Even segregation carbides can be reduced when the nodule count is increased to an appropriate level for the section size. Inoculation additions should be split to insure uniformity. Add some with treatment alloy when treating with Mg Fe Si, and add the balance upon transfer to a pouring ladle. Also inoculation fades, actually more quickly than the magnesium does. Nodularity and nodule counts are easily improved with a late inoculation step. For this reason in-stream and in-mold inoculation processes have gained considerable ground. Very few irons are over inoculated. Thin sections (fast cooling) require more inoculant than heavy sections.

Increasing nodule counts through inoculation and possibly using stronger inoculants, which fade less rapidly, will always be helpful. Some foundries add a very small amount of bismuth (0.01%) along with their normal cerium addition to increase nodule counts.

Finally, higher pouring temperatures are usually better in reducing carbide problems by slowing the cooling rate of a given section, even though the inoculation fade rate is increased. Gating into thin sections is useful as this increases the effective section size as the mold media is heated.

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Improving Melting Yield Through Better Furnace Operation

By James Mullins, Mullins Professional Services
Technical Director of DIS

There have been several studies done on this subject, commissioned by AFS and others, which have shed some light on methods to improve melt yield. One study done by W.M. Nicola and V.L. Richards done as AFS Research, included minimizing oxygen (in air) input into the furnace and the effect of rusty steel scrap, boring briquettes and several pig irons on recovery. They measured slag generation as well as yield, and determined optimum melting methods from trends seen. Certainly increasing the amount of rust on charge materials, the surface area to volume ratio of the charge materials and the amount of slag produced from them can be affected by the furnace operating conditions.

The results, from this actual melting study, showed that melting with a sealed furnace was preferred to using an open furnace, thereby increasing metallic recovery and reducing slag production. (Note that sealing the furnace means to cover the open top with a high temperature ceramic blanket, which drastically reduces heat evolution as well as air introduction.) In addition carbon and silicon recovery were improved over using open top melting furnaces. Even the impact of rust on increasing slag generation and reducing carbon recovery appeared to be significantly negated.

Some other observations were that when using thin steel scrap carbon recovery tended to decrease and slag increased with open melting conditions, probably due to oxidation on heating. This slag became worse when using rusty charge materials. Also carbon recovery was improved as the charge was cleaned up. Charging cast iron boring briquettes produced the highest melt losses, some of which was oil and water counted in the material weight.

This study was not totally conclusive, but showed trends and contributed to the knowledge base about melting. Usually everything that we can do to reduce slag helps the bottom line. This includes decreasing slag handling and disposal costs, reducing the effect of rust and slag on refractories, reducing heat losses and improving metallic yield and carbon recovery. All of this can be easily accomplished by using a cover, which seals the top of the furnace well, thus minimizing air input. This cover can be insulating refractory installed on a good metal cover or ceramic fiber blanket, but in either case they must seal properly.

Other work done on this issue of minimizing oxidation losses was a paper done by K. Copi for an AFS Melting Conference. This involved melting in medium frequency furnaces, where he explained several methods to reduce oxidation.

In addition to buying clean scrap and keeping it clean in storage, the operation of a preheater is important. As thin steel scrap is heated above 1200 degrees F, it becomes more susceptible to surface oxidation. Reducing superheating and air input on this scrap can be beneficial to improving melting yield. This thin scrap can present such a large surface area, that it will rapidly absorb heat and oxidize. Using heavier and thicker scrap and/or reducing oxidizing flame impingement and excessive heating of the charge will also help. Note that carbon present in returns and pig iron reduces this oxidizing effect on them somewhat.

