REFERENCE DOCUMENT: Tutorial for CADS 3.0 Users

1. **Starting with the known generic alloy and process, based on the desired allowable strength requirements; use CADS tool to search and select the right alloy.**

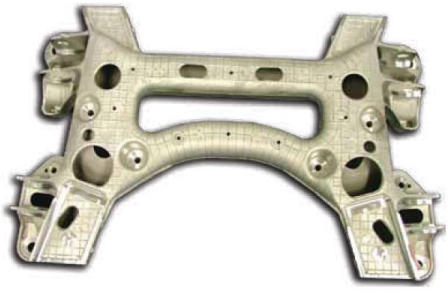
2. **Starting at the Conceptual Design stage – This example will walk you through with the use of CAPS (Casting Alloy & Process Selector) and CADS tools all the way to finding a source using AFS Online Casting Source Directory Tool!**

3. **Knowing the alloy category, group and sub-group; search and select the right alloy grade and export to an FEA Tool.**

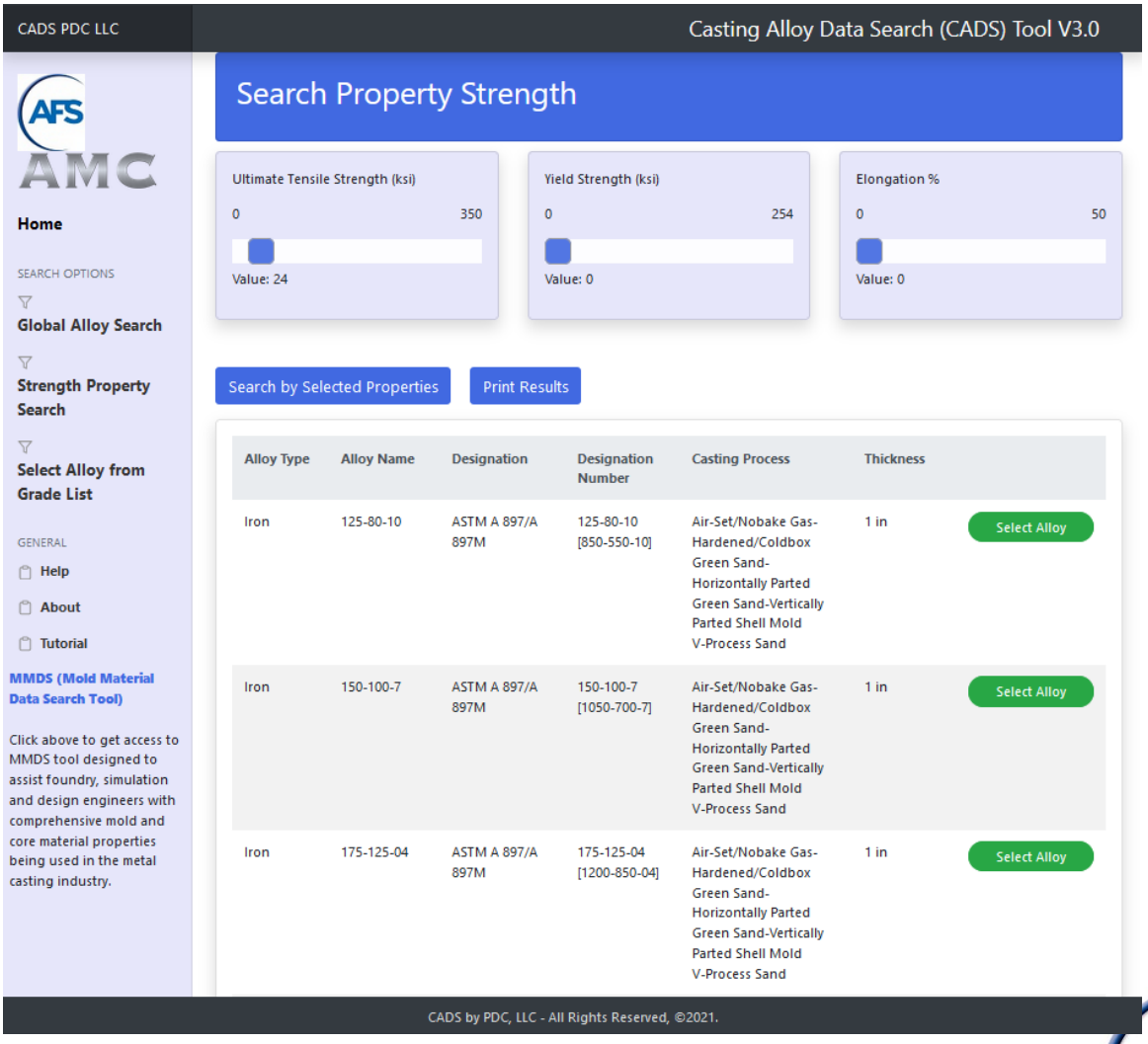
1. Starting with the known generic alloy and process, based on the desired strength requirements; use CADS tool to search and select the right alloy.

