FONDAREX®

SWISS VACUUM TECHNOLOGY

Fondarex vacuum technology & services

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Senior Technical Engineer, St-Légier, Switzerland

Contents

- Company’s profile & history
- References
- Fondarex technology
- A solution to your needs
- Applications studies
- Case studies

A fascination for vacuum

History – A rise to the top

1946
Fondarex is set up as a pressure die casting foundry by Mr. Fritz Hodler, in Montreux

1952
Invention of the first vacuum system for the pressure die casting industry

1989
Fondarex is taken over by Mr. Konrad Baumgartner

2002
Launch of the first vacuum system for the plastic injection molding industry

2010
Launch of the HIGHVAC ECONOMY 1C, PROGRESS 2C and PREMIUM 2C vacuum systems

2012
Launch of the HIGHVAC ULTIMATE 4C vacuum system and the HIGHVAC EXVAC shot sleeve air evacuation system

2019
Launch of the pump management system

2020
Launch of the MODULAR vacuum system, and the advanced vacuum unit

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Fondarex worldwide

Europe

Bulgaria
Czech Rep.
England
Germany
Greece
Italy
Poland
Portugal
Romania
Spain
Sweden
Switzerland
Turkey

America

Argentina
Brazil
United States

Asia

China
India
Japan
Rep. of Korea

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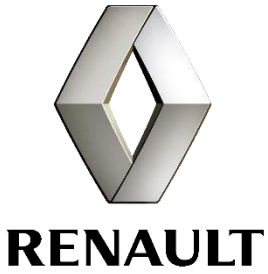
Our references

Our references



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Our references

Sundram Fasteners Limited

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Fondarex technology

Fondarex world

Consulting

Vacuum project recommendation

Vacuum application study

Vacuum system

Vacuum valve

Chill-block

Technical support

Spare parts

Training and forum

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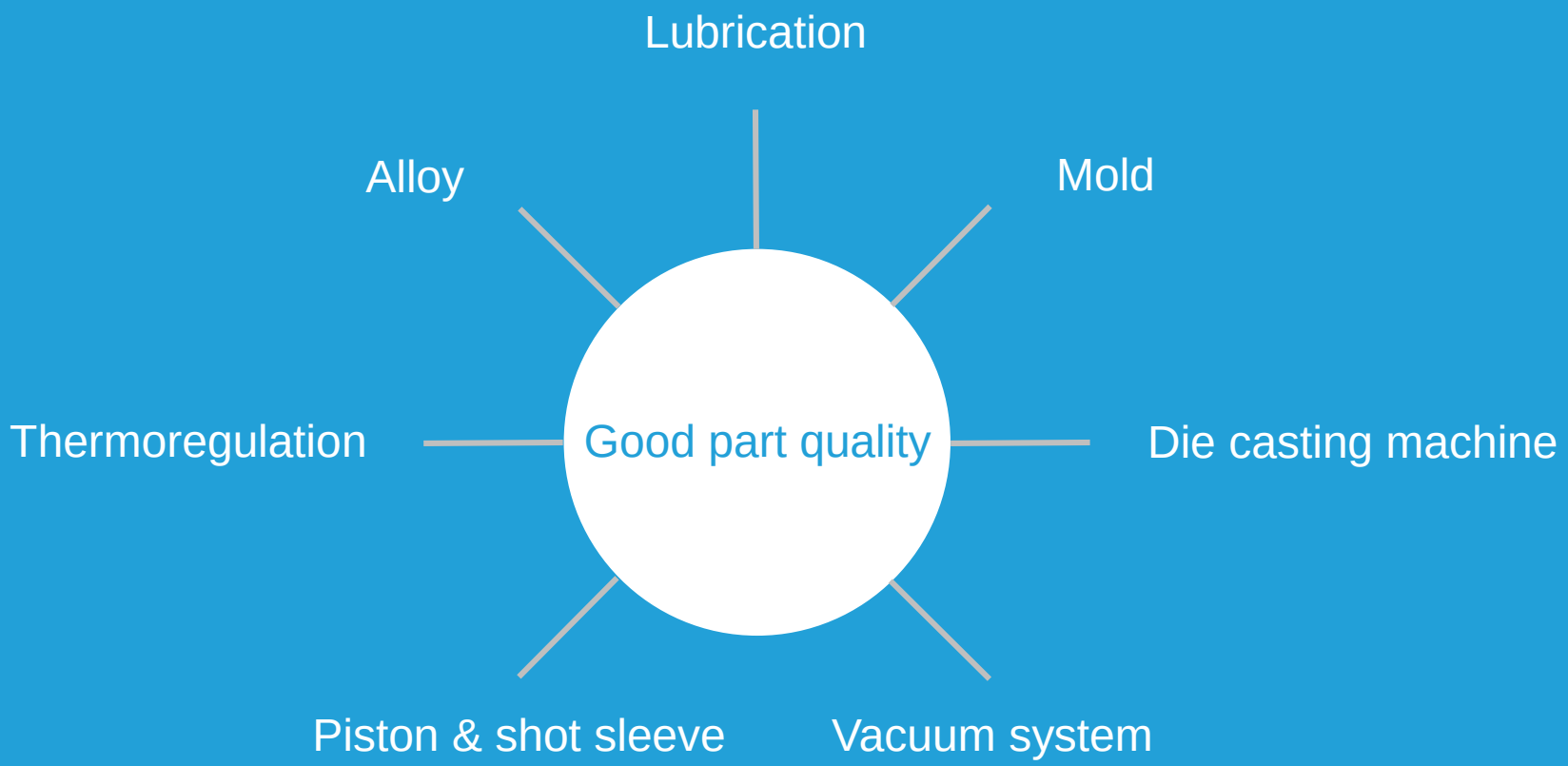
Our concept




HIGHVAC PROGRESS
FONDAREX®
SWISS VACUUM TECHNOLOGY
HIGHVAC ECONOMY
FONDAREX®
HIGHVAC PREMIUM
FONDAREX®
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FONDAREX®
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Products

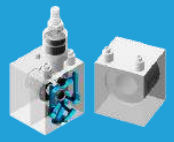
SUPERVAC
MONOVAC

MONOVAC

MINI

MEDIO

MAXI



MACRO

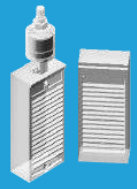
CHILL-BLOCK

SCCZ 12

SCS 30

SCS 60

SCS 100



SCS 140

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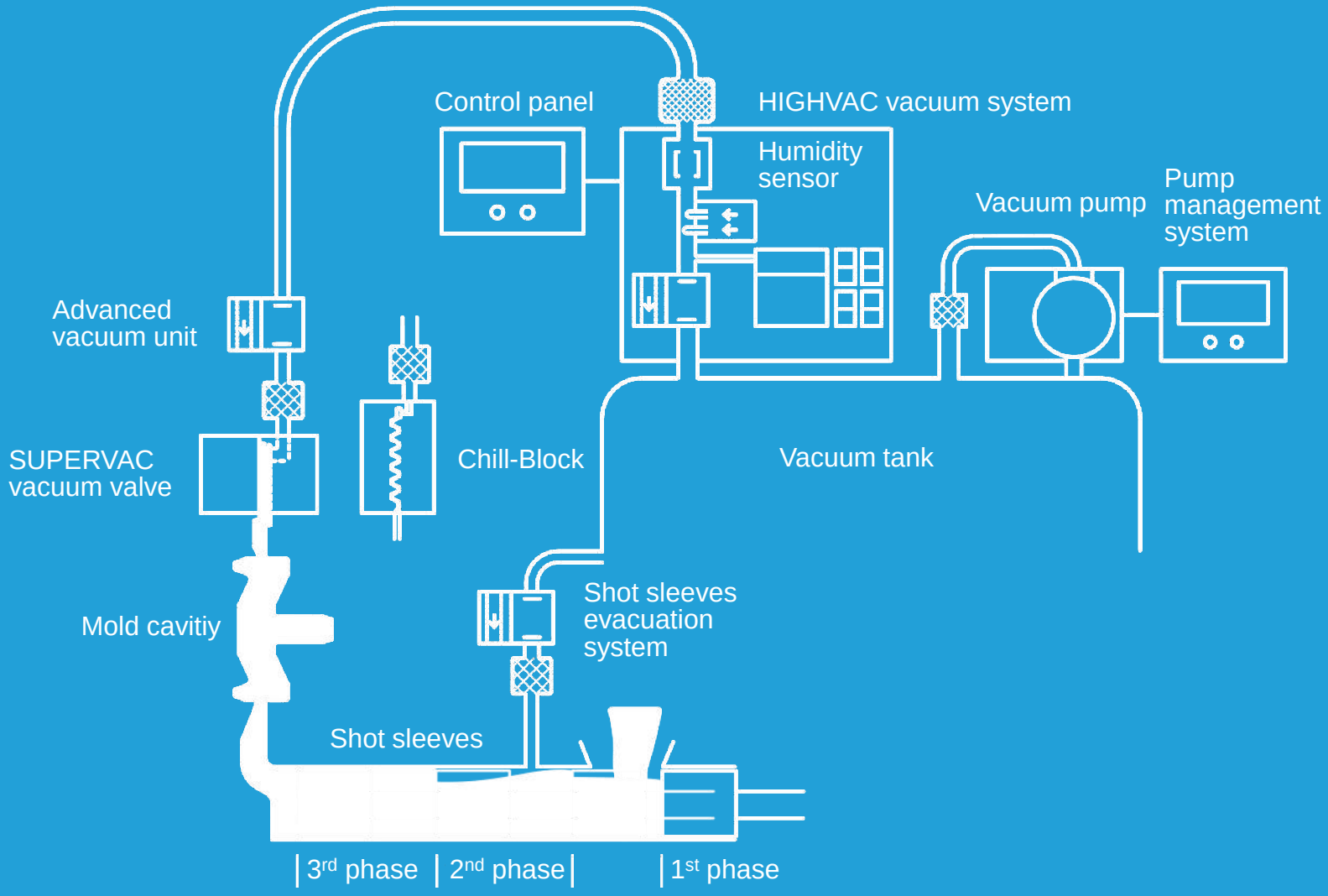
Technology



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Vacuum in which situation?

Properties and characteristics of castings

- Improve parts quality by reducing porosity
- Ductility and strength of the castings
- Resolve cavity filling issues
- Pressure tightness
- Nice surfaces

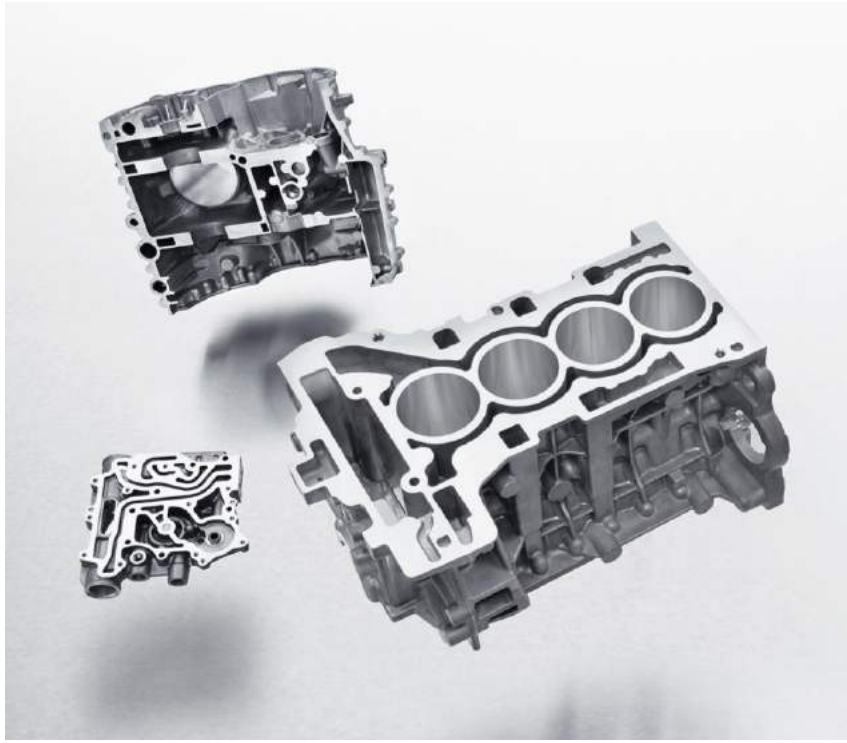
The art to cast with minimum reject and less recycling – ROI

Empower the whole process

– Less die erosion with a controlled speed
– Less die maintenance with lower pressure

For which applications ?

- Basic to highly technical parts
- Chromed parts / surface aspects requirements
- Structural parts
- Security / safety parts
- leakage proof parts
- Parts with tightness requirements
- Parts with complex geometry
- Required for welded parts



