

## *Lightweight Efforts on Cast Iron Parts*

Cem AYDIN  
Mahmut Mert BULDU



## Footprint Information



### Orhangazi Foundry

- Start up in 1973
- Total Area is 300,000 m<sup>2</sup>
  - 120,000 m<sup>2</sup> covered
  - 180,000 m<sup>2</sup> open area
- Capacity is 155,000 tons/year

### Orhangazi Machine Shop

- Start up in 2004
- Total area is 21,800 m<sup>2</sup>,
  - 20,000 m<sup>2</sup> production area,
  - 1,800 m<sup>2</sup> administrative

## Summary

- **The leader** iron casting facility in Turkey with **51 years** experience
- In-house final **machining** applied to **40% of rough castings**
- Casting product weight from **1 kg to 500 kg**
- Through four moulding lines in **different flask sizes**, **flexibility** in volumes is provided
- **High core intensity** castings production capability
- **Engine blocks and heads** production capability in different sizes
- Full castings supply chain from engineering to machining in **a single location**
- **Wide range of material** production capability including Solution Strengthened Ferritic Iron (**SSF**) and Compacted Graphite Iron (**CGI**)



## Orhangazi Sales - Business Area

%34



Construction and Mining

%27



Agriculture

%36



Heavy Truck

%3



Machine Building



**LIEBHERR**

**HIDROMEK**

**TürkTraktör**



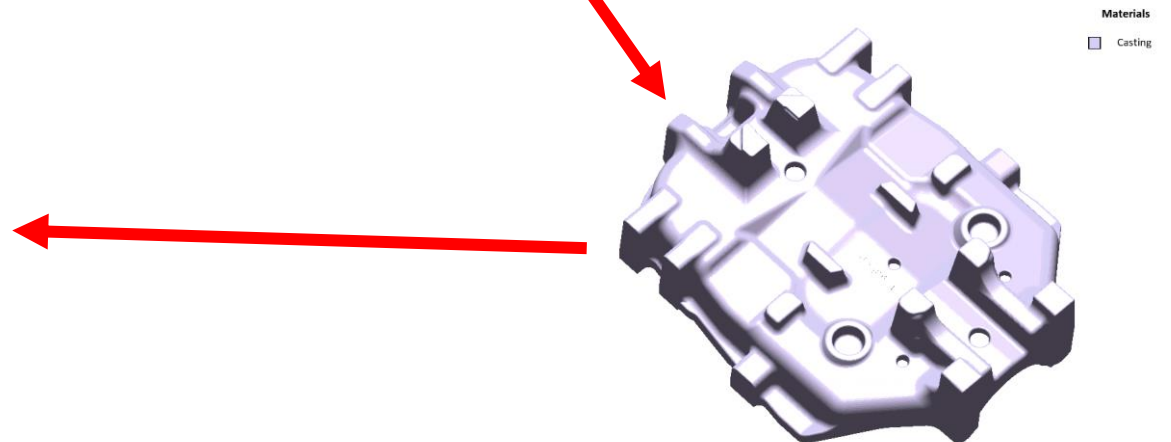
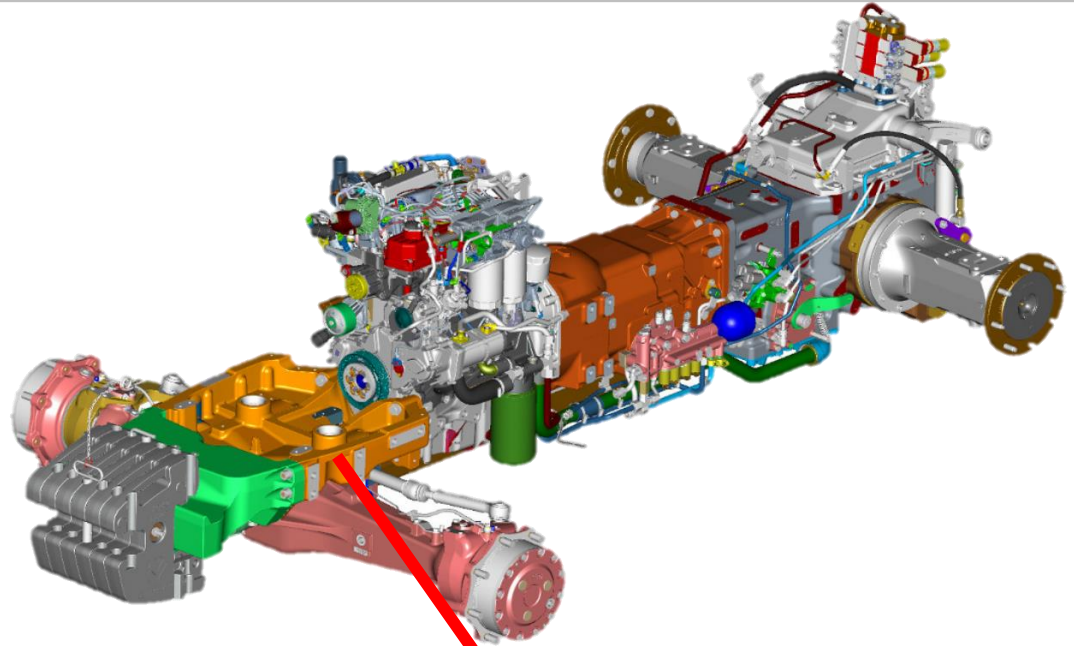
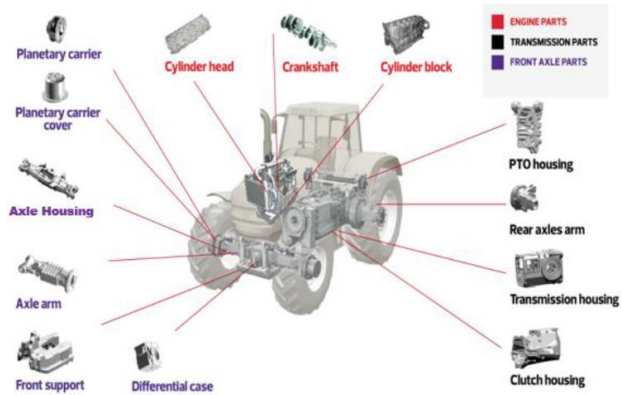
**CLAAS**



