VOSSLOH BEEKAY CASTINGS LIMITED

(ESTABLISHED MANUFACTURER OF CAST MANGANESE STEEL CROSSINGS SINCE 1982)

25-28 , LIGHT INDUSTRIAL AREA, BHILAI – CHHATTISGARH INDIA

VOSSLOH BEEKAY CASTINGS LIMITED

- **A subsidiary of Vossloh Cogifer SA France, a worldwide centrally managed group, with a focus on rail infrastructure with Integrated offers and solutions.**
- **Established Manufacturer of Cast Manganese Steel Crossings**

CERTIFIED WITH:

- **Certifier – Certificate for Manufacturing Cast Manganese Steel Crossings**
- **ISO 9001:2015 (Quality Management System)**
- **ISO 14001:2015 (Occupational Health and Safety)**
- **ISO 45001:2018 (Environment Management System)**
- **ISO / IEC 17025 (NABL ACCREDIATION FOR TESTING LABORATORY)**
- **ISO 3834- 2 (ISO WELDING PROCESS Management System)**
- **ISO 50001 (ISO For ENERGY Management System)**

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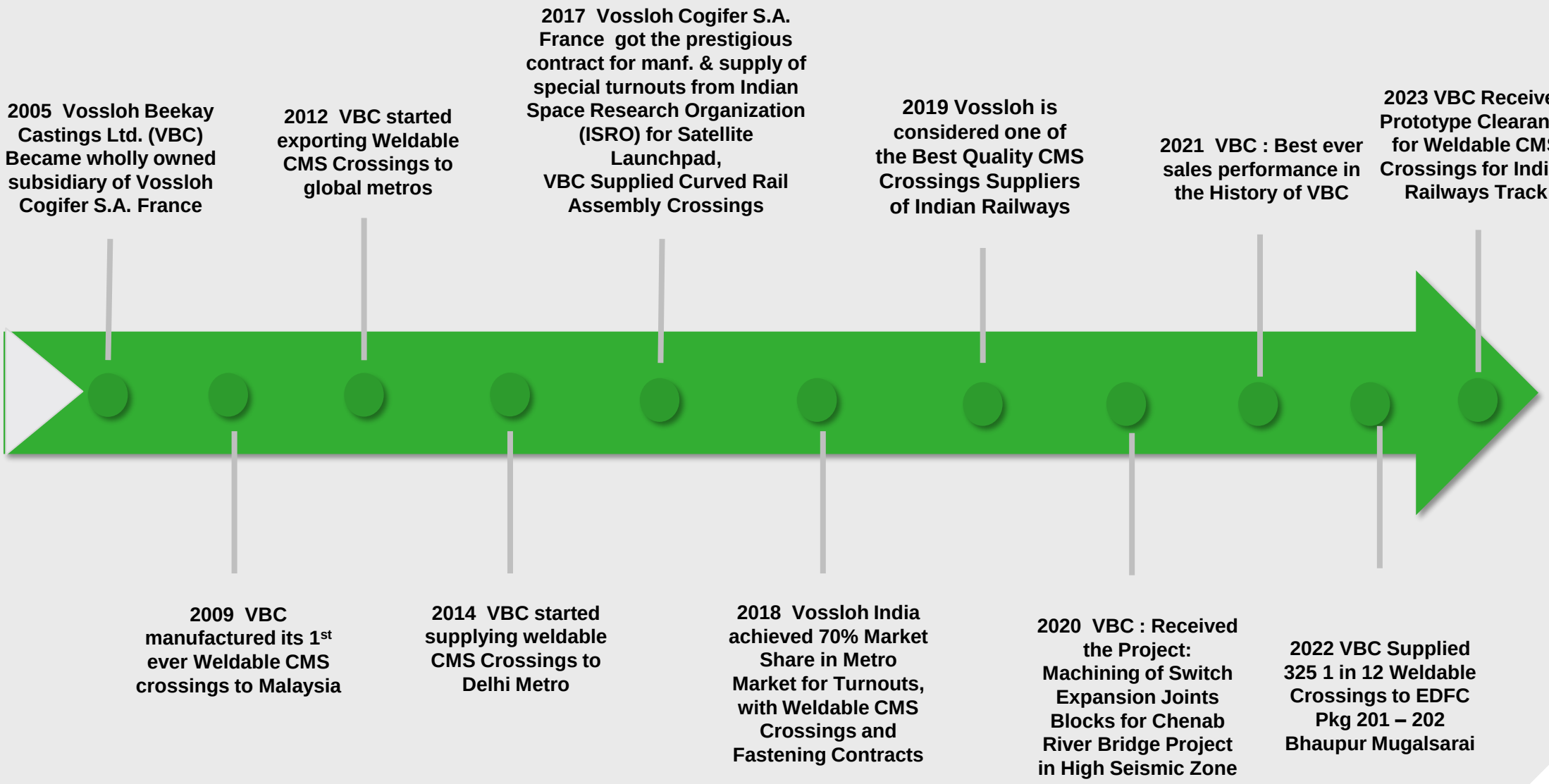
VOSSLOH BEEKAY CASTINGS LIMITED – HISTORY AT A GLANCE