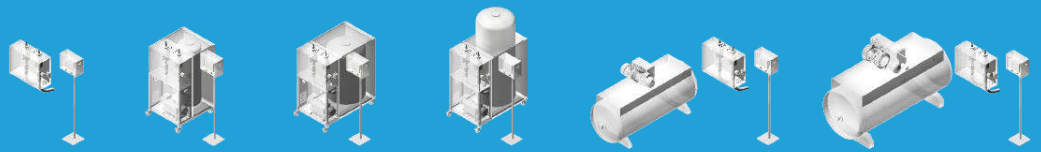
A solution to your needs

Products

HIGHVAC ECONOMY 1C

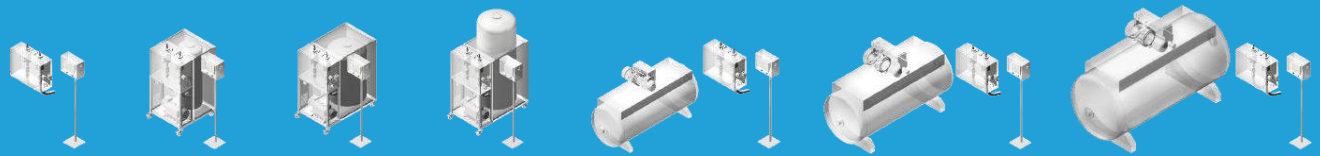
CENTRAL 250 1000

HIGHVAC PROGRESS 2C



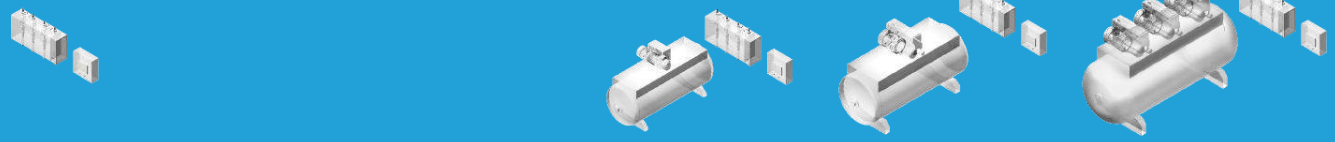
CENTRAL 200 500 800 1000 2000

HIGHVAC PREMIUM 2C



CENTRAL 200 500 800 1000 2000 3000

HIGHVAC ULTIMATE 4C



CENTRAL 1000 2000 3000

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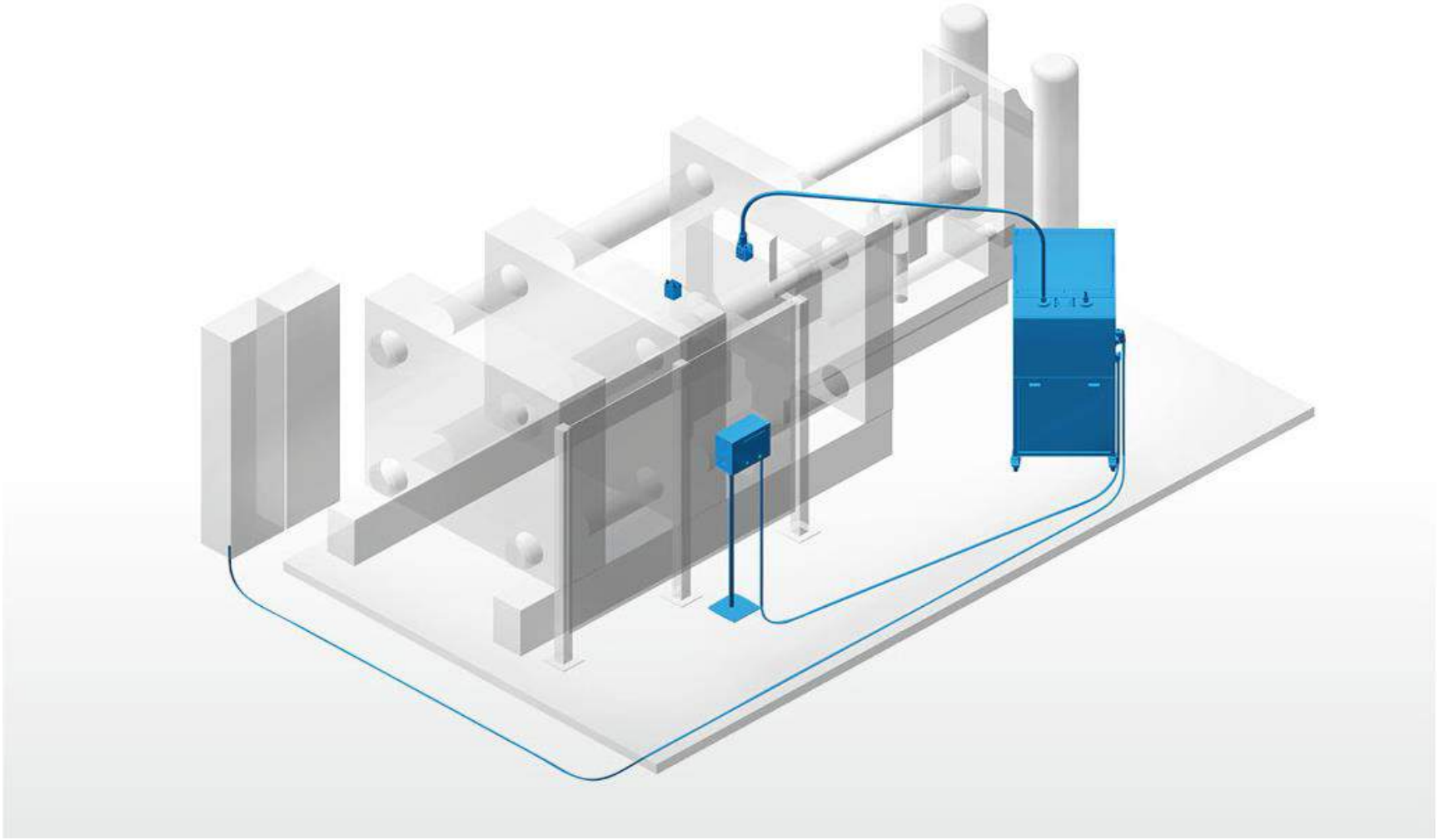
A solution to your needs

HIGHVACH PREMIUM 2C 500



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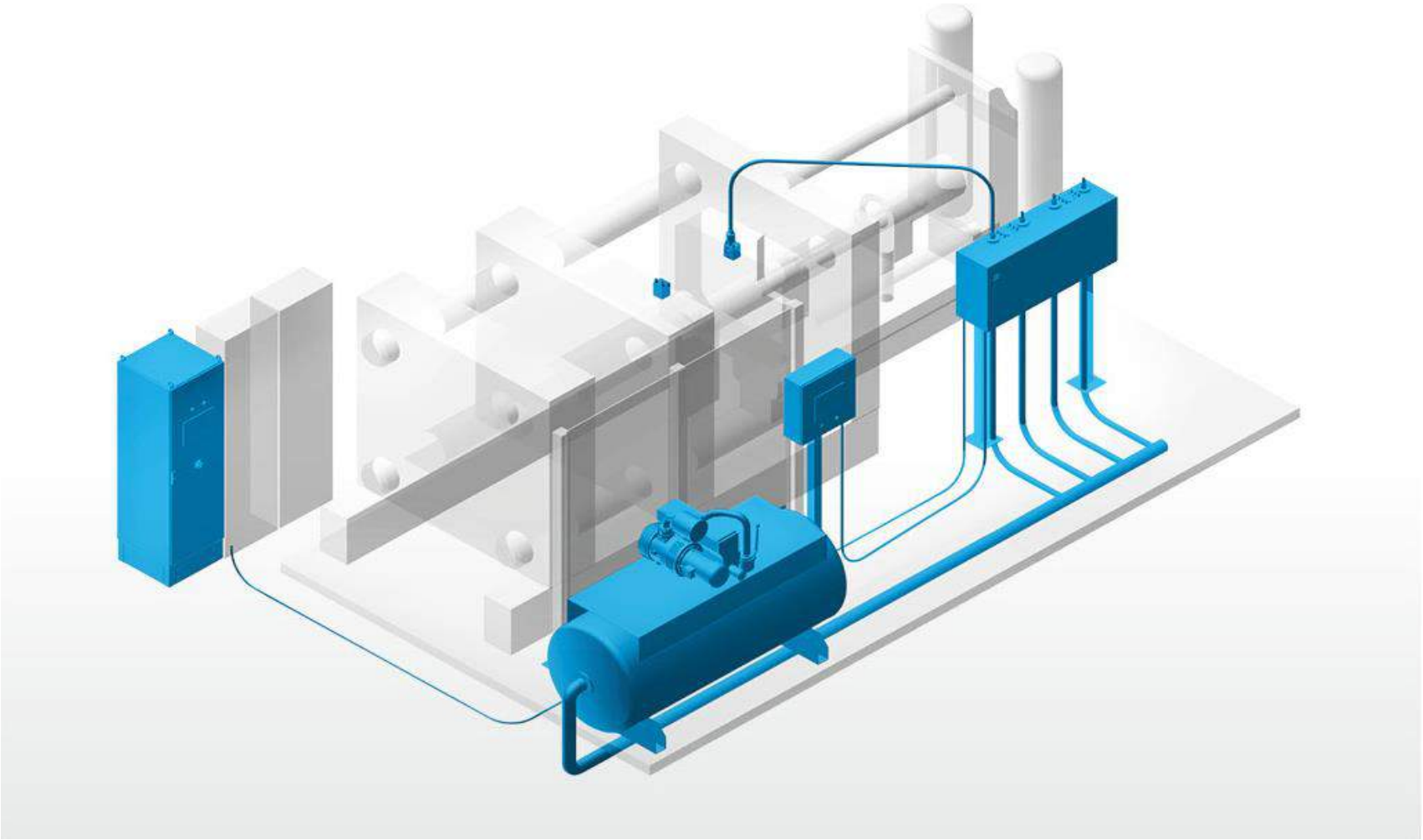
A solution to your needs

HIGHVACH PREMIUM 4C 2000



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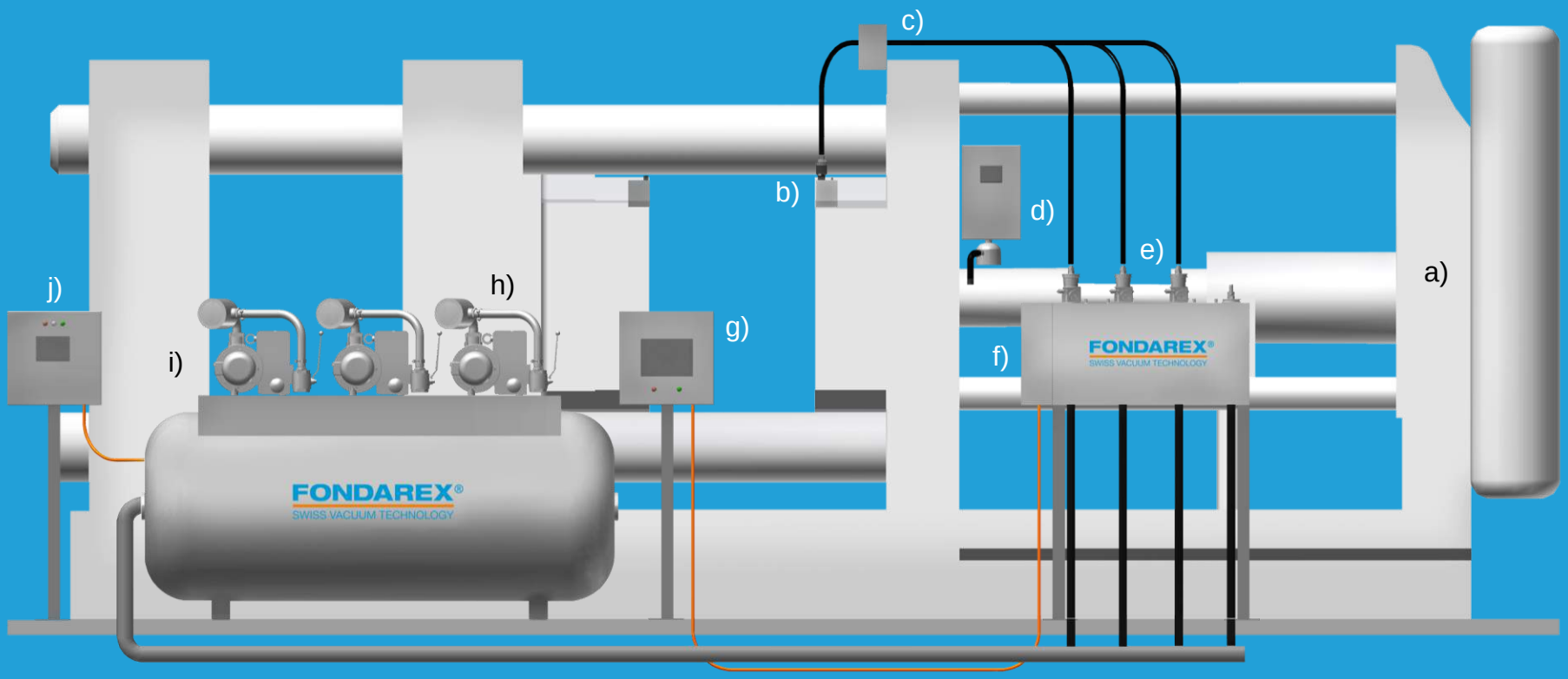
Ex. Solution for structural parts



a) Die casting machine
b) SUPERVAC MACRO vacuum valve
c) Advanced vacuum unit
d) HIGHVAC EXVAC
e) Humidity sensor
f) HIGHVAC ULTIMATE 4C
g) Control panel
h) Vacuum pumps 3 x 160 m^3/h
i) Vacuum tank 3000 l
j) Pump management system

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Interfacing Fondarex - DCM

Compatible with all DCM

Connector IF 24 / 42 pin

Option EX33

PROFIBUS

PROFINET

OPC UA

Advanced communication

IDRA

COLOSIO

BÜHLER

ITALPRESSE

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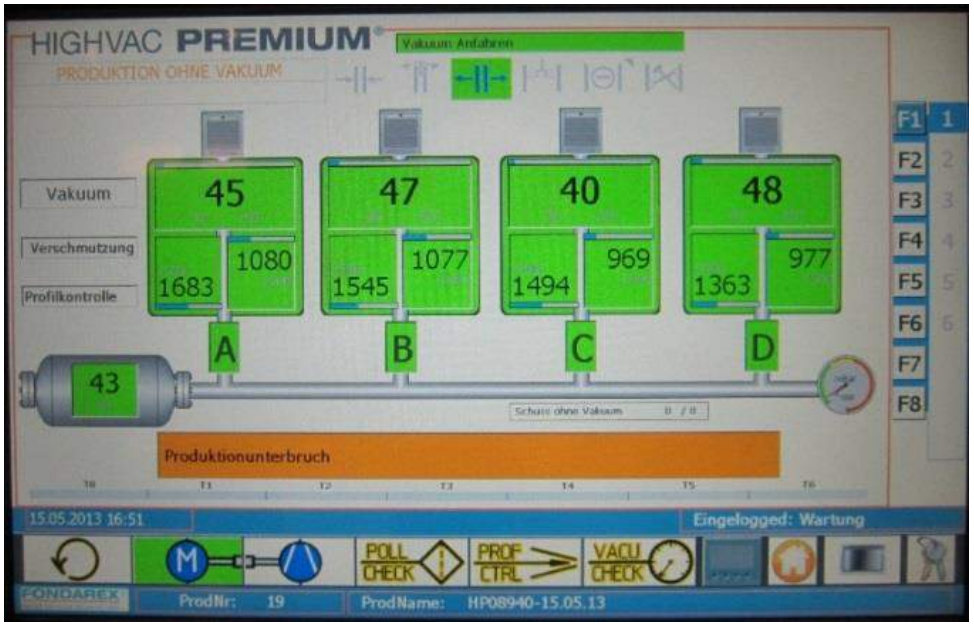
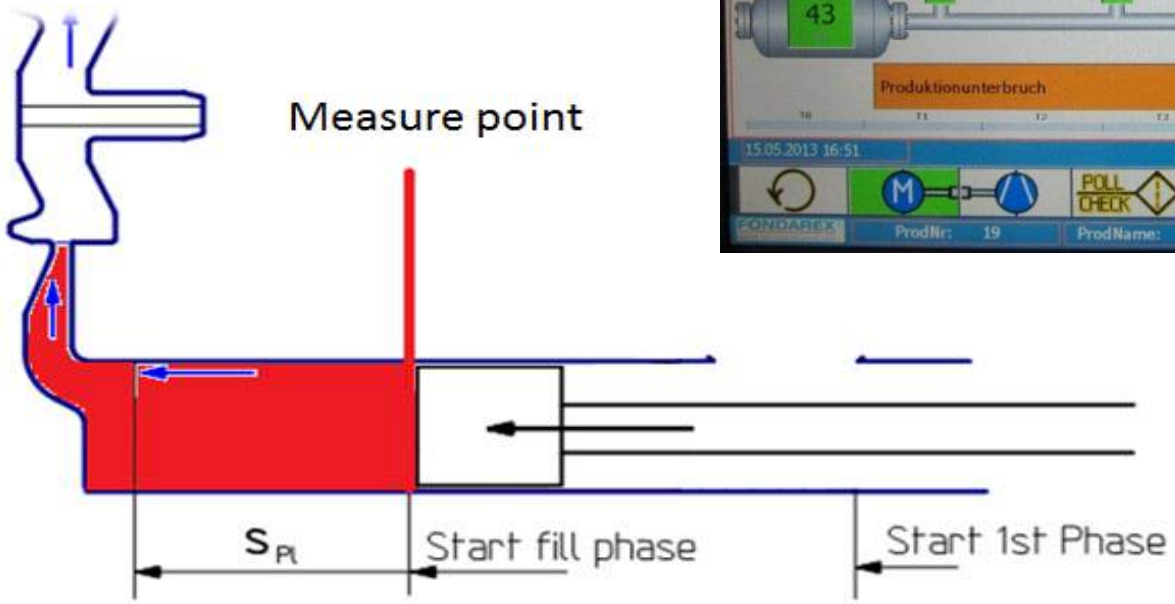
Independant Process Control