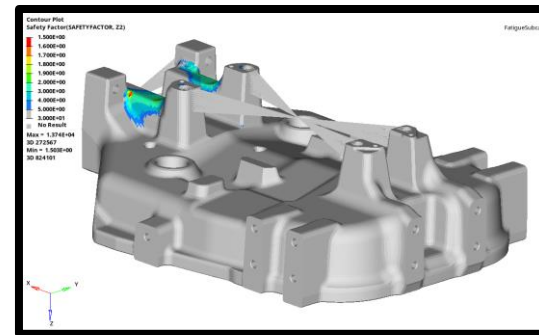
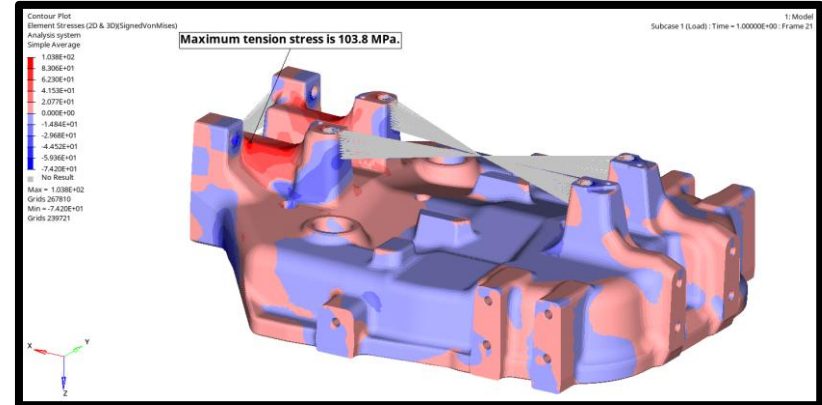
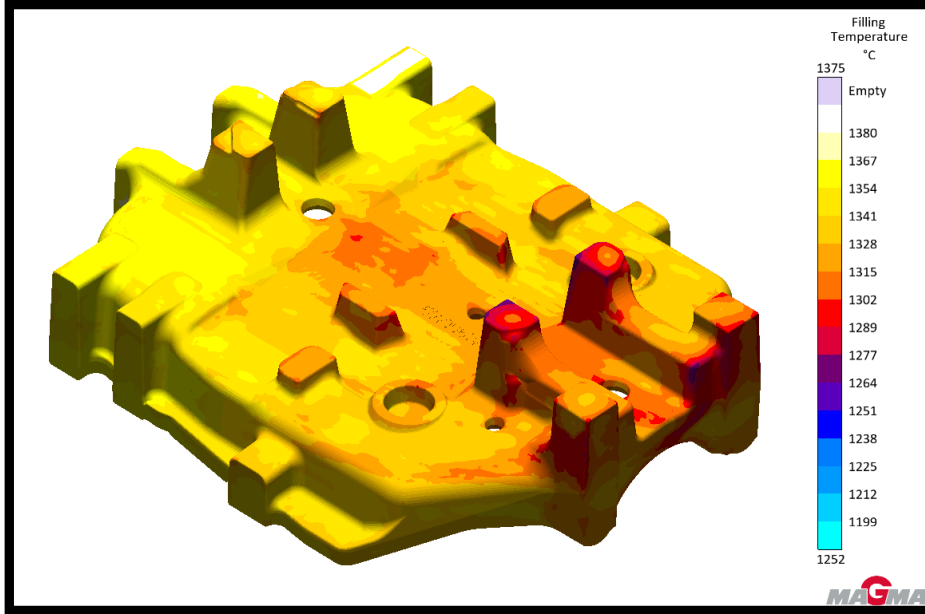
**DAIMLER**



