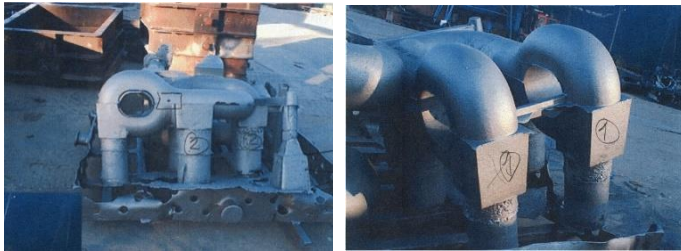


Comparing two different ways to cast a steel casting using Good Guys' Index.

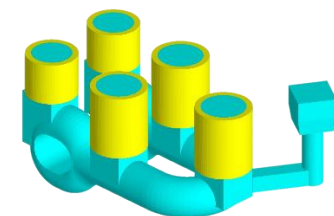
Introduction

This casting part had a complex and costly solution for its methoding. This is the reasons we started to look for ways to simplify the methoding and making it cheaper to produce.

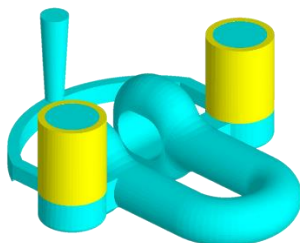


This project started a few years ago, when the focus at the time was mainly reducing production cost. Now, the financial part is still important along with quality, but it becomes more and more interesting to optimize and minimize the CO2 emissions as well. Then the first step is to start calculating in order to know what the starting point is. This is significantly where the GGI (Good Guys' Index) program powered by NovaCast Systems is a solution. Combining GGI with a casting process simulation program, such as NovaFlow&Solid, is highly recommended. With both connected, you can use the GGI program to simulate different designs and production methods in order to find the most profitable solution, financially as well as environmentally.

Below, we are comparing two different ways to do the methoding; one is original and one is the new design that we made by using the casting process simulation:

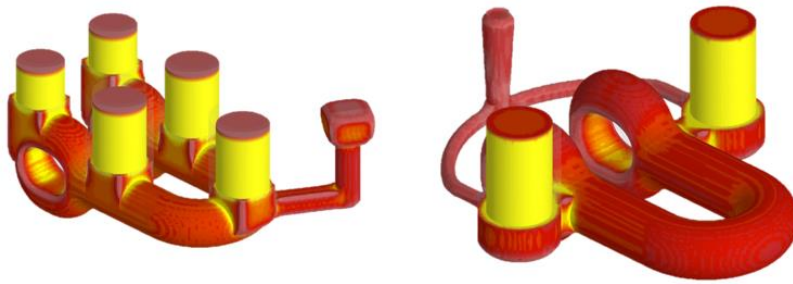


Original variant

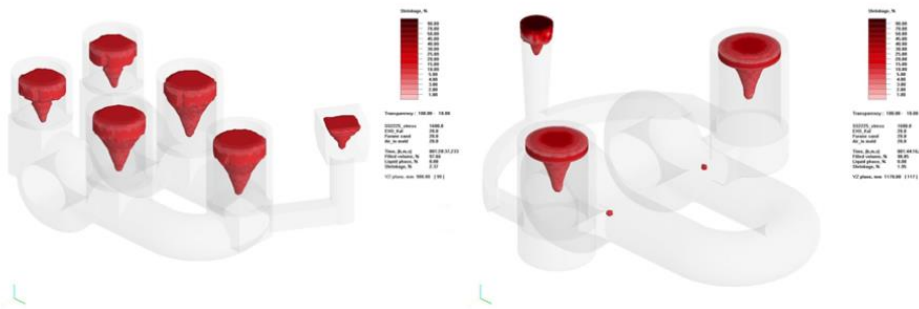


Optimized feeding

	<u>Original</u>	<u>Optimized</u>
Casting weight (kg)	485	485
Gross weight (kg)	940	725
Weight savings (kg)	--	215
Sleeves	5	2
Cutting area (cm ²)	2 800	450
Cost reduction (EUR)	--	200
Yield (%)	51.6	67.0



The above picture shows the liquid phase fraction comparison between the original and the new variant.



The picture above shows the shrinkage prediction comparison between the original and the new variant.

Program settings

The Projector Editor setup and results:

GGI 2.6

Project Editor - Heavy steel casting case				
Iteration		Base	Improved	Turkish
-	Energy Source	Hydro	Hydro	Coal
	Furnace Type	Induction	Induction	Induction
	Process	Gravity 1	Gravity 2	Gravity 1
	Transport Path	Sweden to	Sweden to	Turkey
	Raw Material Transport Path	Sweden to	Sweden to	Turkey raw
	Mould Material Transport Path	Sweden to	Sweden to	Turkey raw
	Foundry Base Energy	KWh/kg 2,00	2,00	2,00
	CO2 Per Kg Casting Material	Kg KWG 160 M	KWG 160 M	KWG 160 M
	Part(s) Weight	Kg 485,00	485,00	485,00
	Feeder Weight	Kg 400,00	185,00	400,00
	Ingate Weight	Kg 55,00	55,00	55,00
	Total Weight	Kg 940,00	725,00	940,00
	Mold Weight	Kg 2000,00	2000,00	2000,00
	Liquidus Temperature	°C 1510,0	1510,0	1510,0
	Number Of Parts/Mold	1,0	1,0	1,0
+	Technical Result			
+	Simulation Results			
	Energy CO2 Emission	Kg 6795	36,66	2321,74
	Base Energy CO2 Emission	Kg 45,12	34,80	1541,60
	Production CO2 Emission	Kg 1,20	0,93	1,20
	Freight CO2 Emission	Kg 7,44	7,44	44,63
	Raw Material CO2 Emission	Kg 368,60	368,60	368,60
	Holding Energy Consumption	KWh 0,0	0,0	0,0
	Energy Consumption	KWh 2831,4	1527,5	2831,4
	Yearly CO2 Emission	Ton 245	224	2139
	CO2 Emission	Kg 490,32	448,43	4277,8
	Good Guys' Index	35,0	37,2	3,5

The Process Editor for setting up the process scheme:

GGI 2.6

Process Editor - Heavy steel casting case

Processes	Step		Shakeout	Cutting Fee	Grinding	Heat Treatm	Shot Blastin
Gravity 1	Machine Cost	€/h	25,00	25,00	5,00	30,00	200,00
Gravity 2	Manpower Cost	€/h	50,00	50,00	50,00	50,00	50,00
Skalforming	Energy Usage	KWh	50,0	20,0	20,0	300,0	30,0
Investment	Time Per Part	h	0,50	5,00	20,00	1,00	0,50
	Man-hour	h	0,10	0,25	0,50	0,00	0,00
	Electrical Cost	€	7,50	30,00	120,00	90,00	4,50
	Production Cost	€	17,50	137,50	125,00	30,00	100,00
	Total Cost/Part	€	25,00	167,50	245,00	120,00	104,50
	CO2 Emission	Kg	0,44	1,75	7,00	5,25	0,26
			9,0				

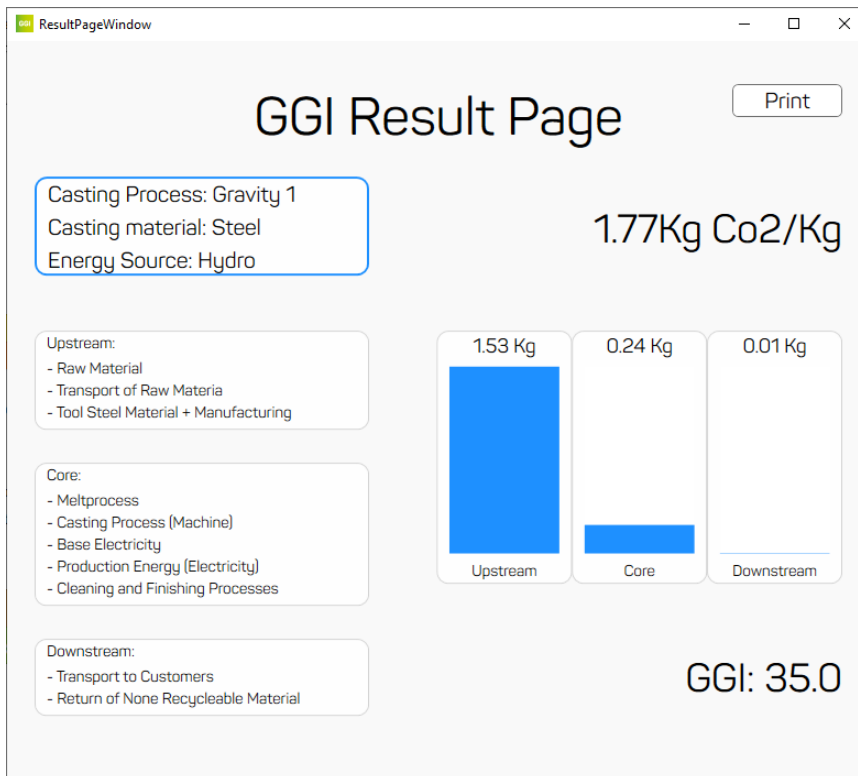
The Path Editor – transport calculations:

GGI 2.6

Path Editor - Heavy steel casting case

Paths	Step		1
Sweden to custom	Freight Type		Truck
Sweden to custom	Distance	km	3000,0
Italian	CO2 Emission	kg/ton	76,68
Turkey			77,7
Turkey raw materi			

The GGI results page including CO2 emissions per kg casting:



Conclusion

Improved feeding design gave a reduction of 42 kg CO₂ emissions per part. If you switch to for example Turkey, the transport and the energy type used will influence a lot and the CO₂ emission could be as high as 3788 kg more per part. This is certainly a huge difference and the biggest thing is that we have set that energy type is coal. By using Good Guys' Index, one can play different scenarios when it comes to:

- In which country the casting is produced
- By which method the casting is produced
- Compare different foundries suggestions
- Which energy source is used
- Which type of furnaces that is used
- Which casting design used
- Which methoding design used