Independant vacuum/ pressures measures





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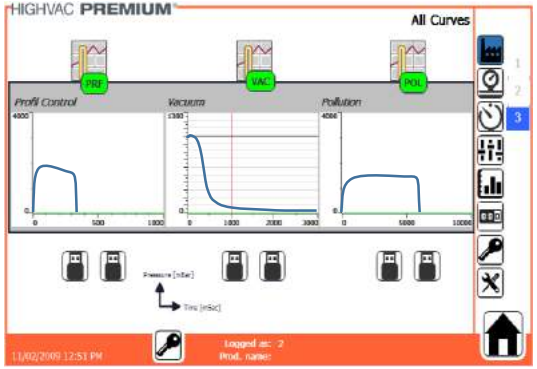
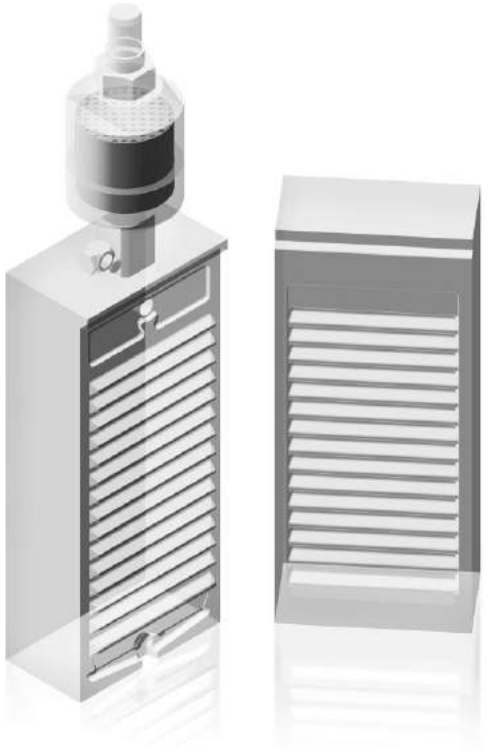
Profil & pollution control

Profil control
Die -> Close





Pollution control
Die -> Open

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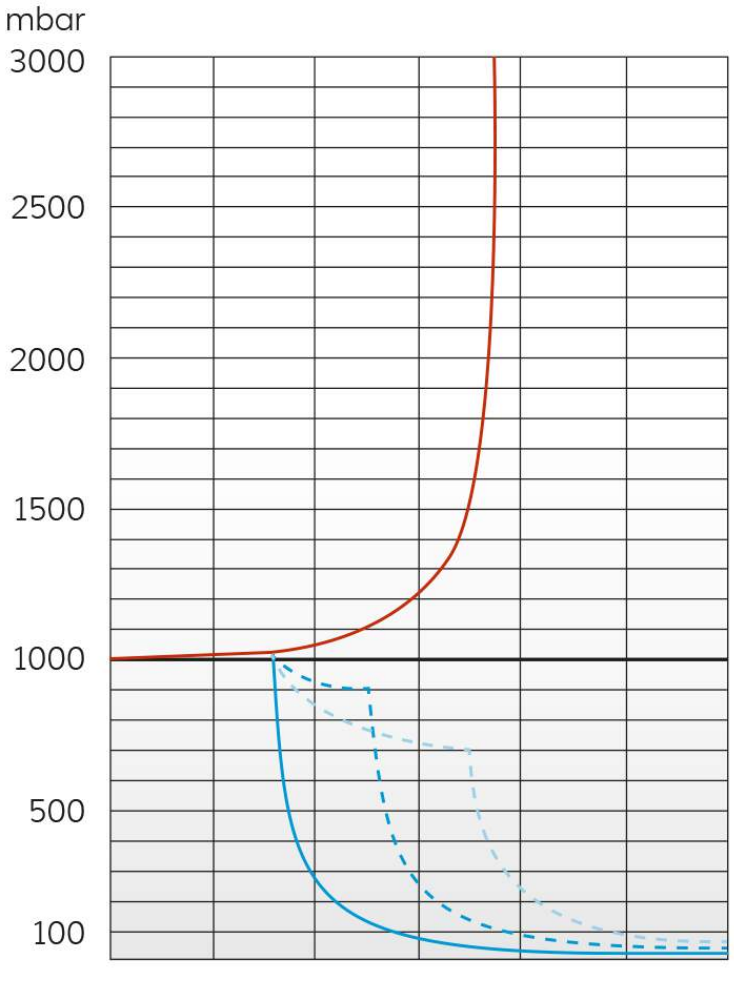
Regulation makes the difference

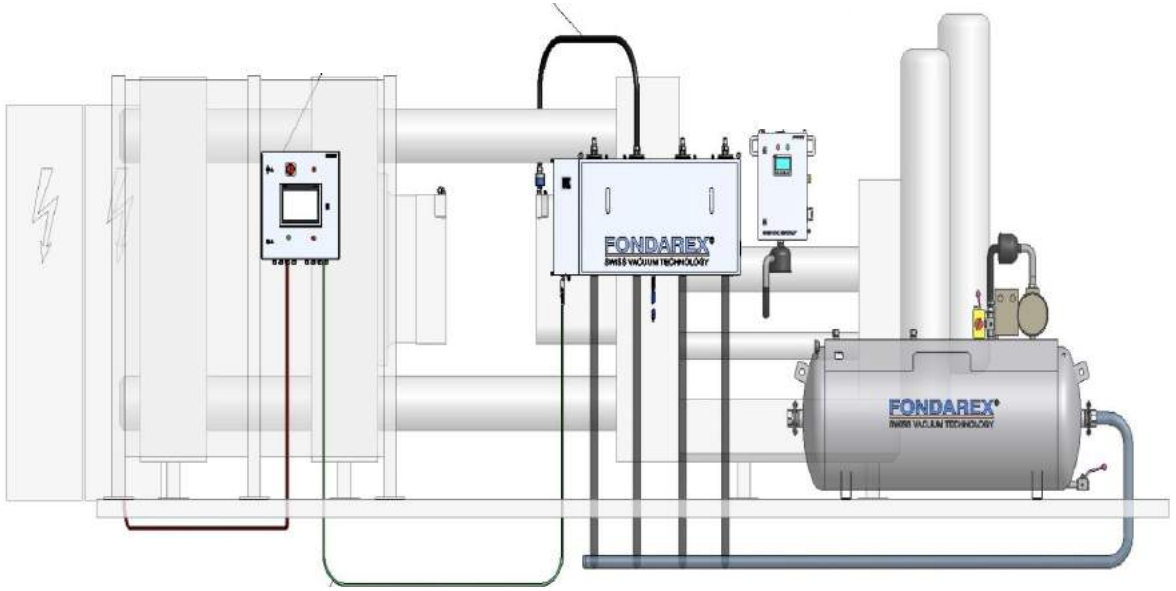
Fondarex efficiency curves

- Standard evacuation (no vacuum)
- Standard vacuum
- Regulated vacuum example A
- Regulated vacuum example B



Air volume measurement

This function is done for every cycle of injection on the Premium or Ultimate !
One alarm inform the operator if the value is out of the tolerance!

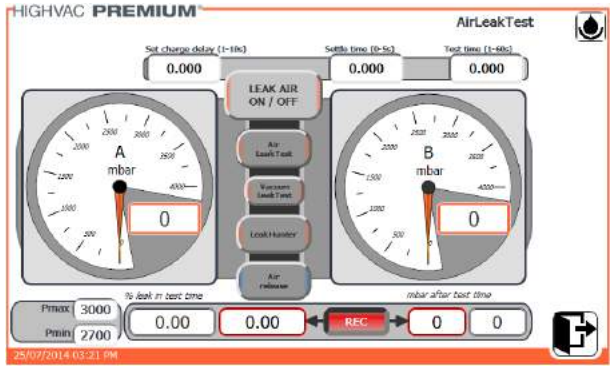


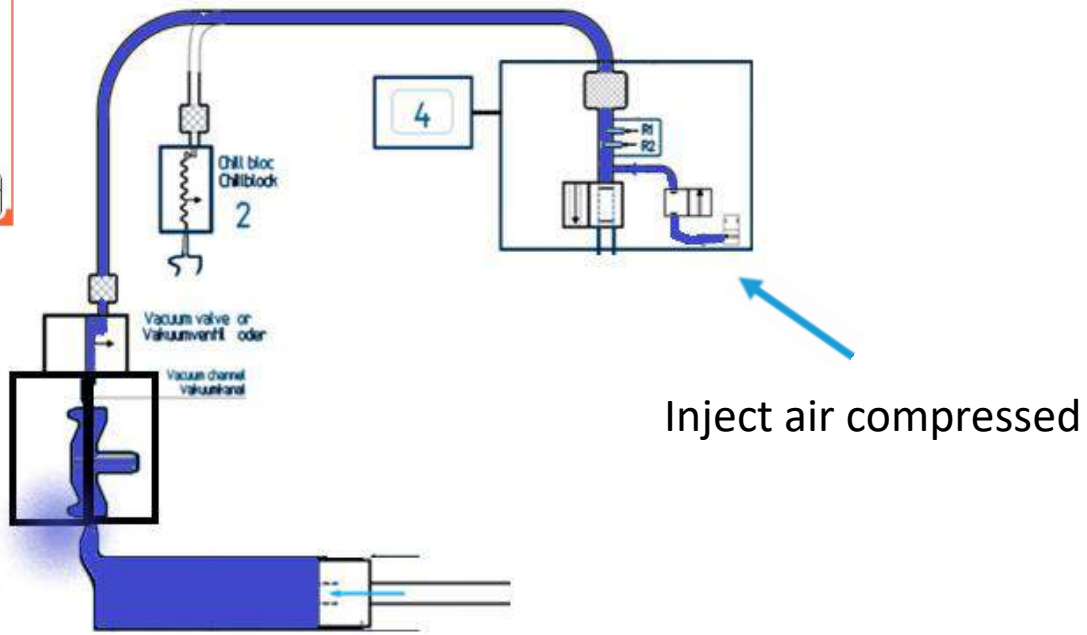
P = pressure inside the tank

$$Pv = rnt$$

V = volume total of air to remove = V cavity + V hose + V shot sleeve)

Detection of leak arround the mould





This function is available on the Premium or Ultimate to check the state of the mould!
The test is not done during the cycle of the production.
Possibility to measure the level of vacuum inside the cavity (without air compressed).

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Parameters/ settings

Log data

Alarms management

Pneumatic diagram

Operating and maintenance data

Data transfer Profinet / Profibus / Ethernet

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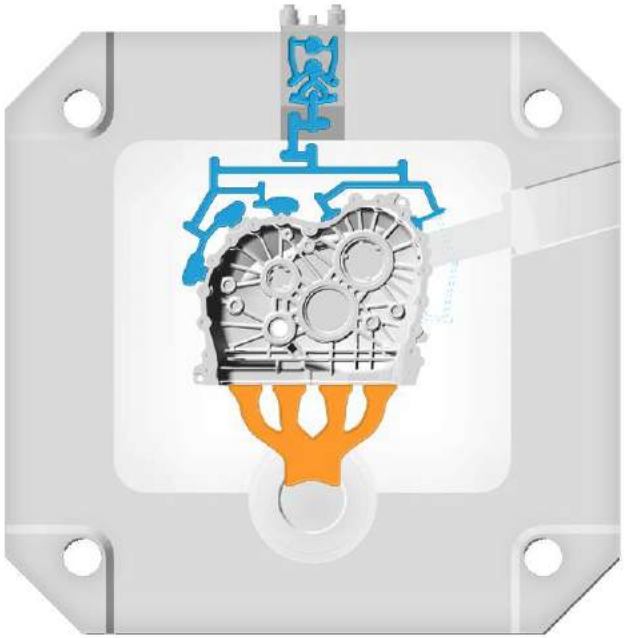
Applications studies

Vacuum application studies



Determine the evacuation system

Size and adapt the gating system

Size and adapt vacuum channels

Fondarex advices on injection parameters.