# Agriculture

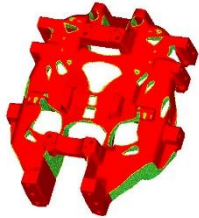
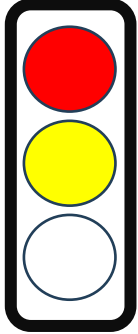


## Current Situation

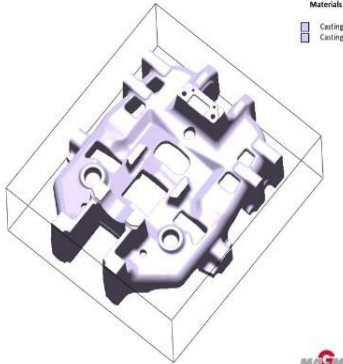


Design Phase	Mass (kg)	Material	Feeders	Safety Factor
Current Design	180	EN-GJL-250		1.5

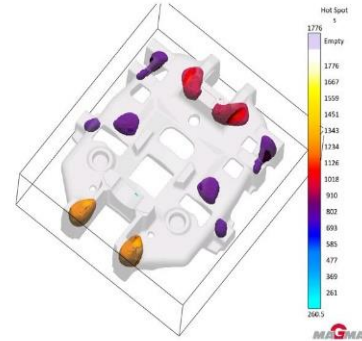
# 1<sup>st</sup> Design



Optimization



Design

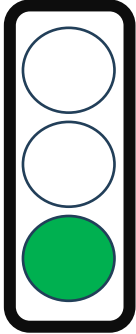


Solidification

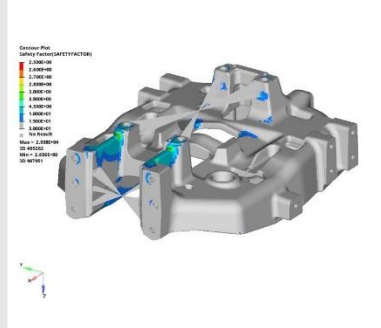


Design Phase	Mass (kg)	Material	Feeders	Safety Factor
Current Design	180	EN-GJL-250		1.5
1st Design	156	EN-GJS-500-7	10 feeders needed	3.4

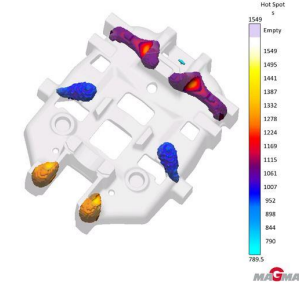
## 2<sup>nd</sup> Design



**Design for  
Manufacturing Study**



**Analysis**



**Solidification**

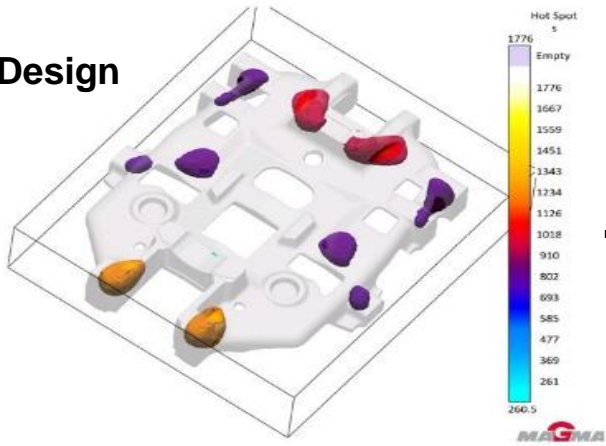


Design Phase	Mass (kg)	Material	Feeders	Safety Factor
Current Design	180	EN-GJL-250		1.5
1st Design	156	EN-GJS-500-7	10 feeders needed	3.4
2nd Design	140	EN-GJS-500-7	6 feeders needed	2.5