The other cost reduction issue comes from modifying the batch melting process, where thin scrap is again heated in an air atmosphere without the protection of carbon in or around it. Keeping a smaller molten heel (15% of capacity) than what was previously used in main frequency melting (up to 1/3 of furnace capacity), where the carbon content is relatively high, has advantages. It allows the steel scrap to be quickly absorbed and recarburized lowering its melting point and reducing any oxidation. This method can allow of greater power input initially as well. Also the carbon additive is more protected from air, oxide and slag thus reducing losses. Adding carbon and alloys directly to the bottom of an empty furnace is not the best practice. They may fuse together or to the bottom and not present the maximum surface area necessary for good absorption. Furthermore when keeping a heel, the amount of one time additions necessary would be somewhat reduced. However, using a preheater is almost always necessary when heel melting, but heating the scrap up to 900 degrees F when done properly can be beneficial to reducing electrical energy input.

If the furnace must be used as a batch melter, a different charge order should be helpful. Instead of heating the steel scrap, which can get to a very high temperature very fast in air where it will be easily oxidized, charge higher carbon, higher density material (pig and dense returns) into the furnace first. They will melt more quickly and at a lower temperature than steel scrap, which must be carburized to lower its melting point. This will again create a high carbon heel as described above, allowing increased power input into the melt and reduce melting time. These steps in combination with covering and sealing the furnace will reduce slag production and melt losses, shorter heat times and lower melt costs. One more benefit may be increased consistency in chemistry results, because of improved recovery, which can take one more variable out of the melting equation.

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News Briefs

MEETINGS

The **June 2003** meeting will be held at The Woodlands Inn and Resort in Wilkes Barre, Pennsylvania on June 2-4, 2003.

There will be a **Keith Millis Symposium** on October 20-23, 2003 at the Crowne Plaza Resort in Hilton Head Island, South Carolina.

BUSINESS

INTERMET Announces New Business Won in 2002

Continued expansion of customer roster in both North America and Europe

Troy, Mich., February 18, 2003 - INTERMET Corporation, one of the world's leading manufacturers of cast-metal automotive components, reported today that new business awarded in 2002 totaled $450 million over the life of the programs. This is in addition to the previously announced $400 million in new programs awarded to INTERMET in 2001. The new business will support automotive OE and Tier 1 manufacturers and is scheduled to launch throughout the next three years.

The new business includes cast-metal components manufactured for power train, chassis, brake and body/interior applications and will be sources both from the company's North American and European operations. A number of programs begin production this year, including:

- Ductile-iron rear knuckle for a major Japanese OEM. Scheduled for launch in first quarter.
- Aluminum steering knuckle for Dodge Durango. Launching in July, contract is a significant addition to INTERMET's existing PCPC™ process steering-knuckle program.
- Ductile-iron rear knuckle for Mercedes-Benz C-Class. January launch at INTERMET's Ueckermünde, Germany, foundry.
- Twelve aluminum housing and electronic enclosure programs for Motorola, including eight launched in late 2002. For use on North American-built European vehicle platforms.

"We are pleased that new customers have recognized the value we are creating technology and manufacturing efficiency and that existing customers continue to see the enhanced casting solutions we provide," said Terry Graessle, INTERMET's Vice President of Sales and Marketing. "Progress was made last year in our revenue and customer diversification initiatives. Most notably, a larger portion of the new sales is coming from New American

Manufacturers who continue to increase the North American content of their vehicles assembled here. Also, in Europe we are diversifying our product base into automotive structural and safety components." Graessle continued, "Our 2003 revenue projection for INTERMET is for modest growth compared with last year in a softening market. However, we expect to be in a more substantial sales growth mode beginning in 2004 when many more new programs come on stream. This new business is a clear indication that INTERMET's global strategy of leveraging our substantial technological resources with our diverse material and manufacturing process capabilities is working."

Foseco and MAGMA form a Strategic Alliance

(Cleveland, Ohio, March 20, 2003) Foseco International of Tamworth, England and MAGMA of Aachen, Germany have entered into a global strategic alliance to act as 'Preferred Partners' in combining their respective strengths and expertise in the development of new and innovative engineering tools for the foundry industry.

In the first phase of this alliance MAGMA will provide Foseco with a proprietary suite of casting simulation software. This will be followed by further co-operation in areas of technology development, training and programmes to support growth of the global foundry industry.