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Vacuum application studies

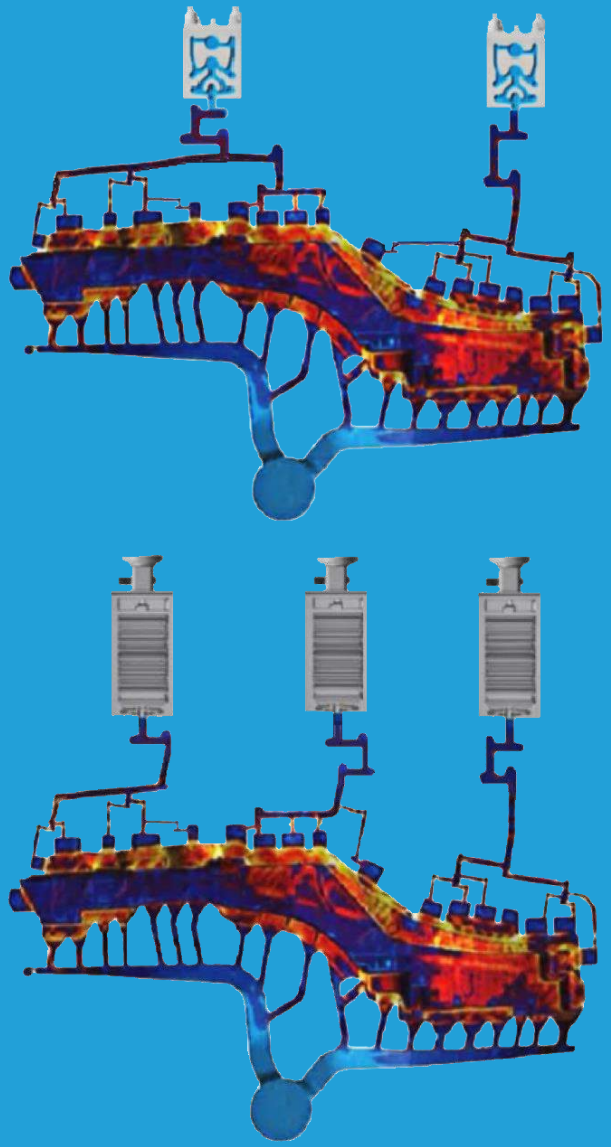
Influence:

Evacuation capacity
> Metal at the gate

Maintenance frequency
> Downtimes

Size of overflows / vacuum channels
> Amount of remelted metal

Projected area
> Locking force of the die casting machine



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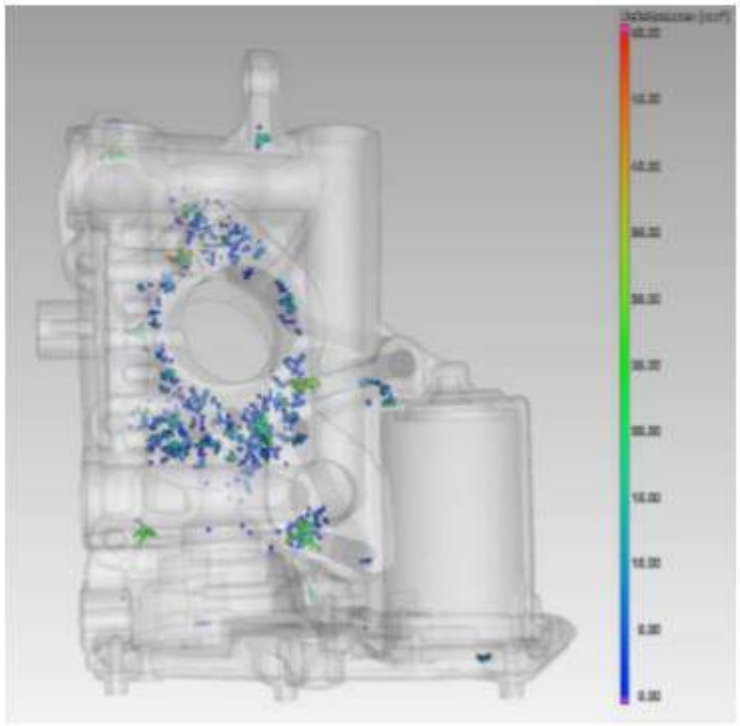
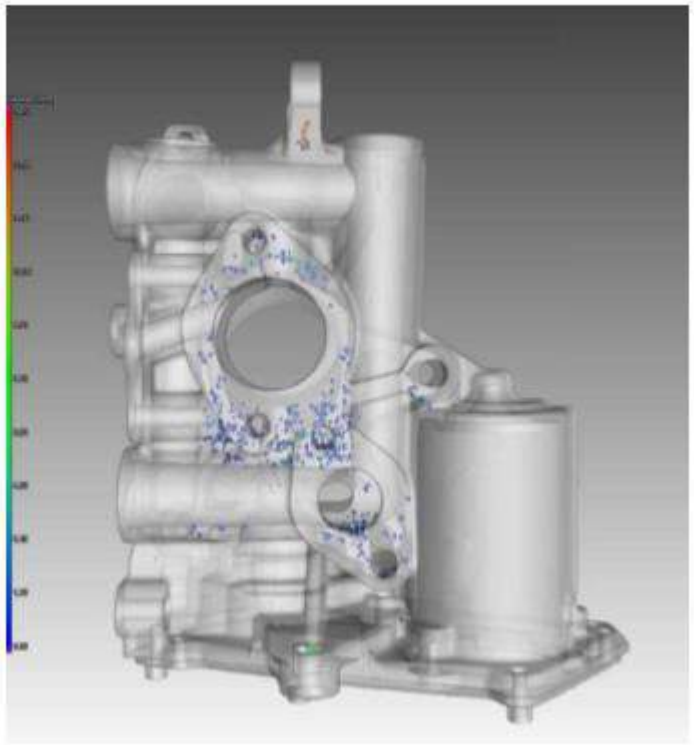
Cases studies

Case study by KSM

Without vacuum



With vacuum



Highvac Premium 2C 500/40 with 4x chill-blocks

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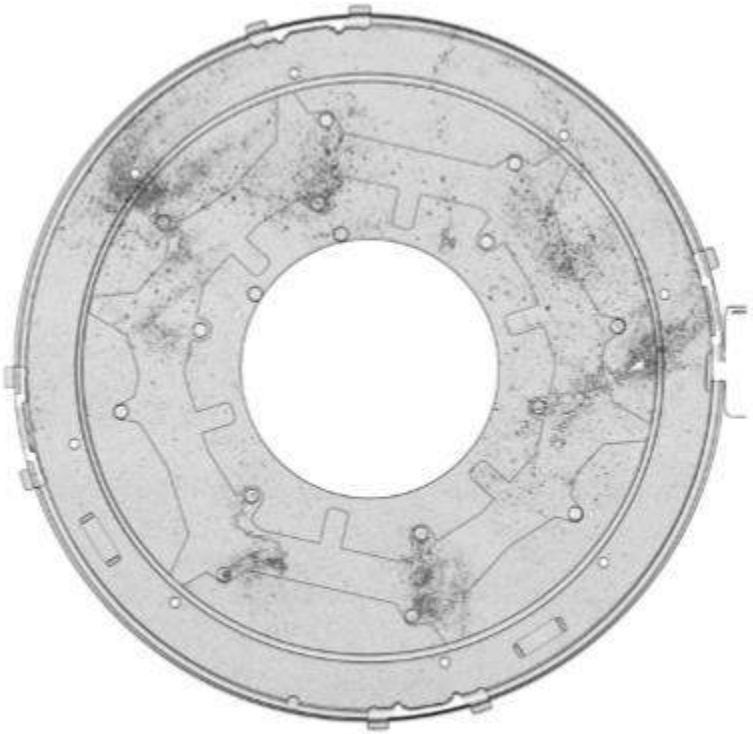
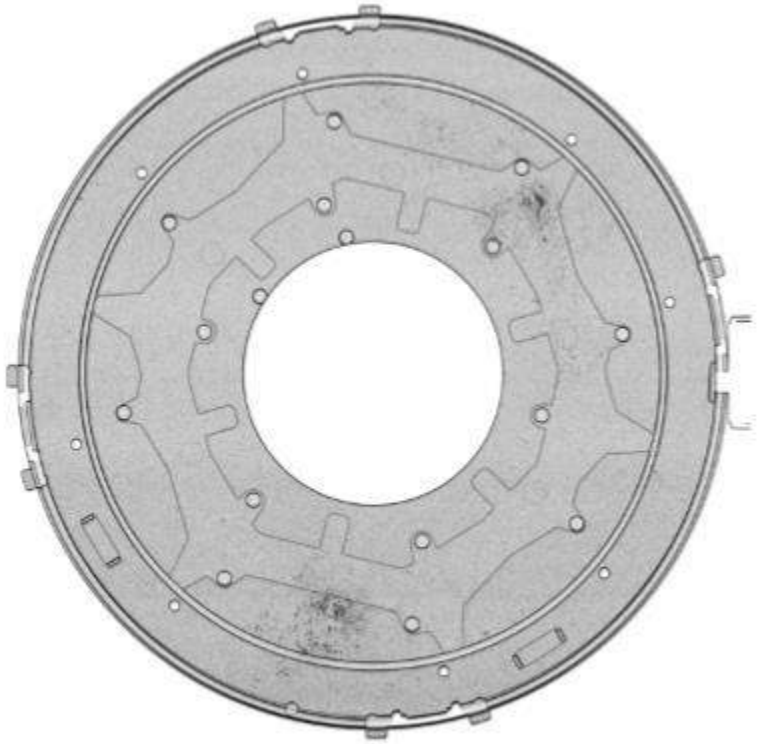
Case study - DONK

DONK INDUSTRIES

Without vacuum



With vacuum



Highvac Progress 2C 500/40 with 1x chill-blocks

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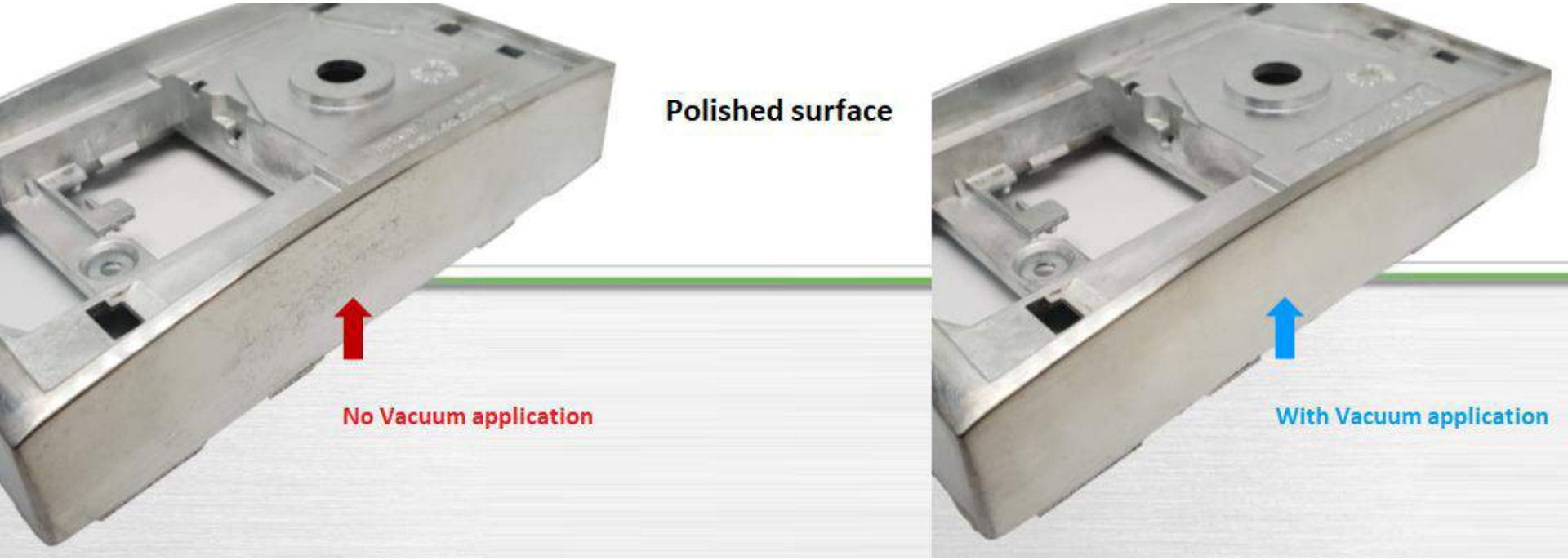
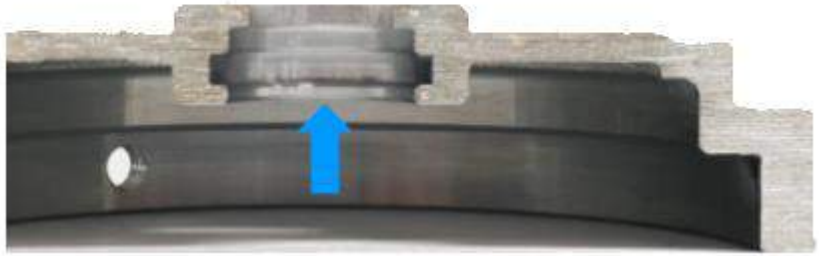
Case study – Laiyue Taiwan



Highvac Progress 2C 500/40 with chill-blocks

Case study – Laiyue Taiwan



Without vacuum

With vacuum

Highvac Progress 2C 500/40 with chill-blocks

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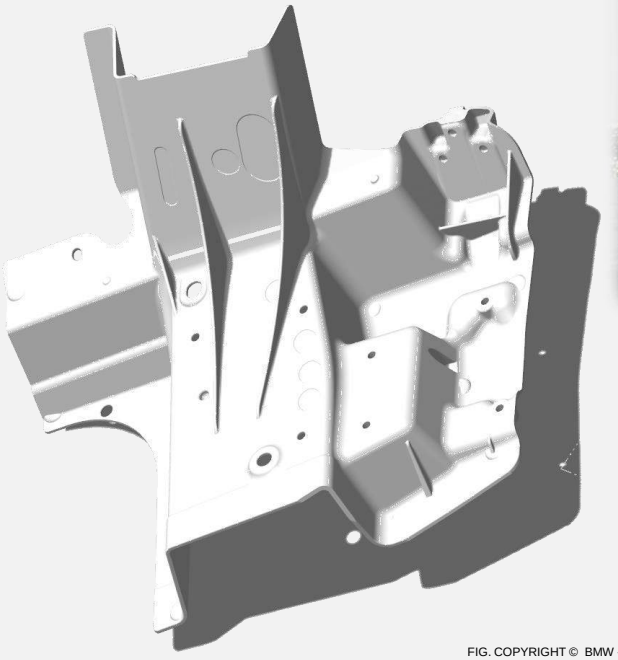
BMW – RollsRoyce

SUV Cullin
Spaceframe Upper node

at COSTAMP - Sirone



SPECIFICATIONS:

- Silafont-36 Alloy
- 2.5mm average thickness
- High ductility specifications➔high integrity, no oxide skins
- T7 heat treatment➔needs to be blisters free

FIG. COPYRIGHT © BMW - COSTAMP

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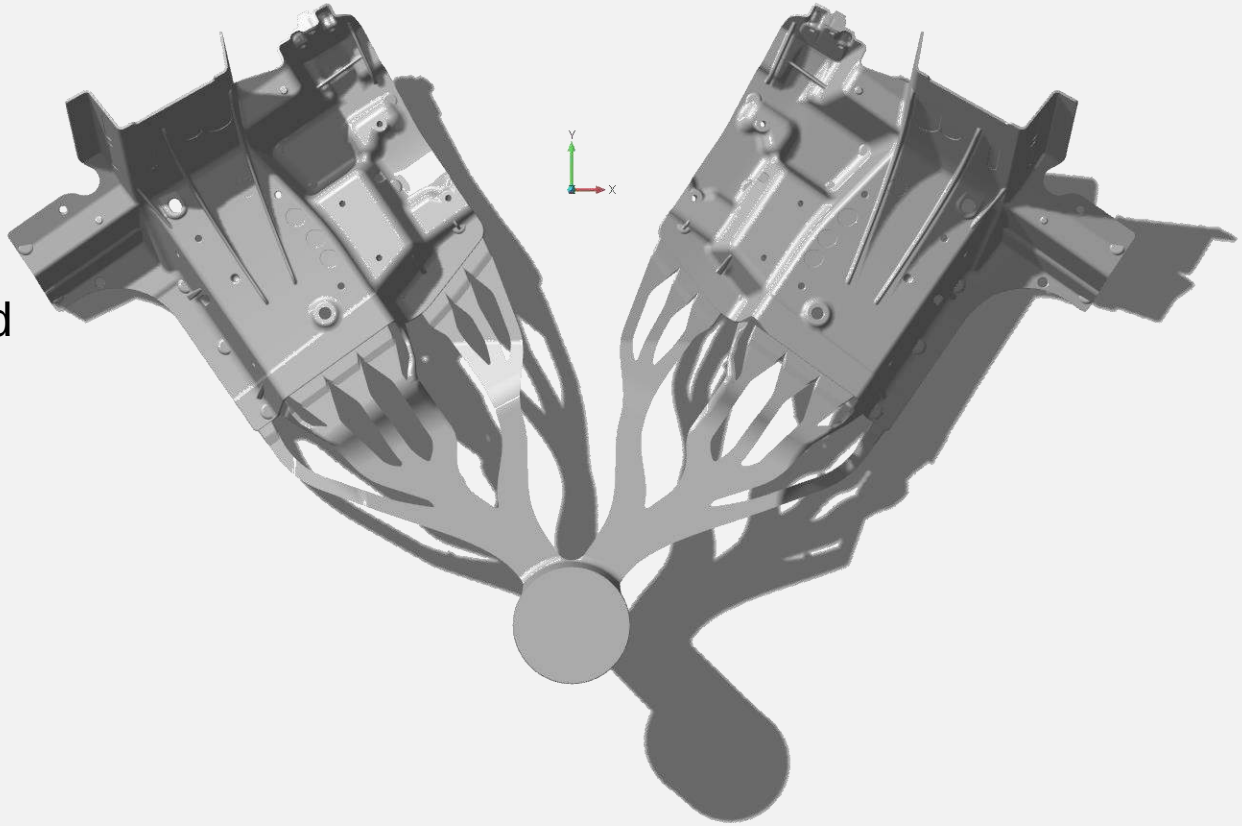
Die optimization and developement