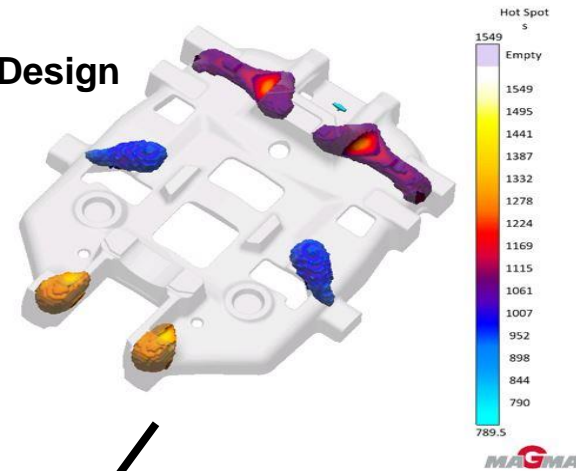


# Validation of Feeders

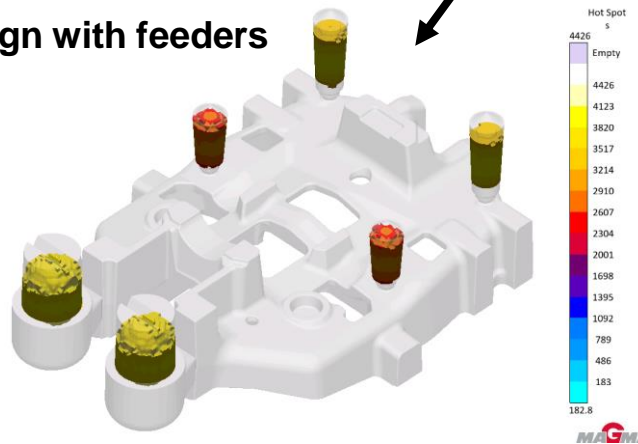
1<sup>st</sup> Design



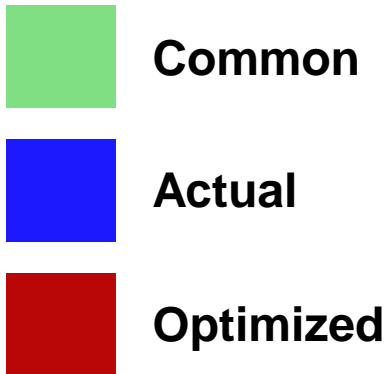
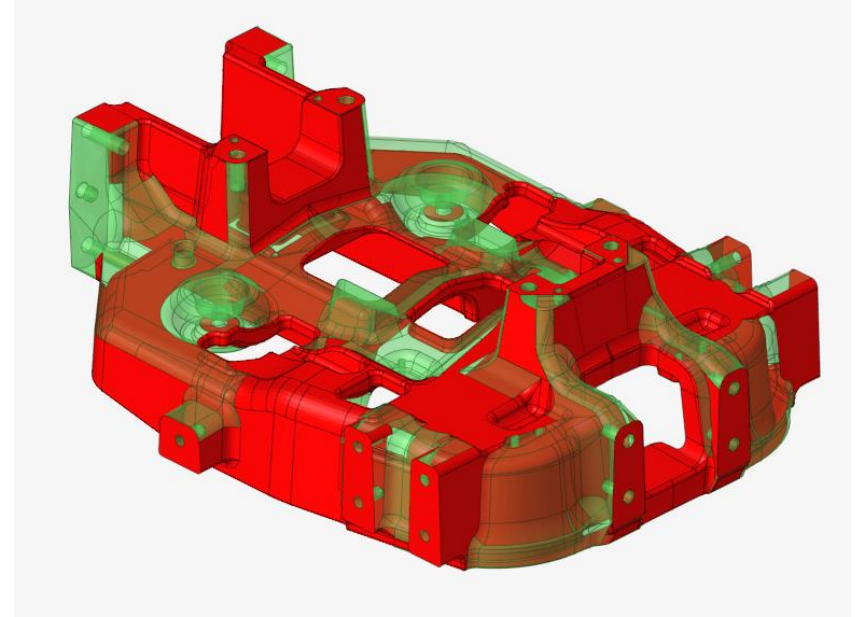
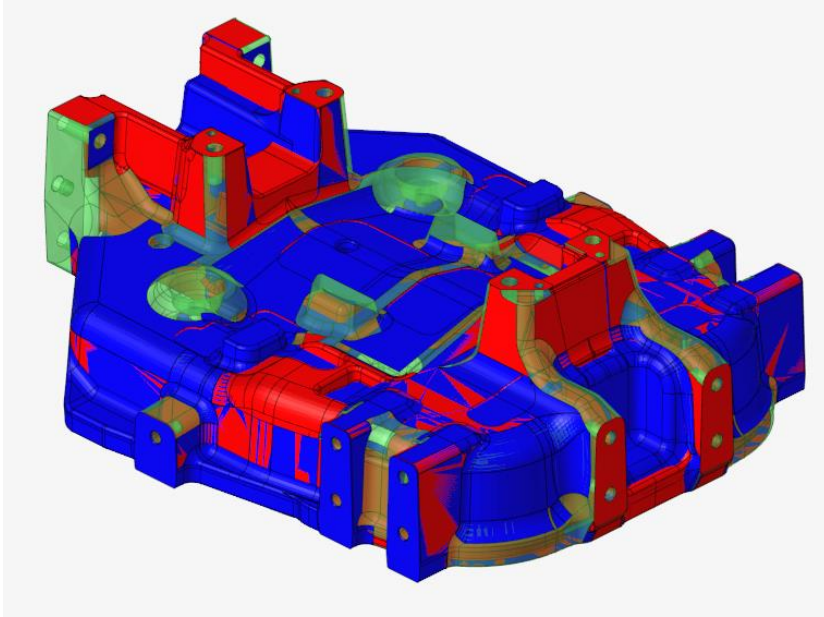
2<sup>nd</sup> Design



2<sup>nd</sup> Design with feeders



## Total Design Change



# Residual Stress Results

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2 $ MAGMA Giessereitechnologie GmbH
3 $ MAGMALink: 6.0.0.4 Build 26953
4 $ Aachen - Germany
5 $=====
6 $ Project F:\Döktas Orhangazi\IUM_2024\SR-20240719-1600\SR-20240719-1600\TTT_84539327_COR1999\v26
7 $ Stress_003269 per=56160 t=56160.0078 cyc=0
8 $ FEM-Input file: C:\Users\magma16\Desktop\Döktas Orhangazi - TTT Dataları\Eski\DT-1999_actual.fem,
9 $ user search radius 0.00 mm
10 $ set-number: 1
11 $ ElementNumber, XX, YY, ZZ, XY, XZ, YZ
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13 2, 5.5114E+00, -2.9727E+01, 1.7977E+00, 9.0508E+00, 3.4095E+00, -1.3879E-01