Roland Johnson, Foseco's Director of Marketing and Technology, stated, "During our discus-sions, Foseco and MAGMA recognized that, when offered separately, our products and services meet a wide spread of client requirements. However, in many cases, we realized that closely coordinated efforts would provide an opportunity to create the most effective overall solution for our customers. We are excited by the prospects for this alliance between two market leaders."

Dr. Erwin Flender, MAGMA's Managing Director added, "This partnership enables both Foseco and MAGMA to offer better and more cost-effective solutions to our customers more quickly. Through our cooperation a new level of quality will be attained especially in the optimization of gating and risering layouts. Greater understanding and improved control of the casting process will lead to more competitive cast parts. I am sure that our common customers will benefit from the alliance, as well as Foseco and MAGMA - all of us will enjoy the success of this partnership."

With headquarters for the Americas region in Cleveland, Ohio, Foseco Metallurgical Inc. is a leading manufacturer and provider of proprietary consumable products to the global foundry industry, operating in over 100 countries around the world. Dedicated to helping customers improve their operations and businesses with innovative products and services, Foseco develops and commercializes the best ideas from customers, employees and its research labs to help customers reach the highest level of performance. Foseco is committed to continuous improvement and Total Quality as a way of doing business.

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Information for Editors

Foseco International is a global supplier of consumable process aids and technical services to the foundry industry. With operations in all major industrial markets, its employees have comprehensive expertise in foundry practice and deep relationships within this industry. Foseco's reputation as a market leader is built on an ability to create value for its customers through improved foundry practice and innovative application of its broad consumables product range.

MAGMA is a global supplier of foundry software technology and engineering services. Its competence in casting process design and optimisation has helped foundry customers across Europe, the Americas and Asia increase the functionality and quality of their castings while improving the productivity and reliability of their casting processes.

INTERMET Again Wins Casting-of-Year Honors

Troy, Mich., May 1, 2003 - INTERMET Corporation, one of the world's leading manufacturers of cast-metal automotive components, announced today that it has won a prestigious casting contest hosted by the American Foundry Society (AFS), the second year in a row for such honors.

An austempered-ductile-iron (ADI) rear control arm that is manufactured for the Ford Mustang Cobra by INTERMET's Decatur Foundry, located in Decatur, Illinois, has been selected as one of just 16 awards presented by AFS along with *Engineered Casting Solutions* magazine.

PEOPLE

Annie Karim, Marketing Administrator with Foseco NorAm in Cleveland has been selected as the AFS Foundry Person of the Year for the Northeast Ohio Chapter of the American Foundry Society. Annie is only the second woman to receive the prestigious award. (The first was Jean Boyer, also from Foseco, when the award was still called "Foundryman of the Year").

The award from the local AFS chapter recognizes Annie's professional contributions to one of the largest foundry chapters in the country over a seven-year period.

Annie started with Foseco in November of 1992, working 1/2 day for Production Control and 1/2 day for Purchasing. She moved to Marketing in 1996 and became a member of AFS that same year.

She has been a Director of the local chapter since 1998.

Photo Caption: Annie Karim, Northeast Ohio AFS Foundryperson of the year shown accepting the award from Brian Alquist, a National Director of AFS and Marketing Manager, Feedings Systems and Steel Filtration, for Foseco Metallurgical Inc.

INTERMET Vice President of Technical Services Thomas Prucha Receives 2003 Industry Award for Scientific Merit

Troy, Mich., April 30, 2003 - Citing his leadership on engineering and manufacturing technology initiatives in the cast-metal industries, **Thomas E. Prucha**, INTERMET's Vice President of Technical Services, was honored by the American Foundry Society (AFS) with the 2003 Award for Scientific Merit at its annual Congress and exposition in Kansas City.

The award was presented on April 29, 2003, at the AFS Casting Congress President's Luncheon and Annual Business Meeting.

Prucha was recognized by AFS "for extensive contribution to process development, metal properties, computer-aided engineering and non-destructive evaluation for aluminum and iron castings."

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