STANDPOINTS:

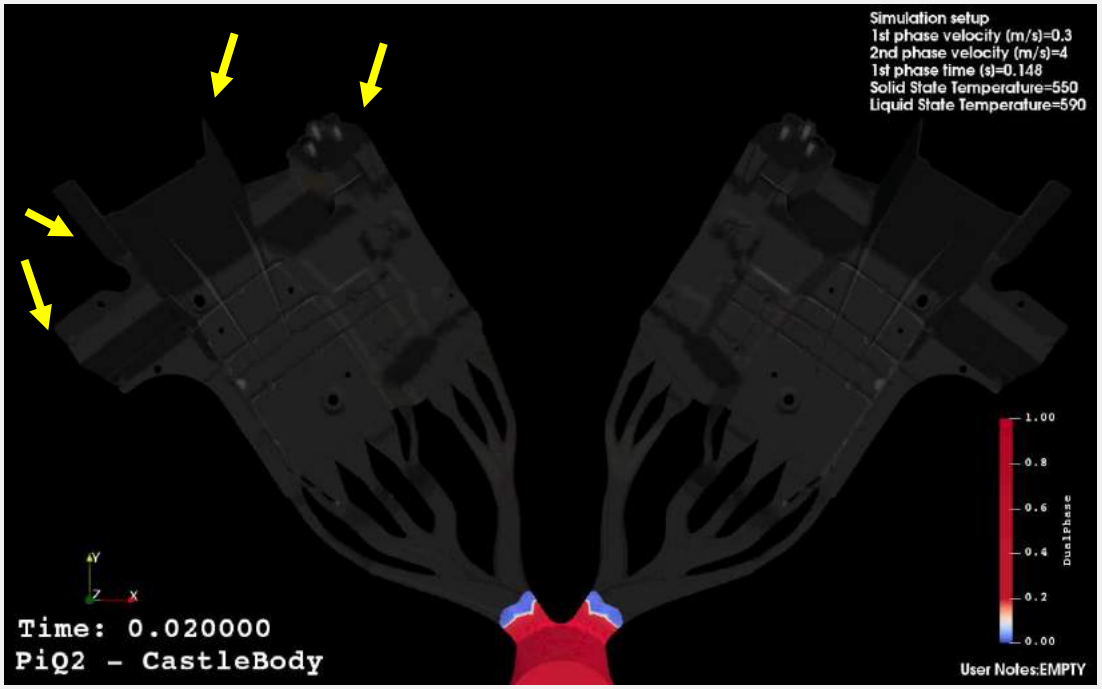
- 2 cavities, symmetric (LH+RH)
- Gating **thickness** limited by part thickness
- Gating **length** limited by part shape
- Overflows and vacuum position limited by parting line shape.



1st STEP: Simulation without overflows and vacuum

Calculated parameters:
- Second phase speed: 4m/s
- Project gating speed about 40m/s

Trace filling pattern and individuate:
- **Latest points to be filled**
- Air entrapment
- Oxides
- Cold regions

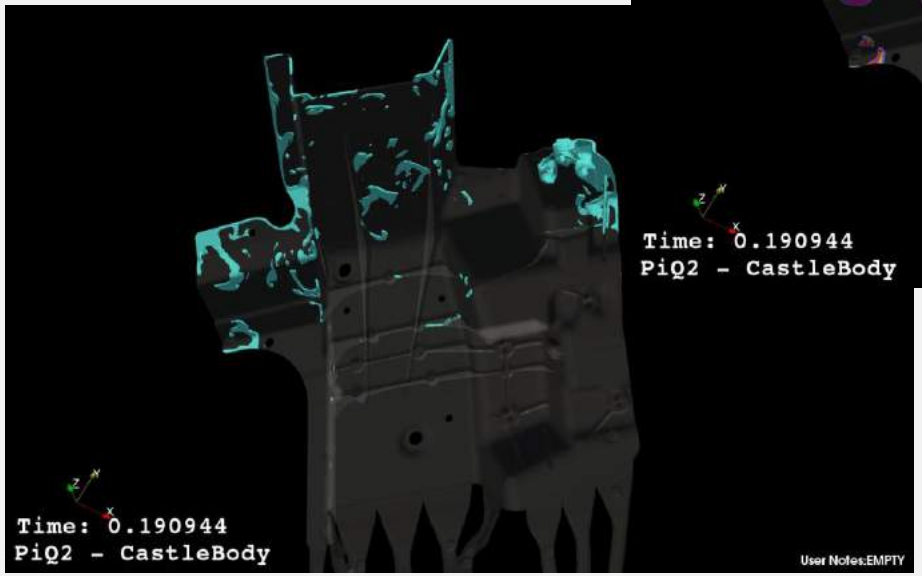


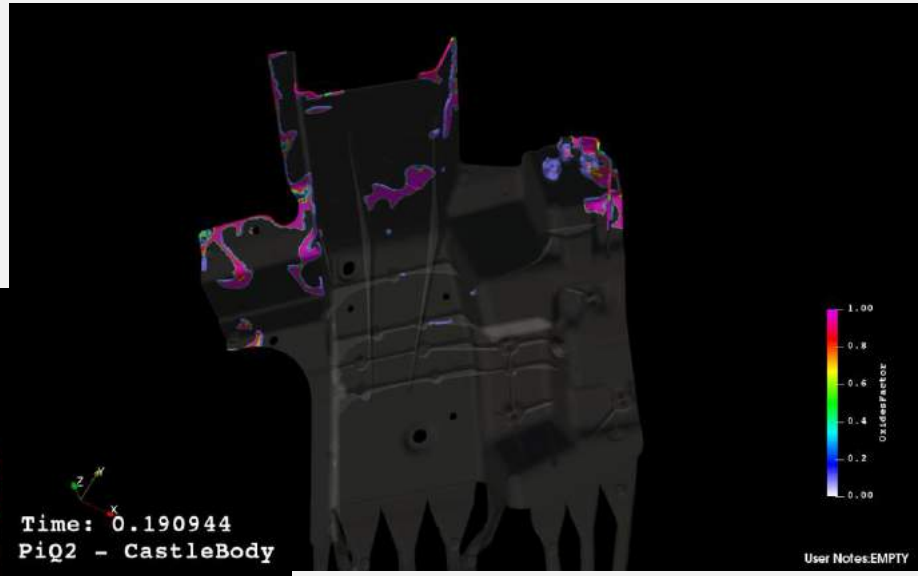
Dualphase filling

1st STEP: Simulation without overflows and vacuum

Calculated typical parameters:
- Second phase speed: 4m/s
- Project gating speed about 40m/s

Trace filling pattern and individuate:
- Latest points to be filled
- **Air entrapment**
- **Oxides**
- Cold regions





Oxides skins position

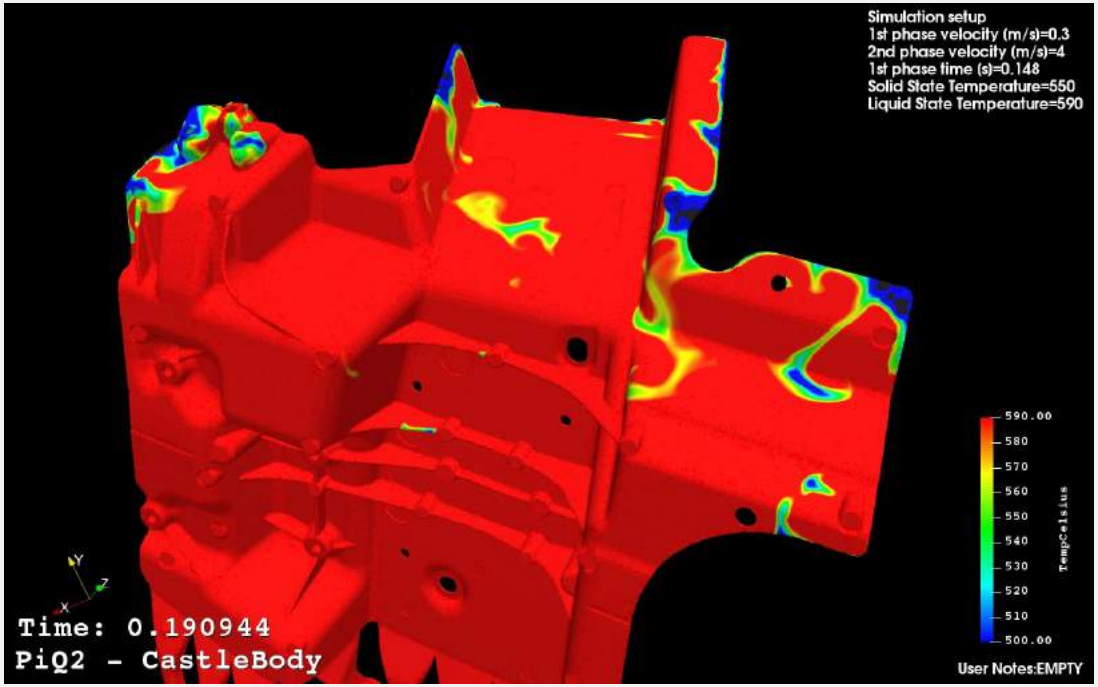
Air entrapment at final stage: threshold 1%

1st STEP: Simulation without overflows and vacuum

Calculated typical parameters:
- Second phase speed: 4m/s
- Project gating speed about 40m/s

Trace filling pattern and individuate:
- Latest points to be filled
- Air entrapment
- Oxides
- **Cold regions**

THUS:
- Add **overflows** in cold/air regions
- Increase **2nd phase speed**
- Reduce **filling time**

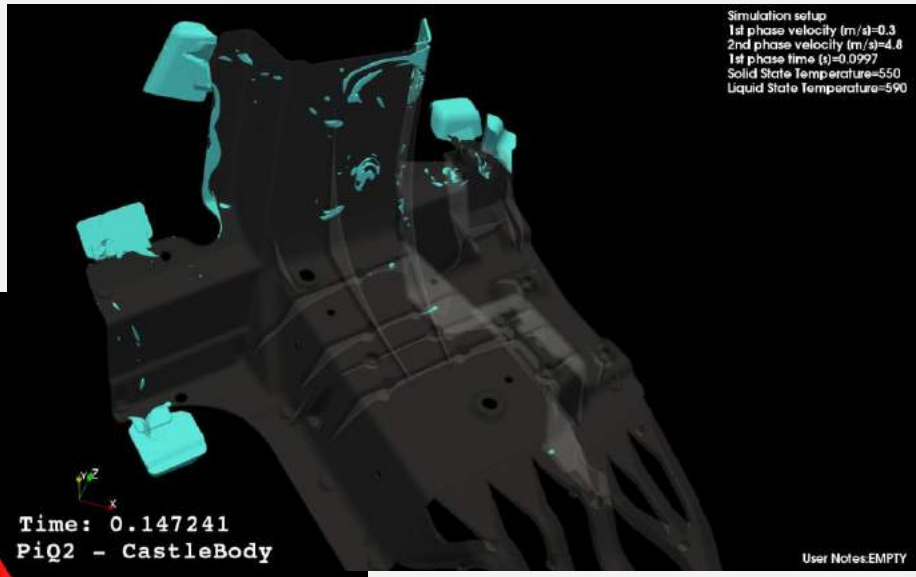


Misfillings and cold joints due to too long filling time

2nd STEP: Simulation with overflows

Modified parameters:

- Second phase speed increased: 4,8m/s
- Project gating speed about 50 m/s

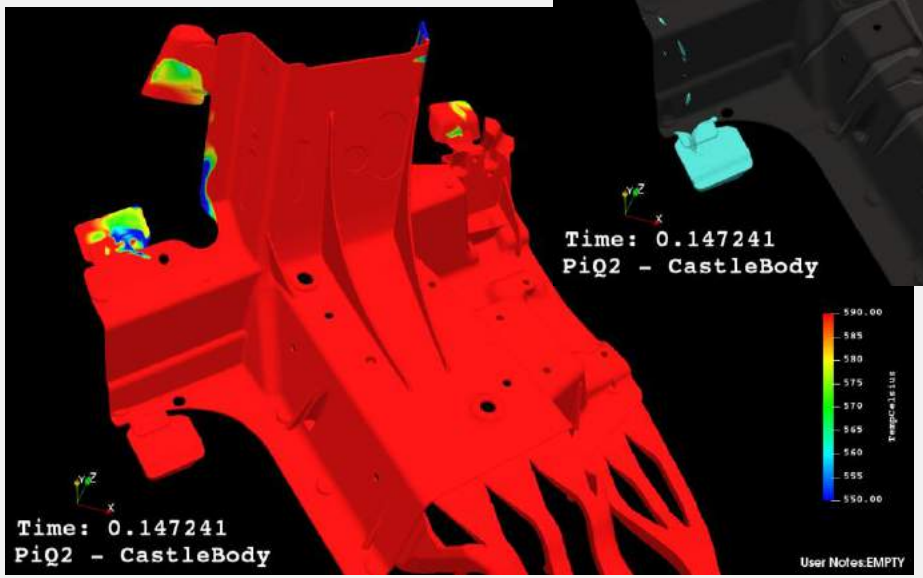


Air entrapment at final stage: threshold 1%

Better results, but still **air entrapment** and **cold joints** risk. Probably **higher speed** would be needed.

Not possible to add more overflows due to **geometric restrictions**.

Risk of **flashing** due to high plunger velocity.



Misfillings and cold joints.