14 3, 4.9390E+00, -2.7105E+01, 1.2436E+00, 7.9705E+00, 2.7883E+00, 1.8006E-01
15 4, 5.8437E+00, -2.8686E+01, 1.5366E+00, 8.9144E+00, 3.3952E+00, -3.6627E-02
16 5, 5.4803E+00, -2.8328E+01, 1.9278E+00, 8.9500E+00, 3.6607E+00, -2.4456E-01
17 6, 3.6347E+00, -3.0171E+01, 9.9928E-01, 7.8806E+00, 2.3668E+00, 5.1118E-01
18 7, 4.1108E+00, -2.8352E+01, 1.2781E+00, 7.9501E+00, 2.6061E+00, 2.6118E-01
19 8, 2.0776E+00, -2.7411E+01, -1.2696E-01, 6.4469E+00, 1.4841E+00, 3.5504E-01
20 9, 5.0037E+00, -2.7913E+01, 4.4842E-01, 7.7563E+00, 2.5137E+00, 2.6953E-01
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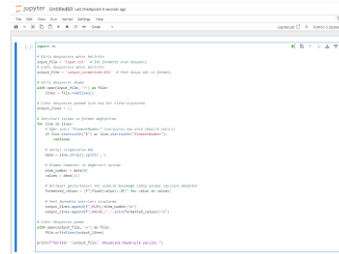
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1418373 1625115, -7.4060E-02, -2.3339E-01, 2.8338E-02, -6.5152E-02, -3.3254E-01, 7.1415E-01
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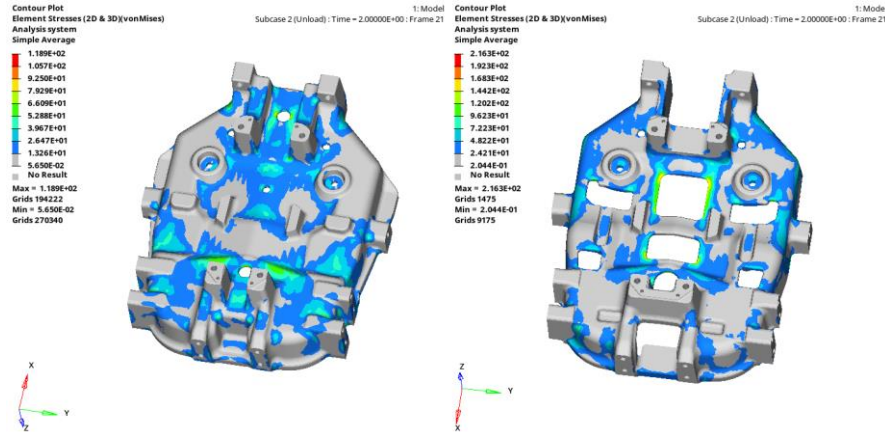
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```