Example: Engine Cradle fabrication being considered for converting into 356 Permanent Mold-Low Pressure Casting

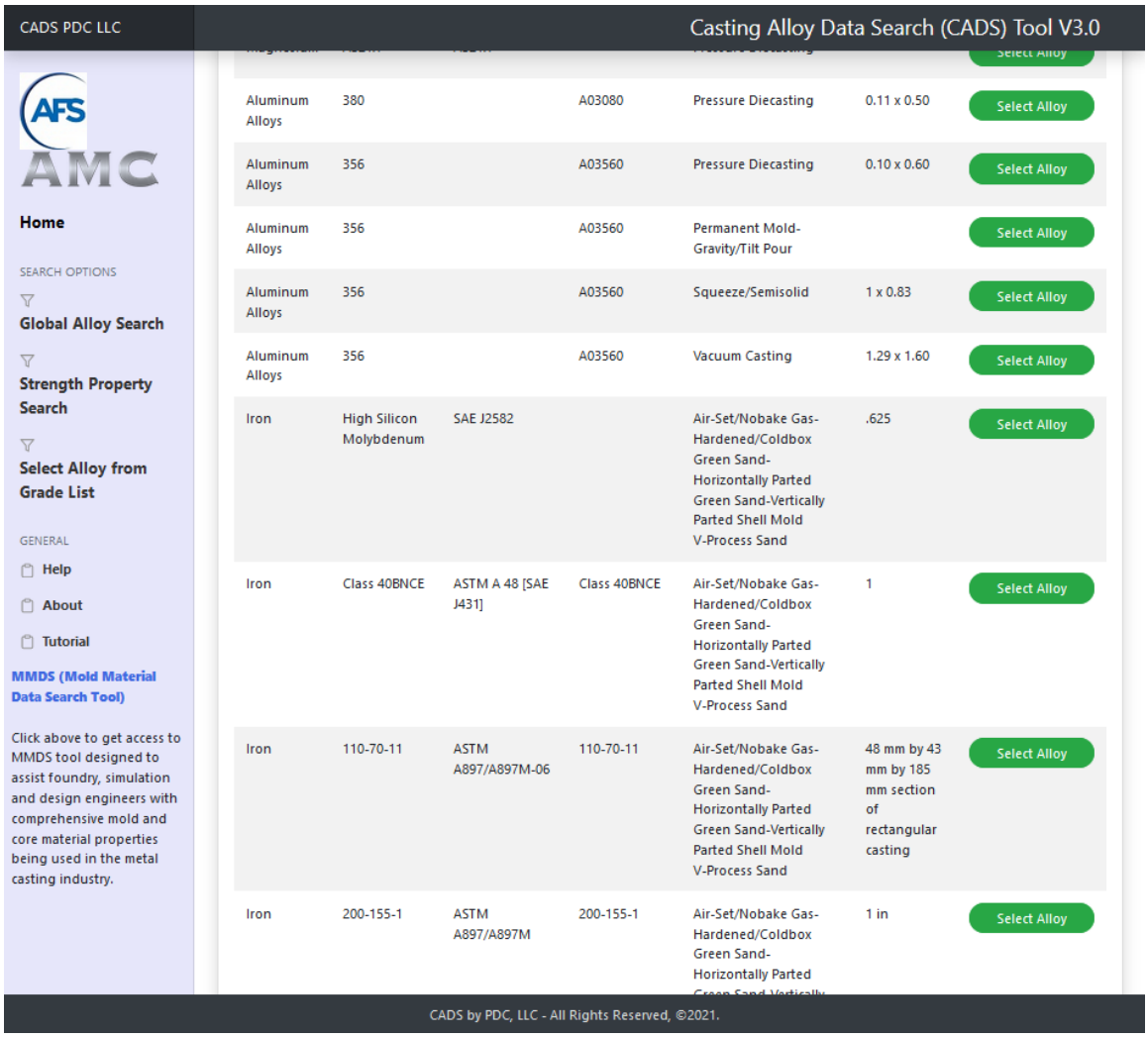
Alloy: Aluminum 300 Series
Weight: 30 lbs
Overall length: 40 inch
Critical Section Thickness: 0.125 inch
Casting Process: Permanent Mold-Low Pressure
Minimum Ultimate strength at Room Temperature: 12 ksi
Safety Factor: 2.0 (so allowable stress would be 24 ksi)