2nd STEP: Simulation with overflows

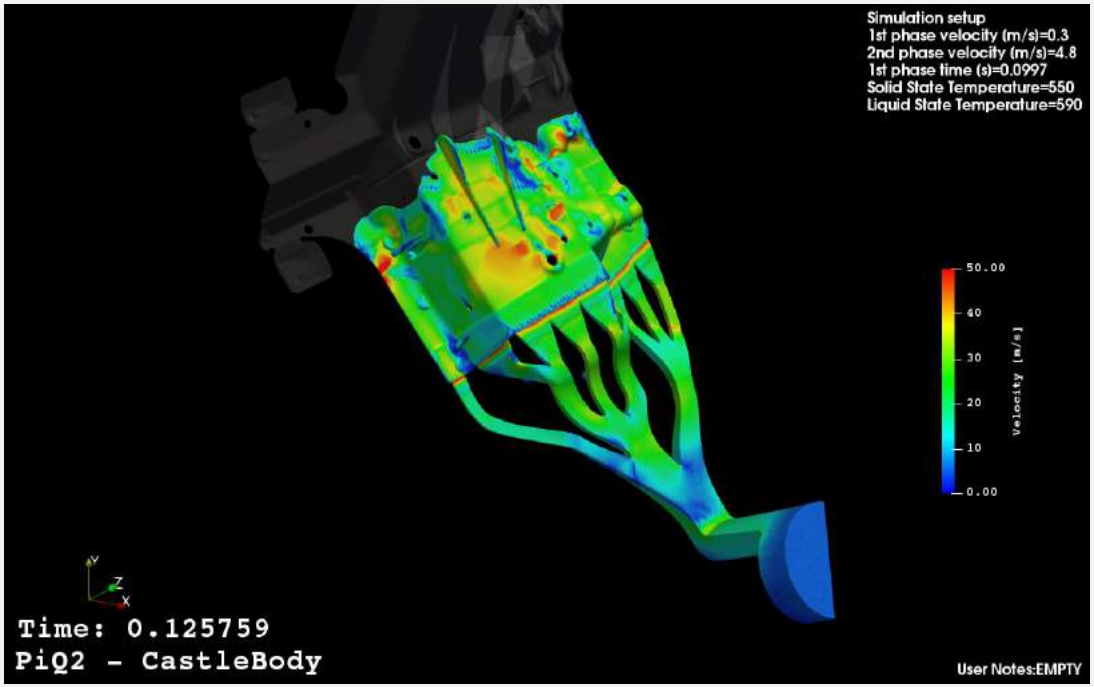
Modified parameters:

- Second phase speed: 4,8m/s
- Project gating speed about 50 m/s

Very **high velocity at the gates** and in the **cavity** > **50m/s**

Risk of **die erosion**

No possibility to further increase **gatings thickness/length**.



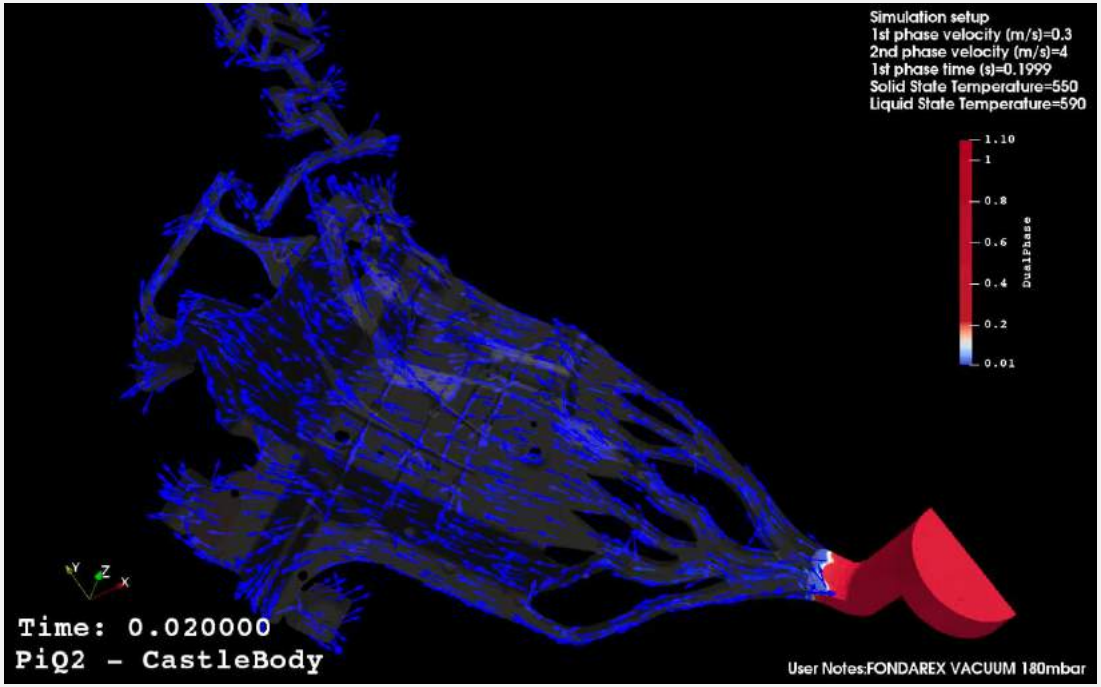
Wall-contact velocity distribution during fast shot

3rd STEP: Simulation with overflows and VACUUM

Final parameters:

- 1 valve per figure added
- 180mbar vacuum setpoint
- Second phase speed reduced to: 4,0m/s
- Gating speed about 40 m/s

Reduced 2nd phase speed allows to start second phase later too



Dualphase filling with air displacement

3rd STEP: Simulation with overflows and VACUUM

Final parameters:

- 1 valve/figure added
- 180mbar vacuum setpoint
- Second phase speed reduced to: 4,0m/s
- Gating speed about 40 m/s

Almost **no air entrapped** in the part.

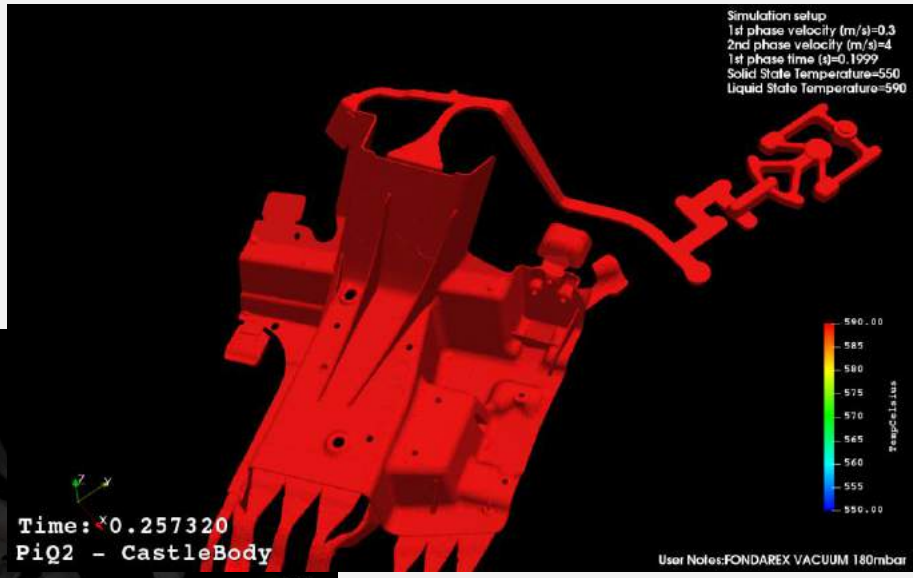
Possible **further optimization** of vacuum channel distributor.

Air entrapment at final stage: threshold 1%

3rd STEP: Simulation with overflows and vacuum

Final parameters:

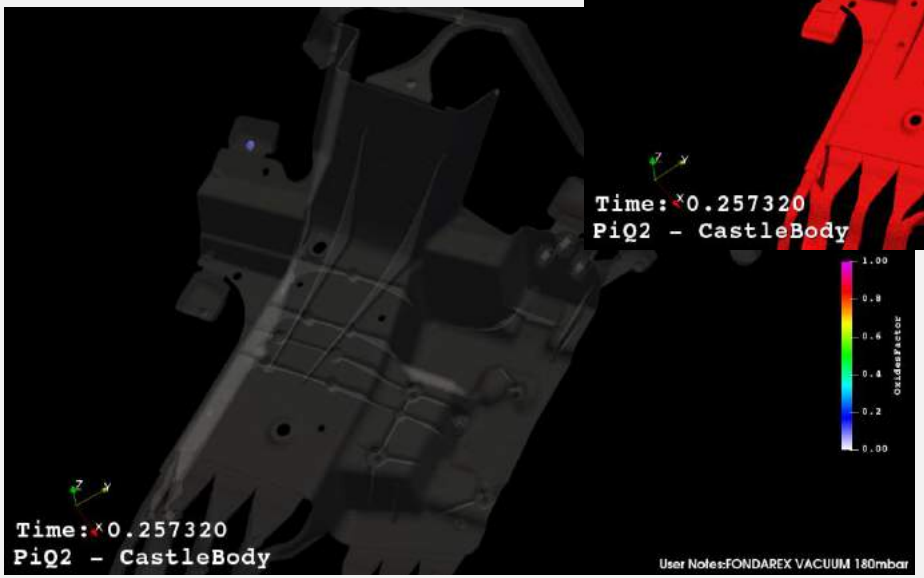
- 1 valve/figure added
- 180mbar vacuum setpoint
- Second phase speed reduced to: 4,0m/s
- Gating speed about 40 m/s



Misfillings and cold joints.

Althoug 2nd phase speed reduced to 4m/s, no more **cold joints**.

No more trace of **oxide skins** in the part



Oxides skins position

3rd STEP: Simulation with overflows and vacuum

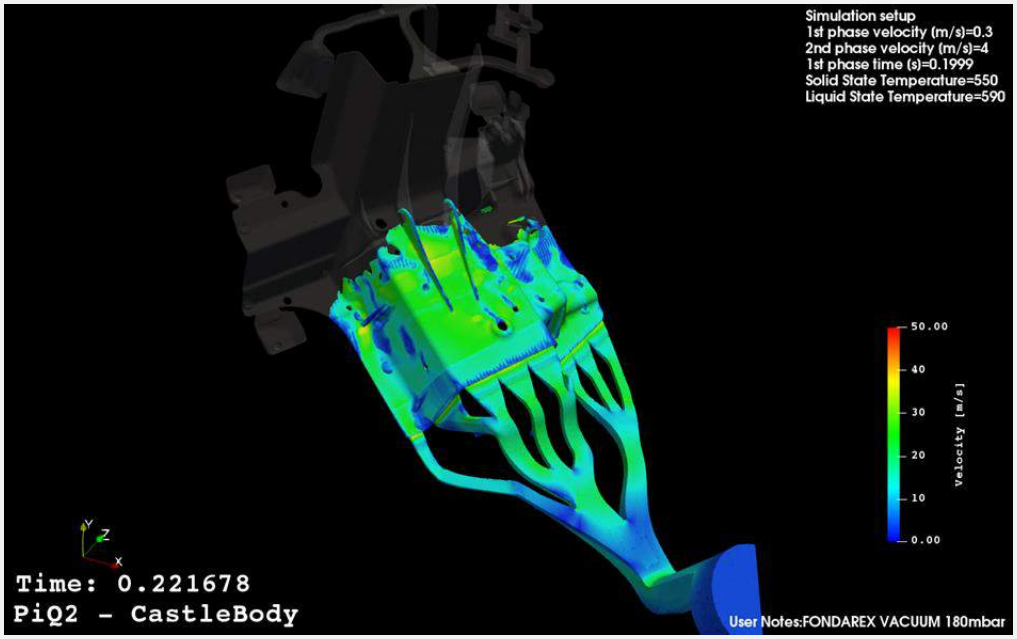
Final parameters:

- 1 valve/figure added
- 180mbar vacuum setpoint
- Second phase speed reduced to: 4,0m/s
- Gating speed about 40 m/s

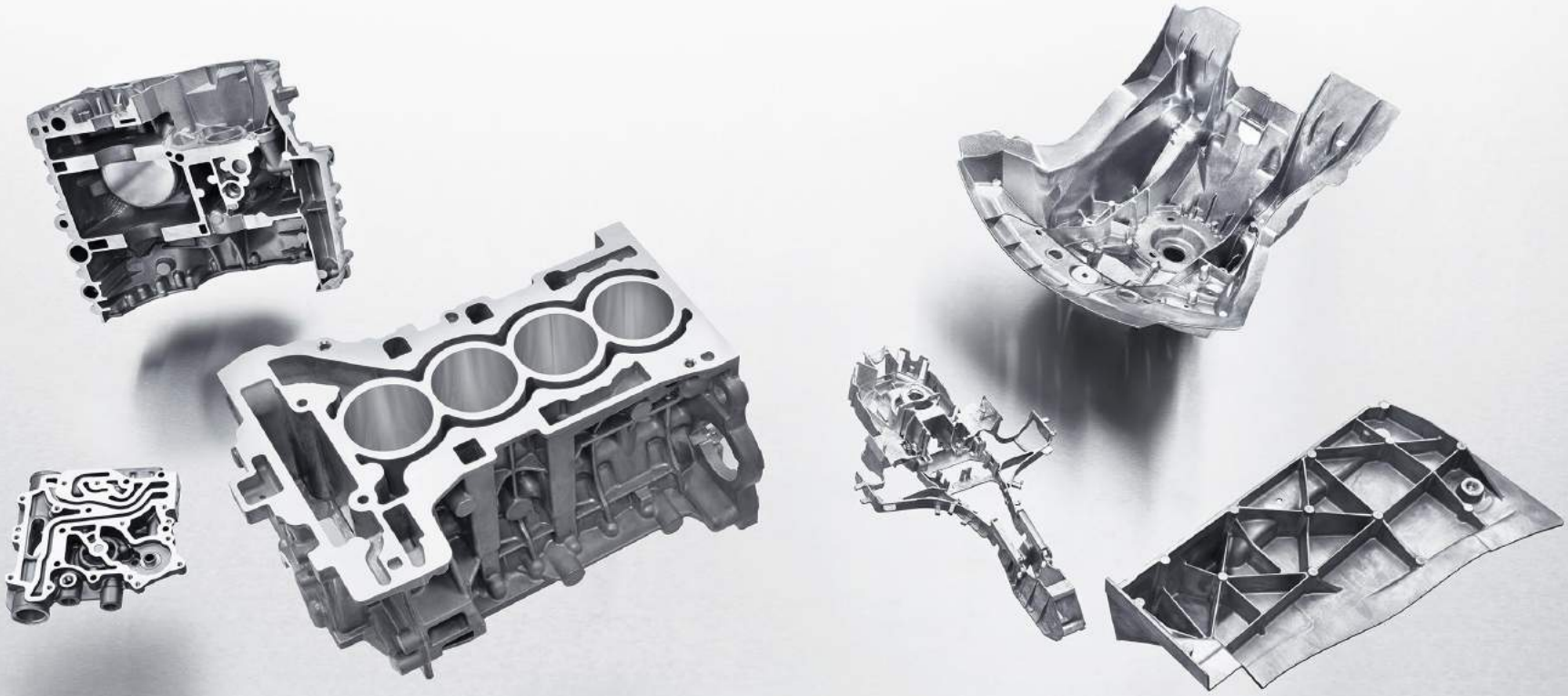
2nd phase speed reduced to 4m/s, **no cold regions**:

Reduced velocity in the cavity, no risk of **die erosion**.