OUR CLIENT NETWORK

MARKET LEADER IN CMS, WELDABLE CMS CROSSING MAINTAINING WORLD CLASS QUALITY

Indian Railway

Kolkata Metro

Navi - Mumbai Line-1

Ahmedabad Metro

Nagpur Metro

Chennai Metro Rail Limited

Crossings made for ISRO Satellite launching Pad Axle load bearing capacity 500 ton per axle. i.e. 125 ton per wheel

Straight Blocks for the World's Highest Rail bridge i.e.359 mts , Length 1,315 mts

America Algeria **Australia** China **Canada** **Chile** Denmark Libya **France** Malaysia **Mexico** Mozambique **Sri-Lanka** USA **Poland** Thailand **Zambia** Brazil **U.K.** **Argentina** Iraq Iran **Sweden** Taiwan **Egypt** Uruguay railways

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ISRO transport its Satellite on the Special Crossings Made in Vossloh Beekay...

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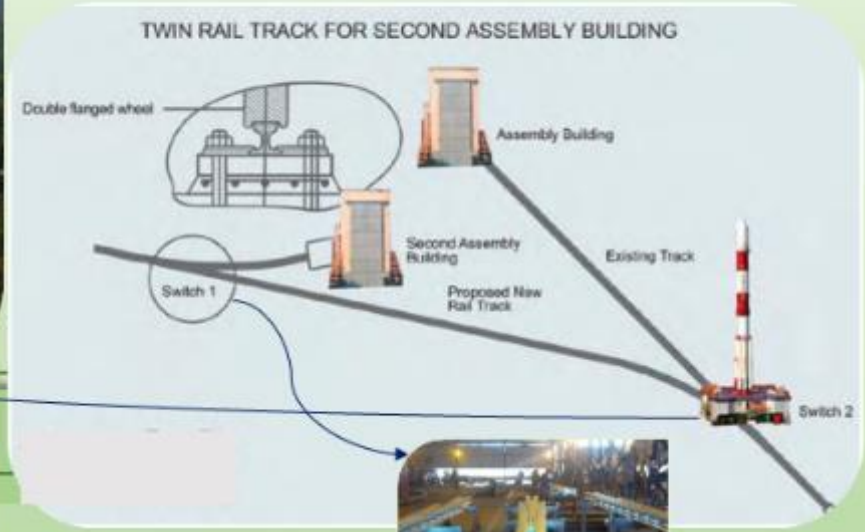
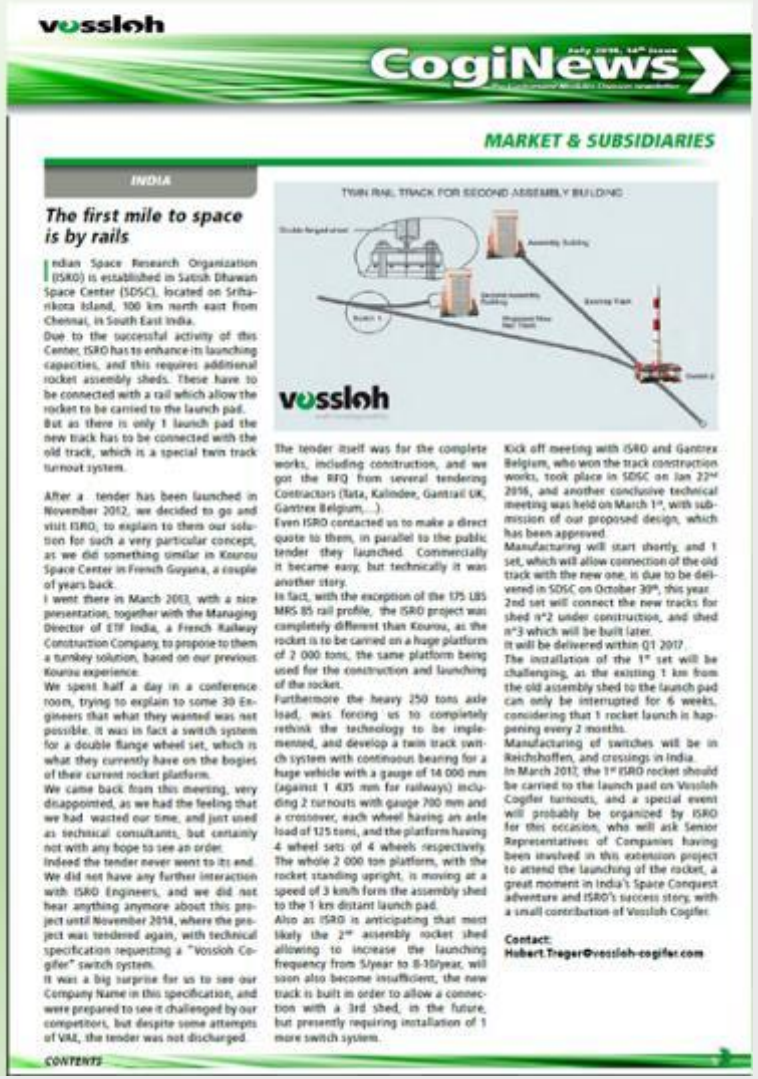
enabling green mobility

Rail to Space...