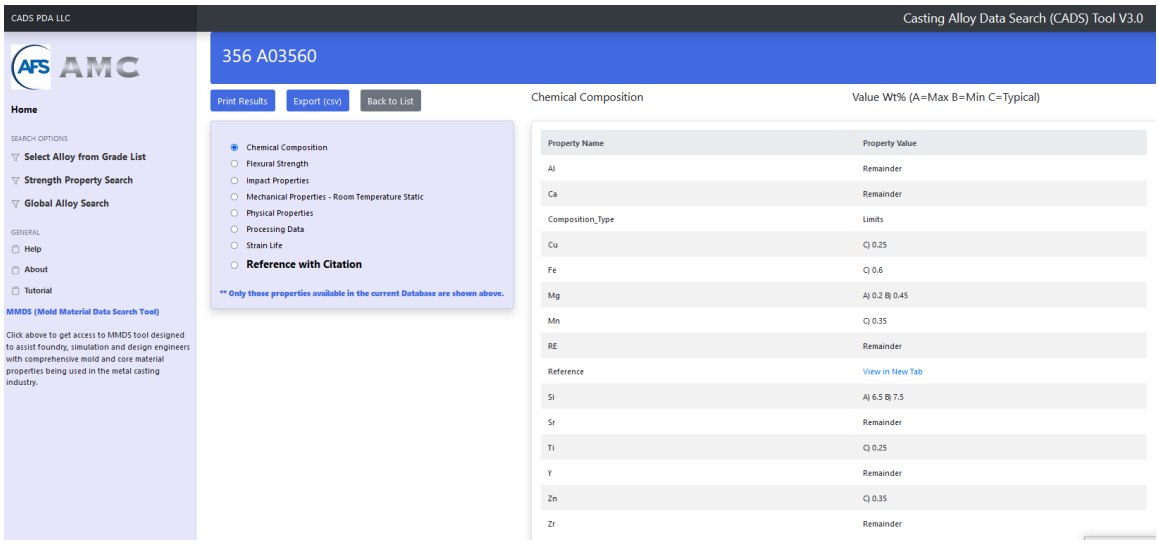
Typical Inputs: Using the slider bar at top, move it till the desired value of 24 ksi and hit search button.



Selection of Alloys to Choose from:

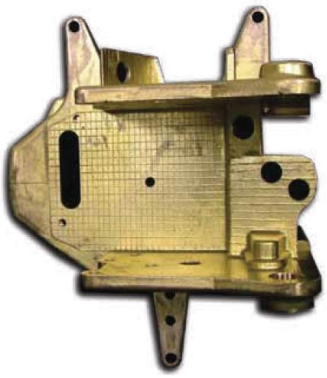


Detail Results of the down selected Alloy 356 Permanent Mold



2. Knowing the alloy category, group and sub-group; search and select the right alloy grade and export to an FEA Tool.

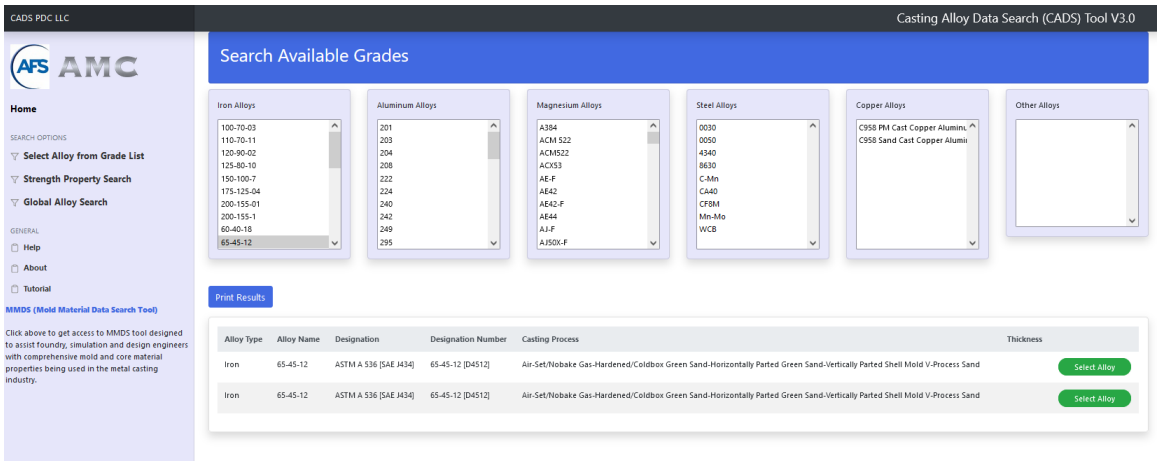
Example: Green Sand Cast Ductile Iron seed Boot Grade 65-45-12



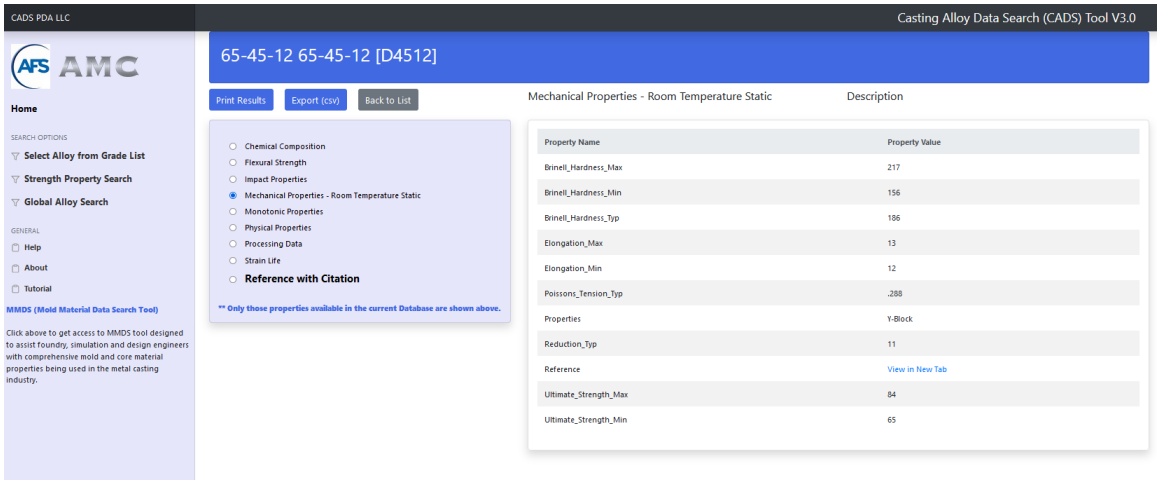
Alloy: Ductile Iron Grade 65-45-12
Weight: 15 lbs
Need to get all the strain fatigue properties

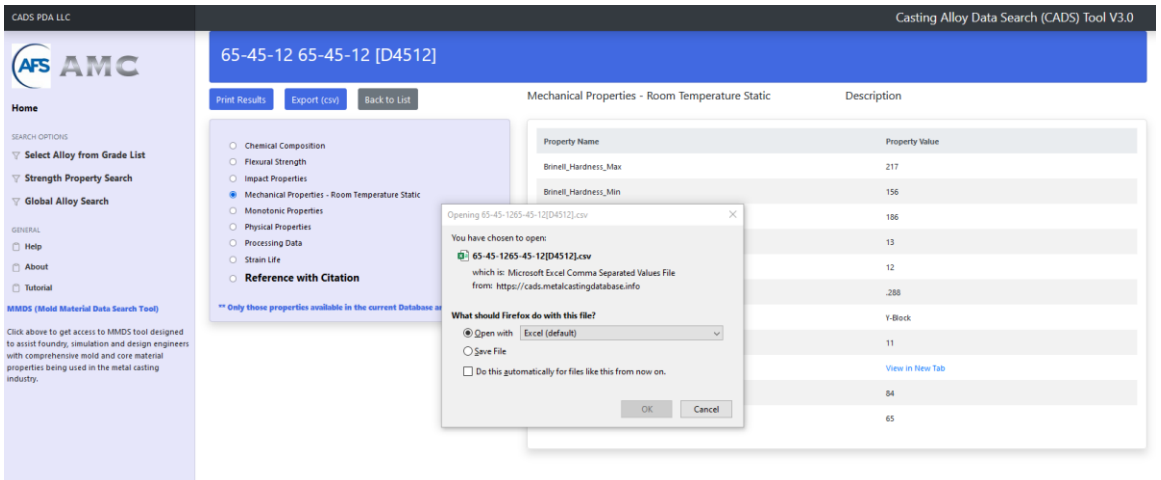
Use Select Alloy from Grade List of available data; Option 3 as shown below and pick the alloy grade within iron column as shown; use slider to scroll down the list.