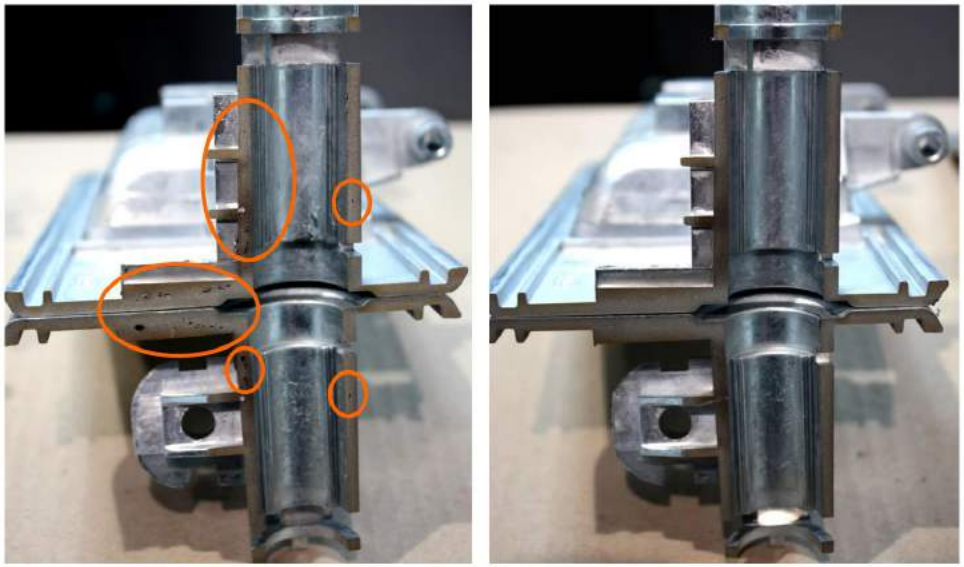
Less risk of **die flashing** on parting line. Better dimensional accuracy.



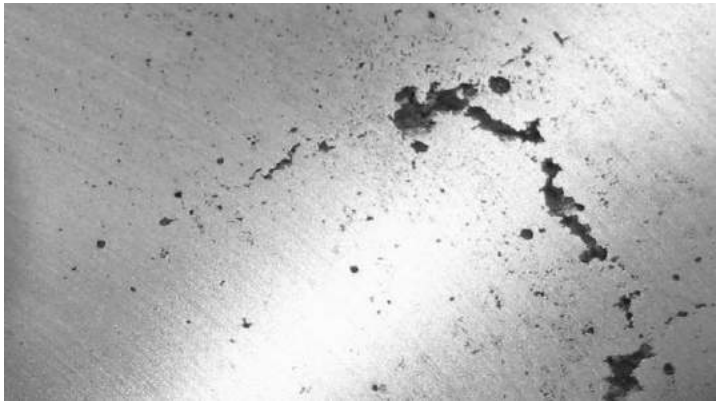
Parts examples



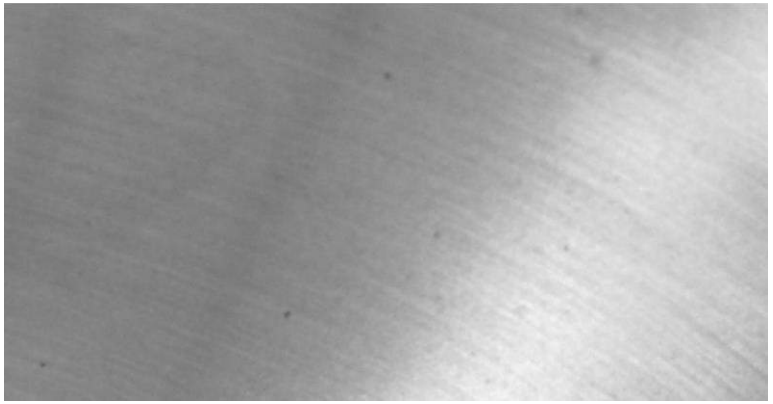
Parts examples



Without Vacuum



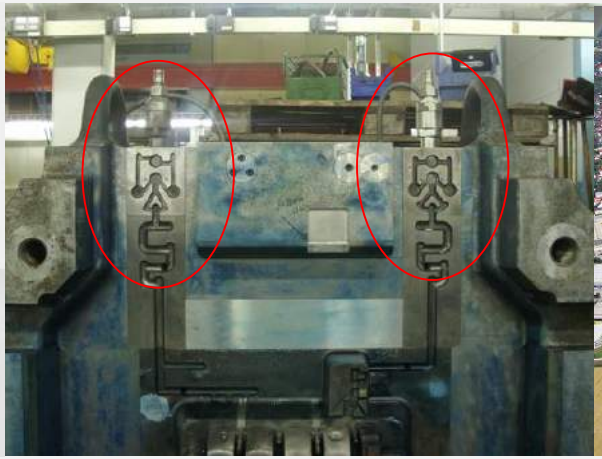
With Vacuum



BMW Germany

BMW has been working with FONDAREX for more than 16 years

Engine block production with the FONDAREX vacuum technology:
- 6 cylinder engine blocks (without sleeves)
- 4 cylinder engine blocks (without sleeves)
- 3 cylinder engine blocks (without sleeves)

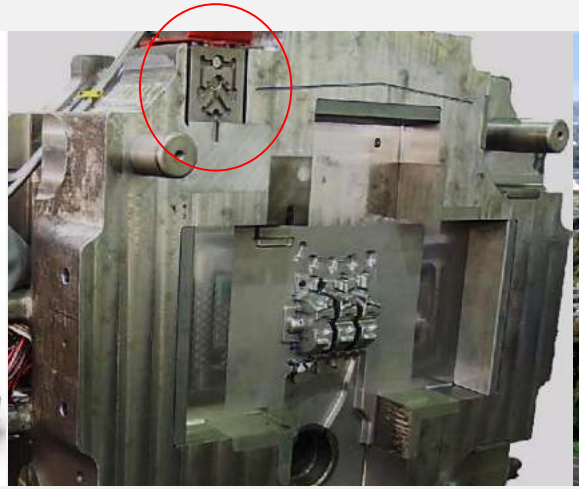


Renault France

RENAULT

RENAULT has been working with FONDAREX for more than 14 years

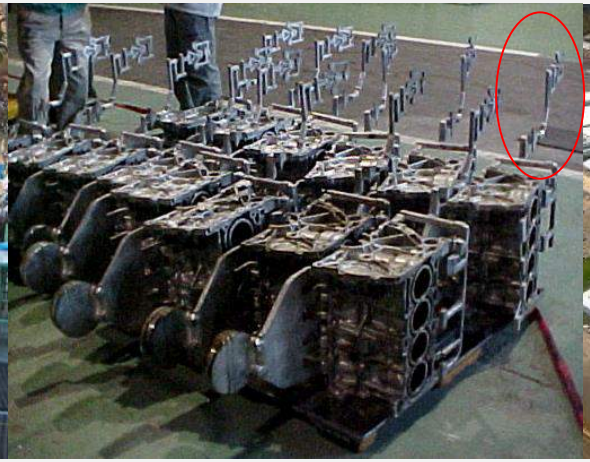
Engine block production with the FONDAREX vacuum technology:
- 4 cylinder engine blocks (with and without sleeves)
- 3 cylinder engine blocks (with and without sleeves)



Nissan Mexico

NISSAN has been working with FONDAREX for more than 12 years in different plants

Engine block production with the FONDAREX vacuum technology:
- 4 cylinder engine blocks (with sleeves)
- 3 cylinder engine blocks (with sleeves)


Volvo Sweden

VOLVO has been working with FONDAREX for more than 7 years

Engine block production with the FONDAREX vacuum technology:
- 5 cylinder engine blocks for VOLVO (with sleeves)

Dacia Rumania / Lada Russia

DACIA & LADA have been working with FONDAREX for more than 5 years

Engine block production with the FONDAREX vacuum technology:
- 4 cylinder engine blocks (with sleeves)
- 3 cylinder engine blocks (with sleeves)



Great Wall China

CHANGAN

CHANGAN has been working with FONDAREX for more than 4 years

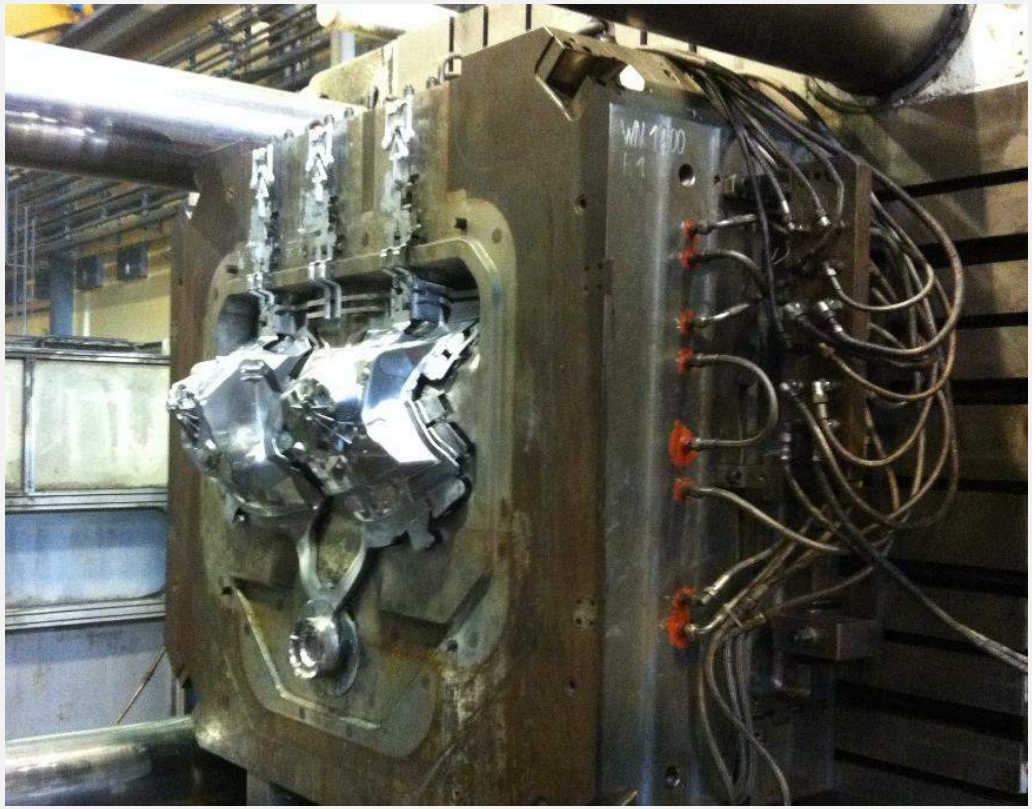
Engine block production with the FONDAREX vacuum technology:
- 4 cylinder engine blocks (with sleeves)
- 3 cylinder engine blocks (with sleeves)

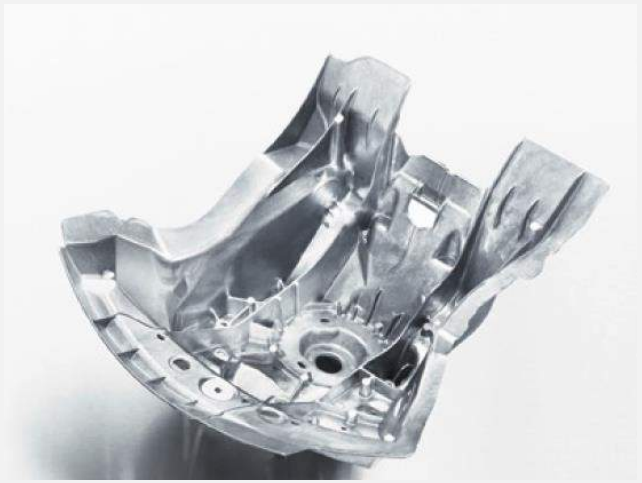
Nemak Poland

NEMAK has been working with FONDAREX for more than 3 years

Engine block production with the FONDAREX vacuum technology:
- 4 cylinder engine blocks (with sleeves) for AUDI and FORD
- 3-drive electric engine for BMW

