

Development of an Electronic Data Base for Rapid Selection of Aluminum Die Casting Alloys

Sponsors

American Metal casting Consortium (AMC)
US Department of Defense (DOD)
ACRC Consortium Members

Industrial Partners:

Kennedy Die Casting Inc.

Research Team:

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The objective of this project is to create an electronic design tool by which the users can input the requirements for performance of die castings and get the needed alloy chemistry, and vice-versa. The electronic database is being created within an electronic design tool that limits variation in specifications and consequently variation in performance of die-casting alloys. The tool enables procurement agents to better procure a better product at the lowest cost and with the shortest possible lead-time. It will also help die casting designers and casters in selecting the appropriate alloys quickly and economically, as well as in tailoring and optimizing the alloys they select or use.

Implementing an electronic tool kit for the selection of aluminum die casting alloys will have a significant impact on the metal casting industry. This will be realized by reducing scrap due to non compliance of metal quality resulting in components not meeting performance requirements, and thus reducing scrap, reducing lead time, reducing quoting risk and reducing total costs.

There are three major phases to this project:

Phase 1 - Development of the electronic design tool kit

The tasks in Phase 1 are:

- Build chemistry/properties database for aluminum die casting alloys
- Develop trend equations between chemistry and performance
- Construct the electronic design tool
- Alpha test the initial design tool at Kennedy Die casting and subsequently expand to ACRC member companies

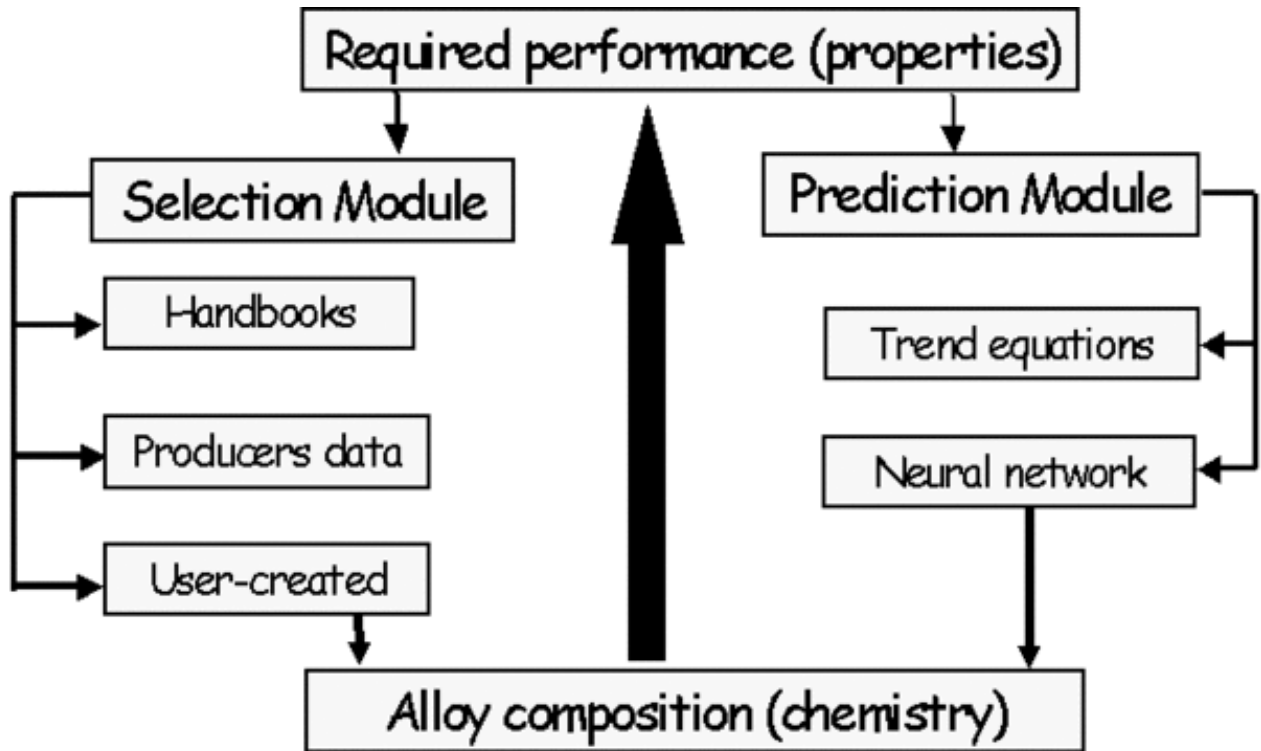
Phase 2 - Enhancement of the tool kit and development of a robust design tool

The tasks in Phase 2 are:

- Enhance the design tool kit
- Perform Beta site tests
- Expand the data set

Phase 3 - Establishment of a standardized set of alloy chemistry/performance indices

The North American Die Casting Association (NADCA) will market the electronic design tool and the accompanying database once they are completed and tested.



Prediction: Properties to Chemistry based on Trend Equations

PREDICTION OF ALLOY CHEMISTRY FROM PROPERTY REQUIREMENTS

Requirements

Tensile Strength (Ksi)	10
Yield Strength (Ksi)	24
% Elongation (%)	2
Fatigue Strength (Ksi)	20
Thermal Conductivity (w/m. C)	98

Predicted Alloy Chemistry

Si (%)	11.67
Mg (%)	0.16
Cu (%)	1.85
Fe (%)	0.54
Ti (%)	0.17
Mn (%)	~0.5
Zn (%)	<=2.0
Cr (%)	<=0.1
Ni (%)	<=0.1
Sr (%)	-

Input the required properties

Predicted alloy chemistry

Selection: "Chemistry to Properties" from NADCA Data

Input the required chemistry

Alloys that fit the requirements

Properties of selected alloys

Microsoft Access - [loc:TP6\ndca]

File Edit View Insert Format Records Tools Window Help

Alloy Selection From Specified Composition From NADCA Data

Alloy Name:

Fe
Cu
Mn
Mg
OthersEach:
OthersTotal:

Ni
Zn
Ti
Sn

Information for Chemistry Property Adjustment

Compositions	Mechanical Properties				Physical Properties						
AlloyName	Si	Fe	Cu	Al	Mg	Ni	Zn	Ti	Sn	OthersEach	Other
383.0	9.5-11.5	1.3			0-0.5	0-0.1	0-0.3	3		0.15	
A388.0	7.5-9.5		3-4		0-0.5	0-0.1	0-0.5	3		0.35	

Form View

Start | Database | Main Menu | Chemistry to Proper... | Handbook Data | loc:TP6\ndca