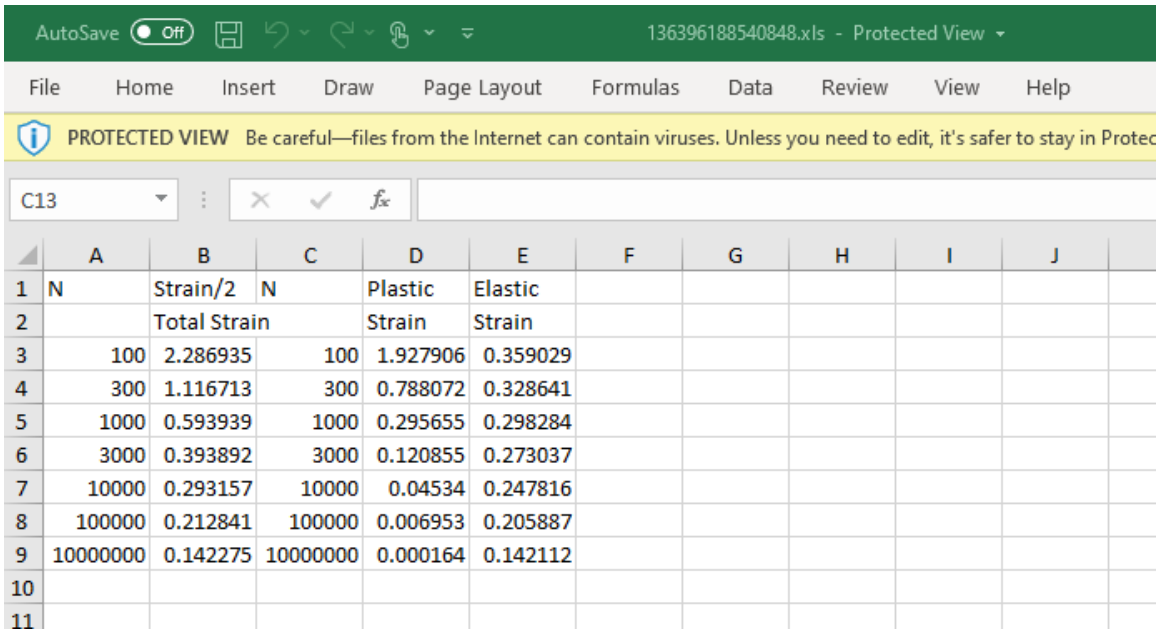
Input Window:



Down select Grade 65-45-12 to view and download the engineering data or print or export as CSV for imputing into FEA or Simulation tools.