Handtmann Germany



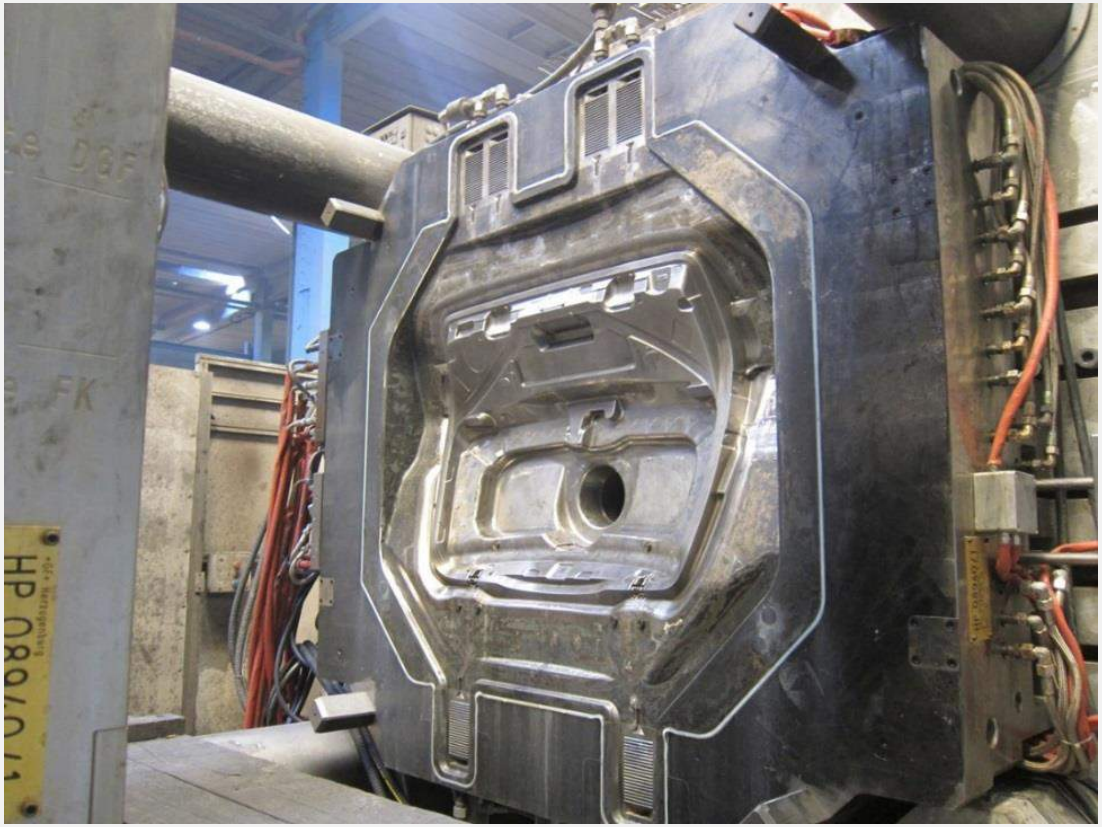


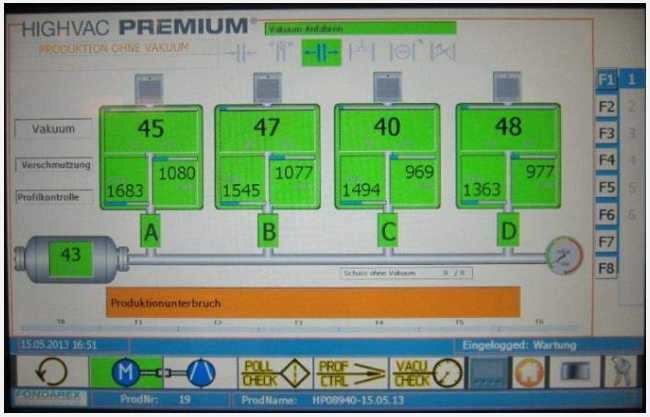
FONDAREX®
SWISS VACUUM TECHNOLOGY

BMW Germany

FONDAREX®
SWISS VACUUM TECHNOLOGY

Georg Fischer Austria



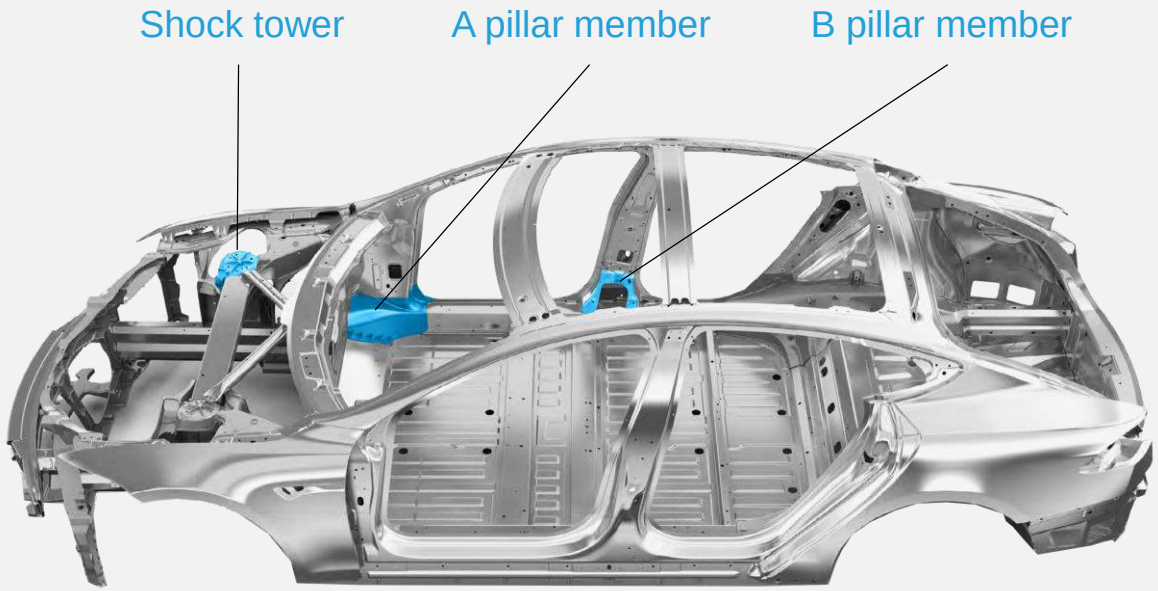


FONDAREX®
SWISS VACUUM TECHNOLOGY

Tesla USA

Vacuum equipment

5 x
HIGHVAC
ULTIMATE 4C
3000

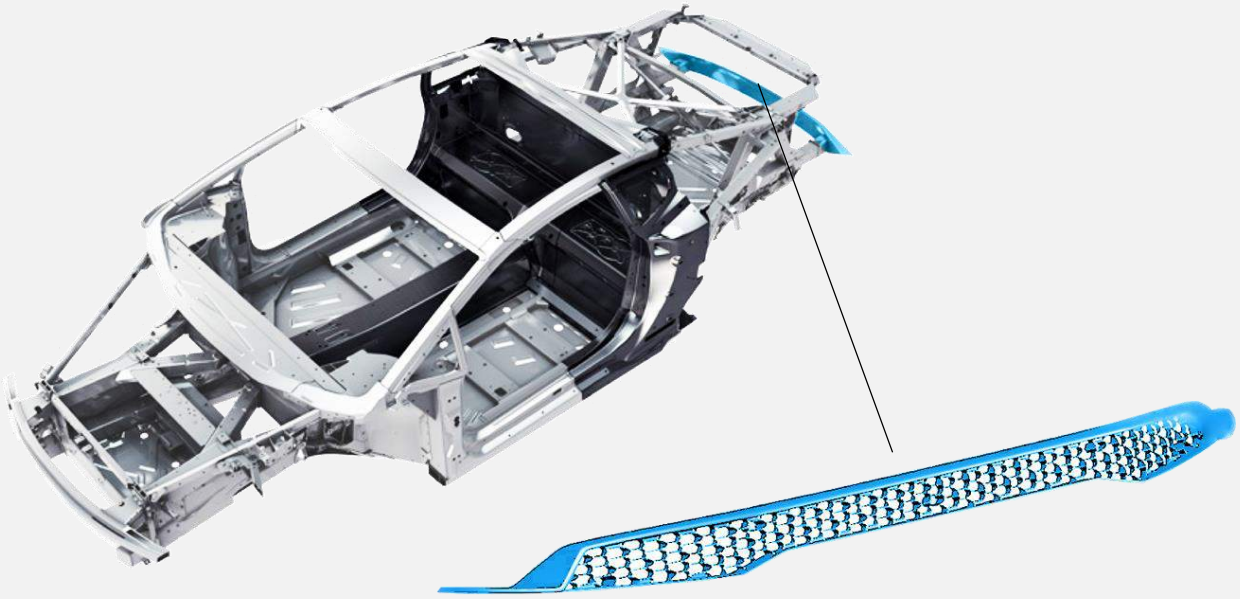


Lamborghini Italy

Vacuum equipment
at Co.Stamp Italy

1 x
HIGHVAC
ULTIMATE 4C
1000

2 x
HIGHVAC
PREMIUM 2C
800



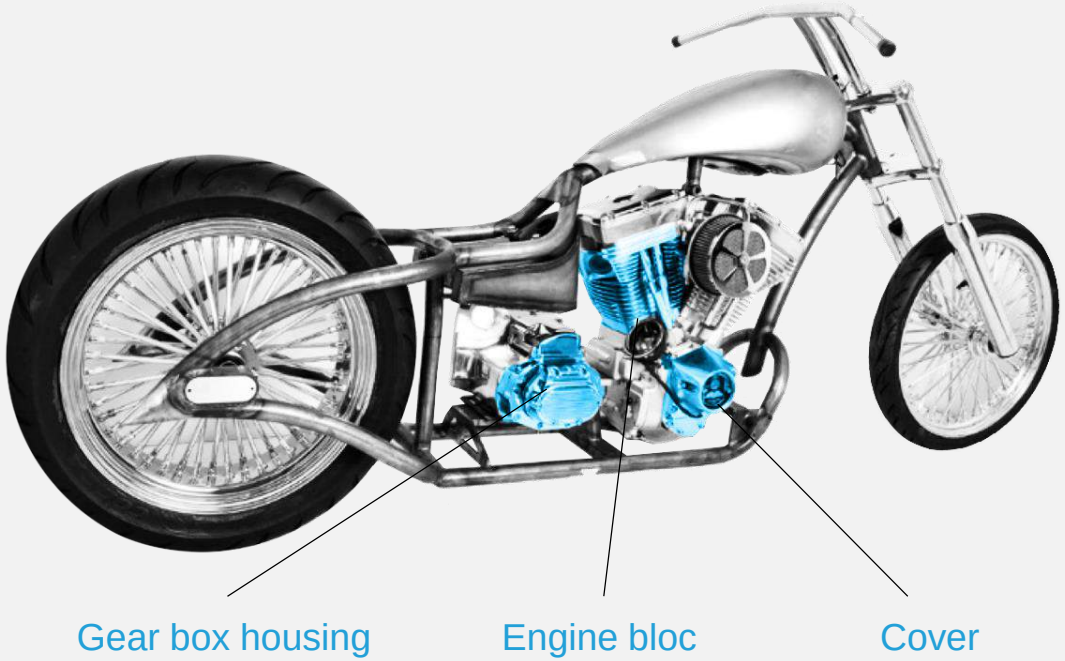
Lamborghini Huracán rear grille

Harley-Davidson USA

Vacuum equipment at
Pace Industries USA

3 x
HIGHVAC
PROGRESS 2C
500

20 x
VACUPAC

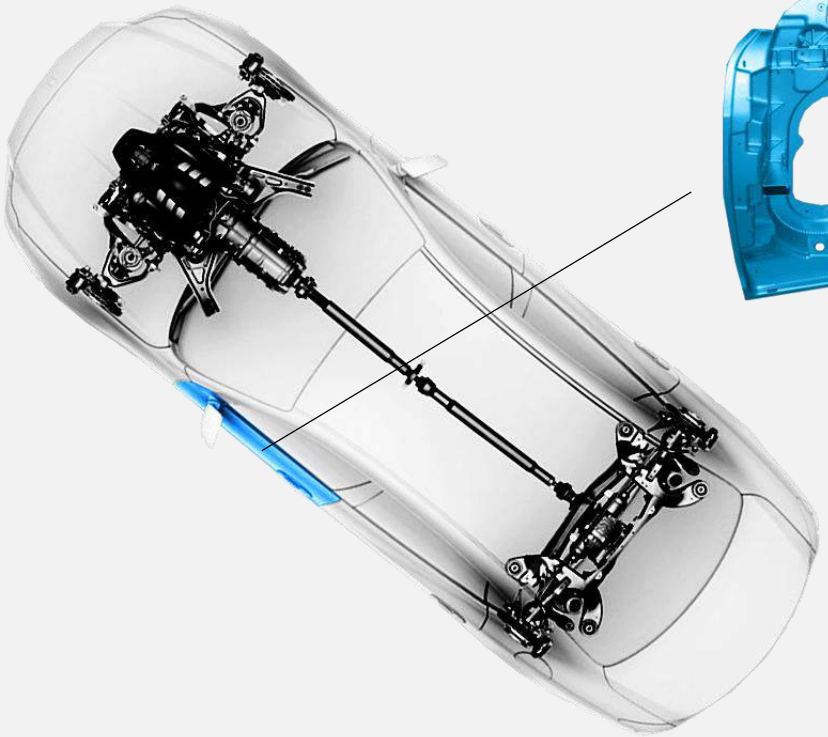


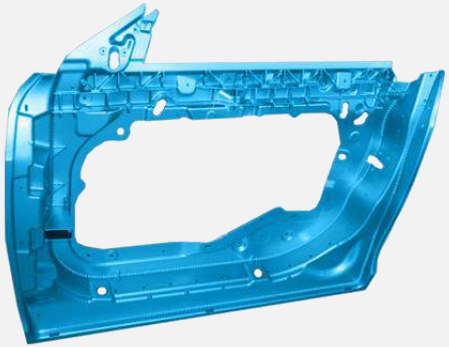
Maserati Italy

Vacuum equipment
at Georg Fischer

5 x
HIGHVAC
ULTIMATE 4C
Central

8 x
VACUPAC
Central





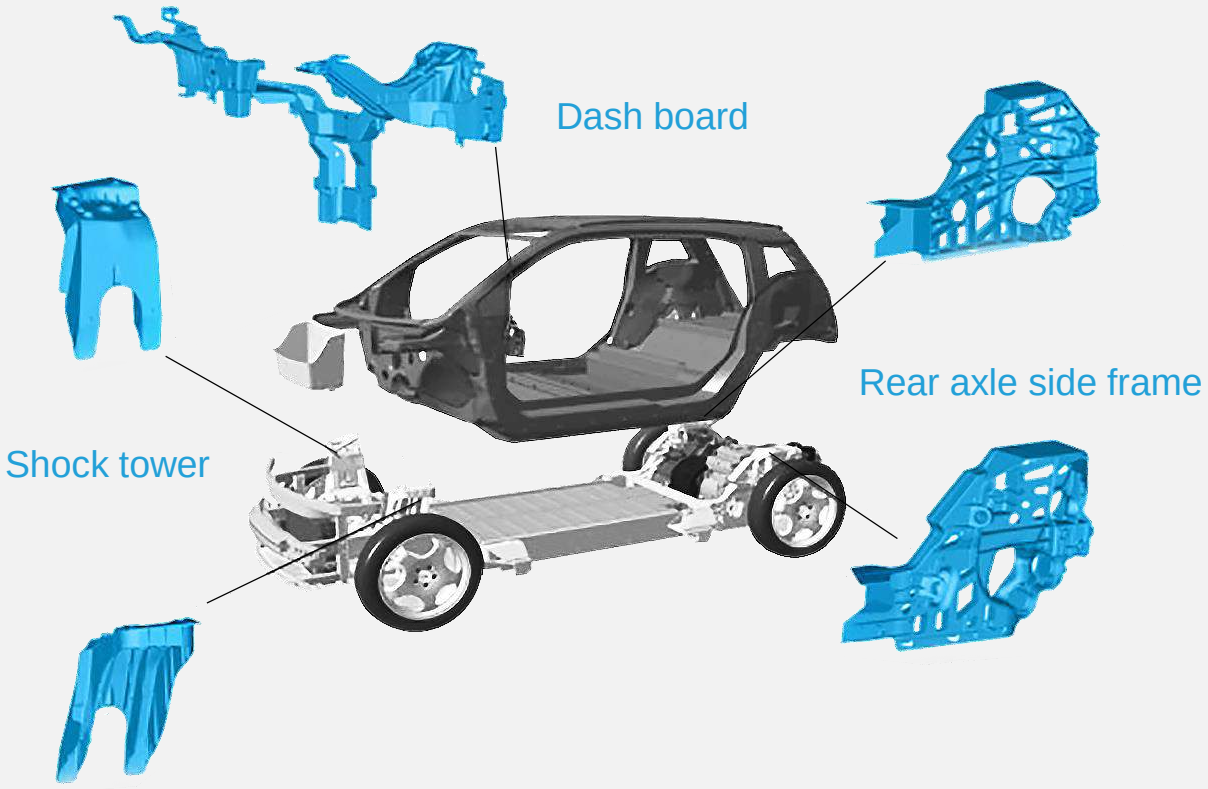
Door frame

BMW Germany

Vacuum equipment

5 x
HIGHVAC
ULTIMATE 4C
Central

8 x
HIGHVAC
PREMIUM 2C
Central



FONDAREX®

SWISS VACUUM TECHNOLOGY