**Residual Stress Values from MAGMALink**

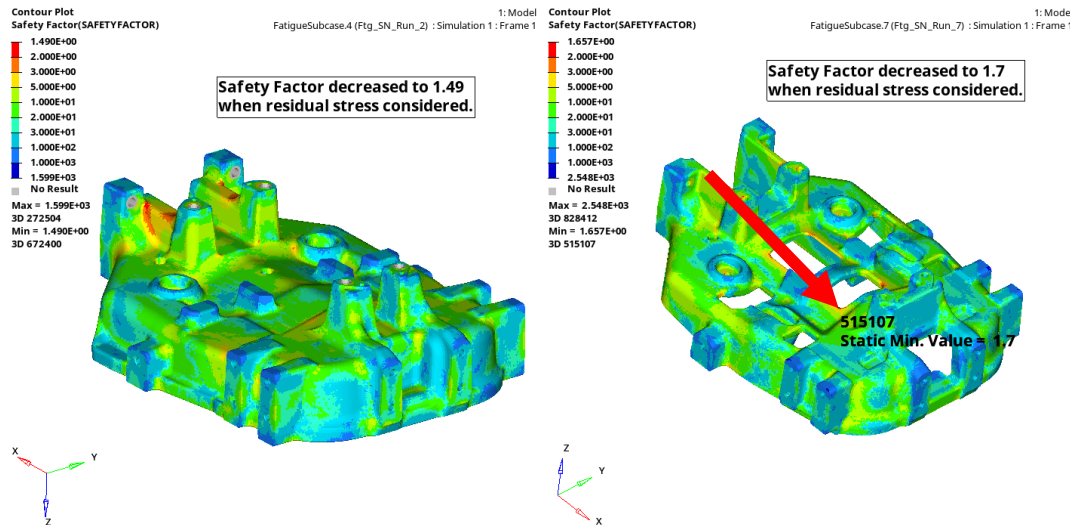
**1418380 Columns has been converted to OptiStruct's INISTRESS card format.**

# Residual Stress Results



(Created by ChatGPT)