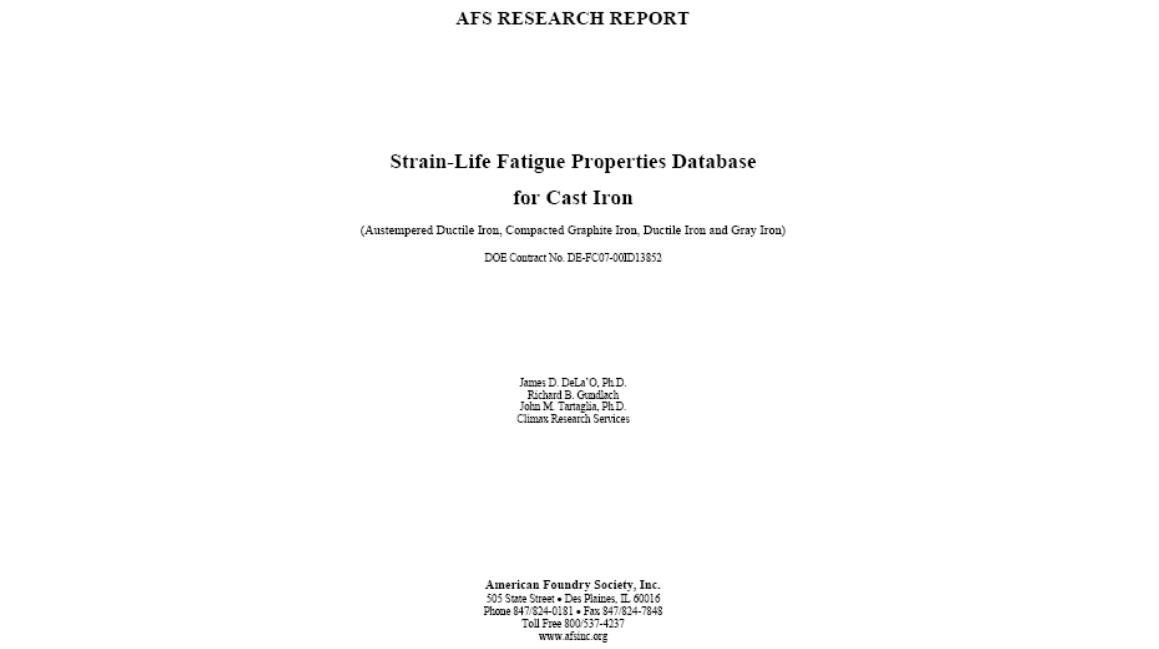




	A	B	C	D	E	F	G	H	I	J
1	N	Strain/2	N	Plastic	Elastic					
2		Total Strain		Strain	Strain					
3	100	2.286935	100	1.927906	0.359029					
4	300	1.116713	300	0.788072	0.328641					
5	1000	0.593939	1000	0.295655	0.298284					
6	3000	0.393892	3000	0.120855	0.273037					
7	10000	0.293157	10000	0.04534	0.247816					
8	100000	0.212841	100000	0.006953	0.205887					
9	10000000	0.142275	10000000	0.000164	0.142112					
10										
11										

For the reference to the properties source data, if available, is shown highlighted in blue and hyperlinked to the abstract as well as to the source of the full document.

Reference abstract for the mechanical properties:



AFS RESEARCH REPORT

Strain-Life Fatigue Properties Database

for Cast Iron

(Austempered Ductile Iron, Compacted Graphite Iron, Ductile Iron and Gray Iron)

DOE Contract No. DE-FC07-00ID13852

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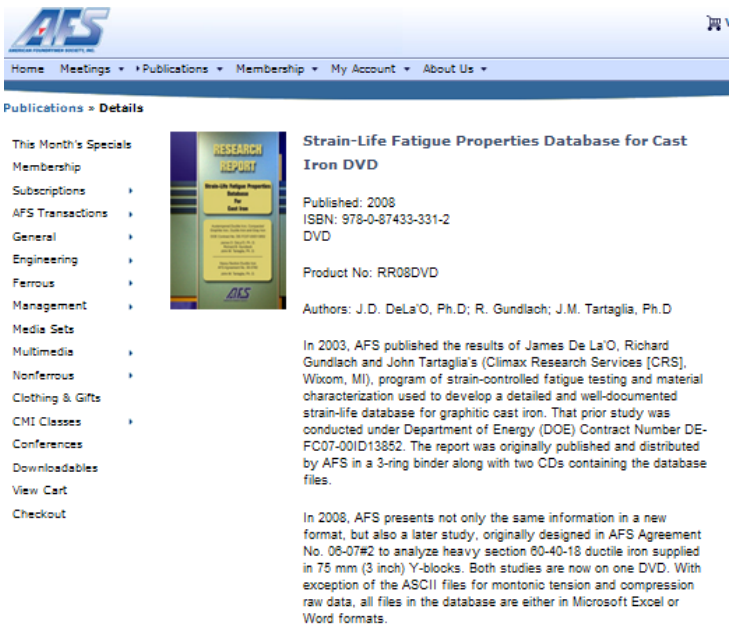
Full reference document destination:

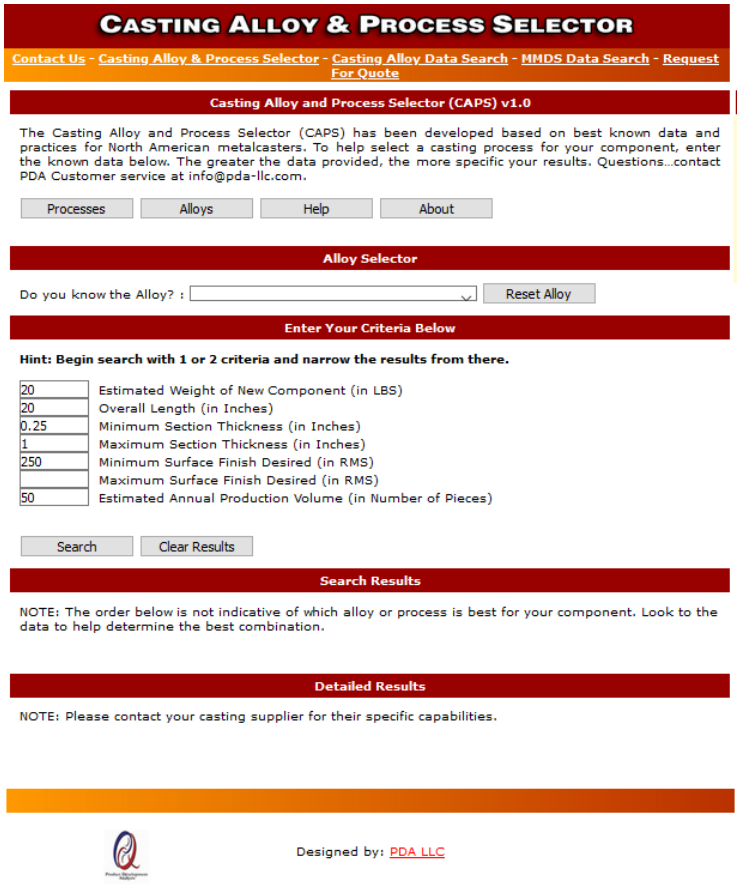


3.Starting at the Conceptual Design stage – This example will walk you through with the use of CAPS and CADS tools all the way to finding a source using AFS Online Casting Source Directory Tool!

Example: Steel fabrication being considered for converting into ductile iron casting

Weight: 20 lbs
Overall length: 15 inch
Minimum Section Thickness: 0.375 inch
Maximum Section Thickness: 1”
Min. Surface Finish Desired: 200 RMS
Estimated Annual Volume: 5,000 pcs.
Minimum Ultimate strength at Room Temperature: 48 ksi
Minimum Tensile Yield Strength at Room Temperature: 27 ksi
Hardness ranging from 96-140 BHN
Safety Factor: 2.0 (to calculate the allowable stress)

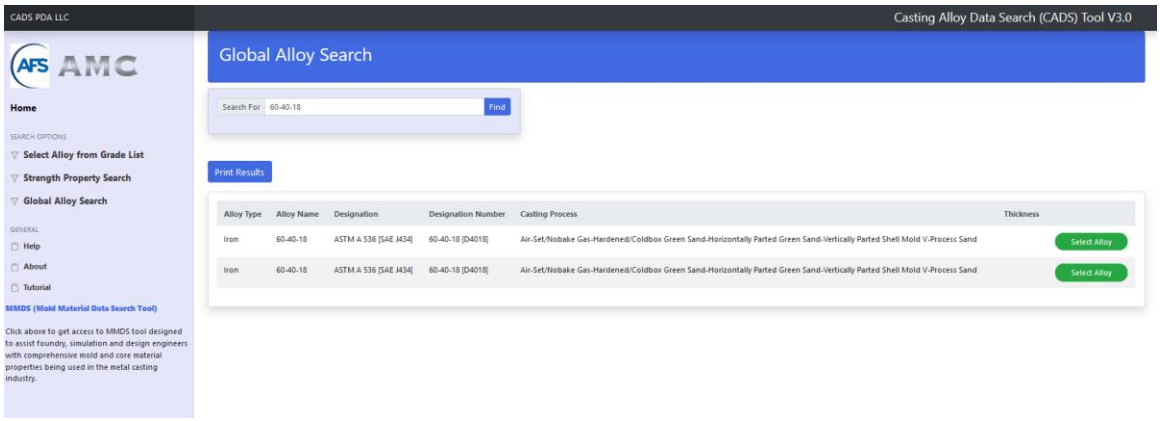
Please type in or with a Control key, click on this http://pda.metalcastingvirtuallibrary.net/caps/caps.aspx ; which will launch CAPS and enter the inputs as shown below.