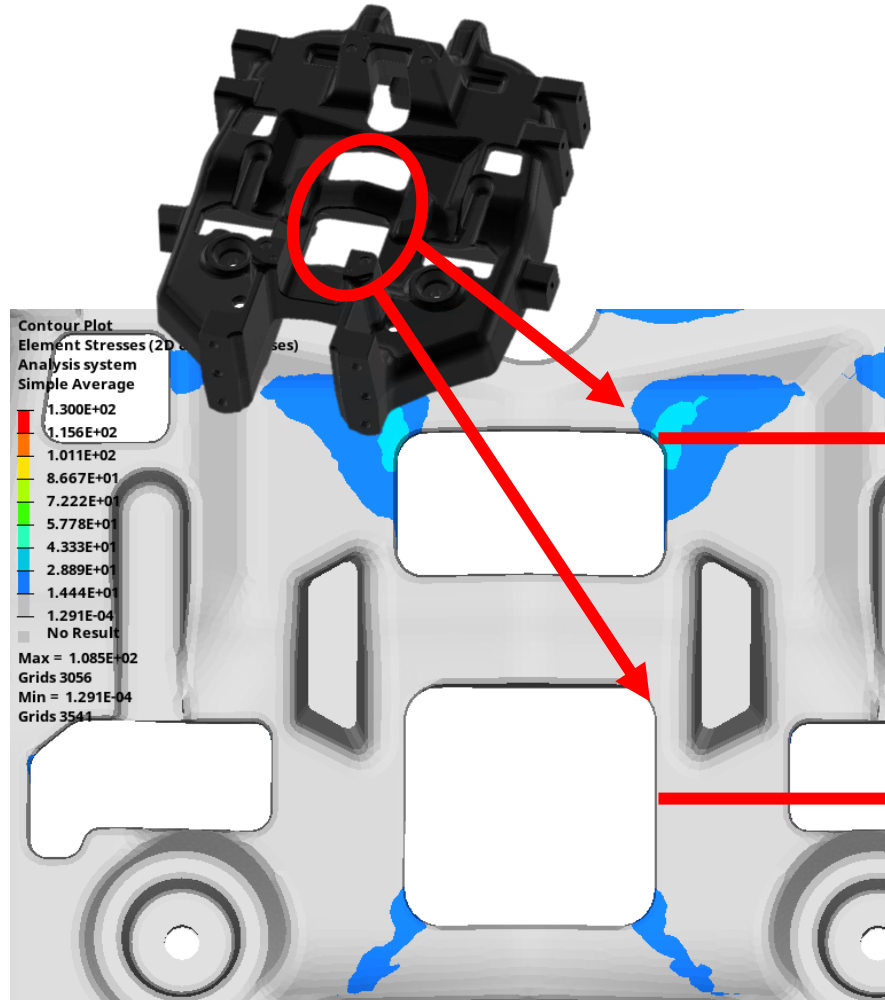
## Residual Stress Results From MAGMALink



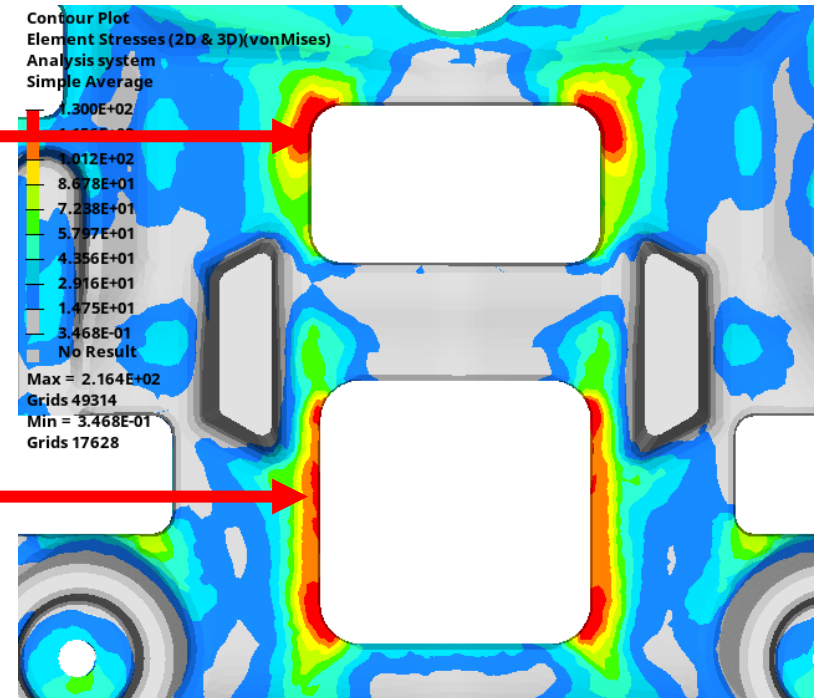
We observed that the crack zone as relocated to different position on the part.