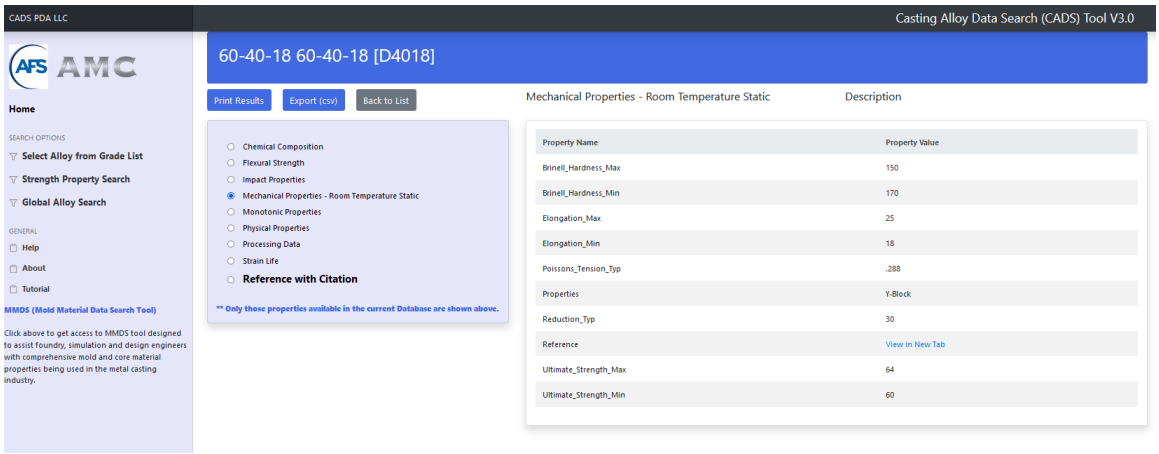
The search results will come up with 3 potential combinations of the alloy and process; down select the first one as shown below - Ductile iron and green sand horizontally parted process.

Select	Green Sand-Horizontally Parted	Ductile Iron	2	5	10	30	1	6	0.03	0.05	39
Select	Green Sand-Horizontally Parted	Low Alloy Steels	2	5	10	30	1	6	0.0625	0.1	40
Select	Green Sand-Horizontally Parted	Lead	2	5	10	30	1	6	0.015	0.02	41
Select	Green Sand-Horizontally Parted	High Copper Alloys	2	5	10	30	1	6	0.015	0.02	42
Select	Green Sand-Horizontally Parted	Compacted Graphite Iron	2	5	10	30	1	6	0.03	0.05	43
Select	Green Sand-Horizontally Parted	Gray Iron	2	5	10	30	1	6	0.03	0.05	44
Select	Green Sand-Horizontally Parted	Corrosion Resistant Iron	2	5	10	30	1	6	0.03	0.05	45
Select	Green Sand-Horizontally Parted	Superalloys	2	5	10	30	1	6	0.0625	0.1	46
Select	Green Sand-Horizontally Parted	Malleable Iron	2	5	10	30	0.5	6	0.03	0.045	47
Select	Green Sand-Horizontally Parted	Nickel-Base	2	5	10	30	1	6	0.0625	0.1	48
Select	Green Sand-Horizontally Parted	Aluminum-Silicon (300 Series)	2	5	10	30	1	6	0.015	0.02	49
Select	Green Sand-Horizontally Parted	Titanium	2	5	10	30	1	6	0.0625	0.1	50
Select	Green Sand-Horizontally Parted	Nickel-Base	2	5	10	30	1	6	0.0625	0.1	51
	Green Sand-	Heat									

Than, click on Casting Alloy Data Search Tool at the top main menu or on the right side bar or type in or with Control Key click on http://afs.metalcastingvirtuallibrary.net/cads/cads.aspx , which will launch CADS V3.0 and select Search option 1 – Generic Alloy Search as shown below by entering 60-40-18:



After selecting the alloy 60-40-18, all the details will be displayed as shown below, which can be printed or exported as CSV file, which can be imported and viewed into Excel.



Ductile Iron 60-40-18 Casting Conversion from Steel fabrication

To find a suitable metalcaster in North America, type this or with Control key, click on https://www.castingsource.com/metalcaster-directory , Casting Source Directory will show up as shown below automatically; enter the alloy type, select the process, enter the casting weight, select the country and finally state and you will see the list of foundries in your search results. If you know the name of the company, enter in the first search option.