## Residual Stress Results

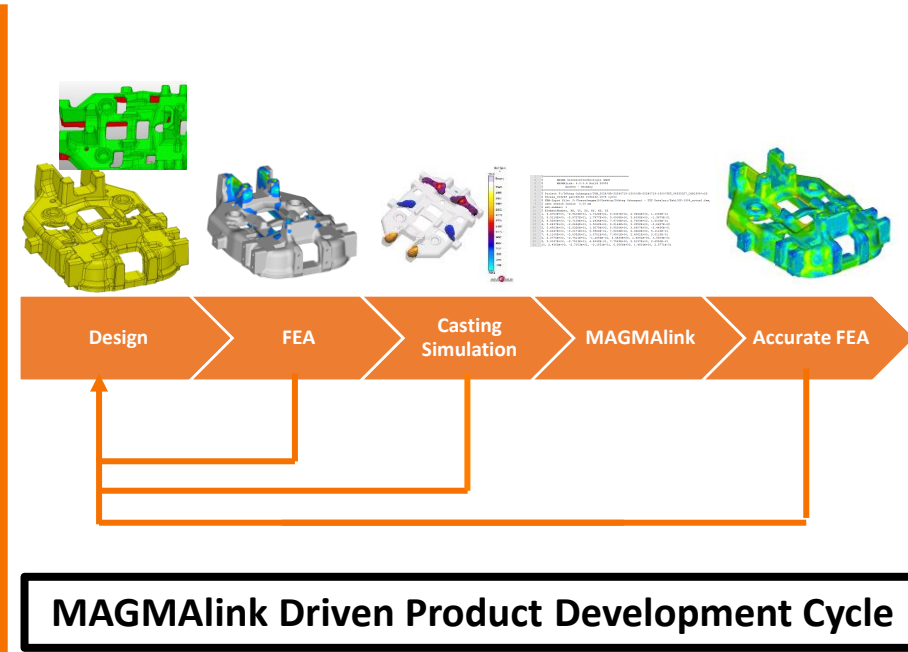
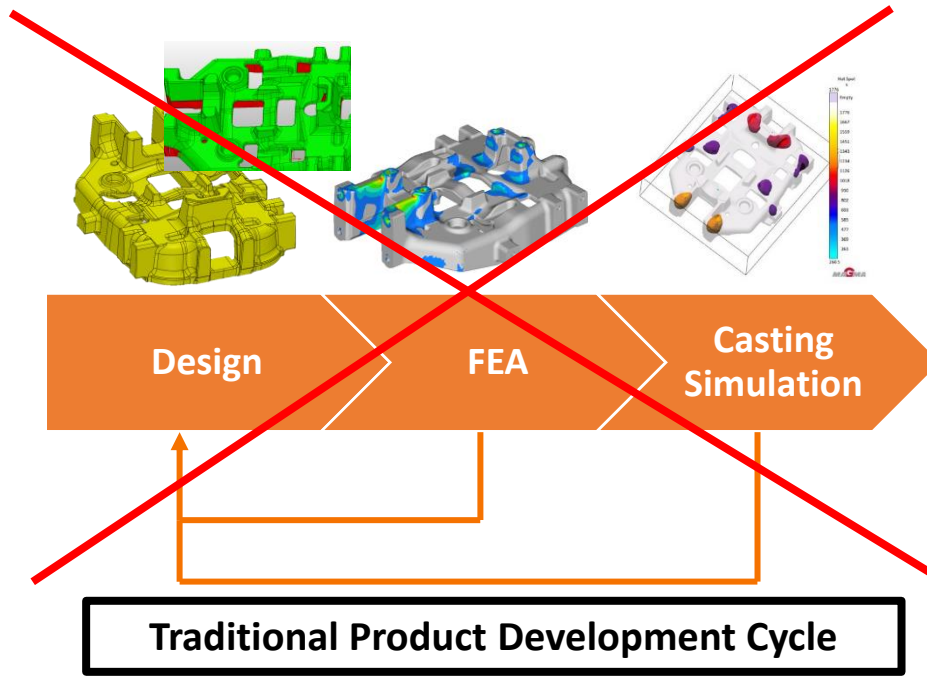


**Traditional FEA**



**FEA with MAGMALink**

## General Review



Design Phase	Mass (kg)	Material	Feeders	Safety Factor	Safety Factor with MAGMALink
Current Design	180	EN-GJL-250		1.5	1.49
1st Design	156	EN-GJS-500-7	10 feeders needed	3.4	N/A
2nd Design	140	EN-GJS-500-7	6 feeders needed	2.5	1.7

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