Vossloh Beekay manufactured specially designed Crossings for ISRO GSLV Rocket launch which joins the 1 Km long rail line that covers the route from the Assembly Station of the Satish Dhawan Space Centre to the launching pad



Four crossings for this project manufactured at Vossloh Beekay, to bear 250 tons axle load, making this one-of-a-kind manufacturing marvel



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CogiNews

MARKET & SUBSIDIARIES

INDIA

The first mile to space is by rails

Indian Space Research Organization (ISRO) is established in Satish Dhawan Space Center (SDSC), located on Sriharikota Island, 100 km north east from Chennai, in South East India.
Due to the successful activity of this Center, ISRO has to enhance its launching capacities, and this requires additional rocket assembly sheds. These have to be connected with a rail which allow the rocket to be carried to the launch pad.
But as there is only 1 launch pad the new track has to be connected with the old track, which is a special twin track turnout system.

After a tender has been launched in November 2012, we decided to go and visit ISRO, to explain to them our solution for such a very particular concept, as we did something similar in Kourou Space Center in French Guyana, a couple of years back.
I went there in March 2013, with a nice presentation, together with the Managing Director of ETF India, a French Railway Construction Company, to propose to them a turnkey solution, based on our previous Kourou experience.
We spent half a day in a conference room, trying to explain to some 30 Engineers that what they wanted was not possible. It was in fact a switch system for a double flange wheel set, which is what they currently have on the bogies of their current rocket platform.
We came back from this meeting, very disappointed, as we had the feeling that we had wasted our time, and just used as technical consultants, but certainly not with any hope to see an order.
Indeed the tender never went to its end.
We did not have any further interaction with ISRO Engineers, and we did not hear anything anymore about this project until November 2014, where the project was tendered again, with technical specification requesting a "Vossloh Cogifer" switch system.
It was a big surprise for us to see our Company Name in this specification, and were prepared to see it challenged by our competitors, but despite some attempts of VAE, the tender was not discharged.

TWIN RAIL TRACK FOR SECOND ASSEMBLY BUILDING

The tender itself was for the complete works, including construction, and we got the RFQ from several tendering Contractors (Tata, Kalindee, Gantrail UK, Gantrex Belgium, ...).
Even ISRO contacted us to make a direct quote to them, in parallel to the public tender they launched. Commercially it became easy, but technically it was another story.
In fact, with the exception of the 175 LBS MRS 85 rail profile, the ISRO project was completely different than Kourou, as the rocket is to be carried on a huge platform of 2 000 tons, the same platform being used for the construction and launching of the rocket.
Furthermore the heavy 250 tons axle load, was forcing us to completely rethink the technology to be implemented, and develop a twin track switch system with continuous bearing for a huge vehicle with a gauge of 14 000 mm (against 1 435 mm for railways) including 2 turnouts with gauge 700 mm and a crossover, each wheel having an axle load of 125 tons, and the platform having 4 wheel sets of 4 wheels respectively.
The whole 2 000 ton platform, with the rocket standing upright, is moving at a speed of 3 km/h form the assembly shed to the 1 km distant launch pad.
Also as ISRO is anticipating that most likely the 2nd assembly rocket shed allowing to increase the launching frequency from 5/year to 8-10/year, will soon also become insufficient, the new track is built in order to allow a connection with a 3rd shed, in the future, but presently requiring installation of 1 more switch system.

Kick off meeting with ISRO and Gantrex Belgium, who won the track construction works, took place in SDSC on Jan 22nd 2016, and another conclusive technical meeting was held on March 1st, with submission of our proposed design, which has been approved.
Manufacturing will start shortly, and 1 set, which will allow connection of the old track with the new one, is due to be delivered in SDSC on October 30th, this year.
2nd set will connect the new tracks for shed n°2 under construction, and shed n°3 which will be built later.
It will be delivered within Q1 2017.
The installation of the 1st set will be challenging, as the existing 1 km from the old assembly shed to the launch pad can only be interrupted for 6 weeks, considering that 1 rocket launch is happening every 2 months.
Manufacturing of switches will be in Reichshoffen, and crossings in India.
In March 2017, the 1st ISRO rocket should be carried to the launch pad on Vossloh Cogifer turnouts, and a special event will probably be organized by ISRO for this occasion, who will ask Senior Representatives of Companies having been involved in this extension project to attend the launching of the rocket, a great moment in India's Space Conquest adventure and ISRO's success story, with a small contribution of Vossloh Cogifer.

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CONTENTS

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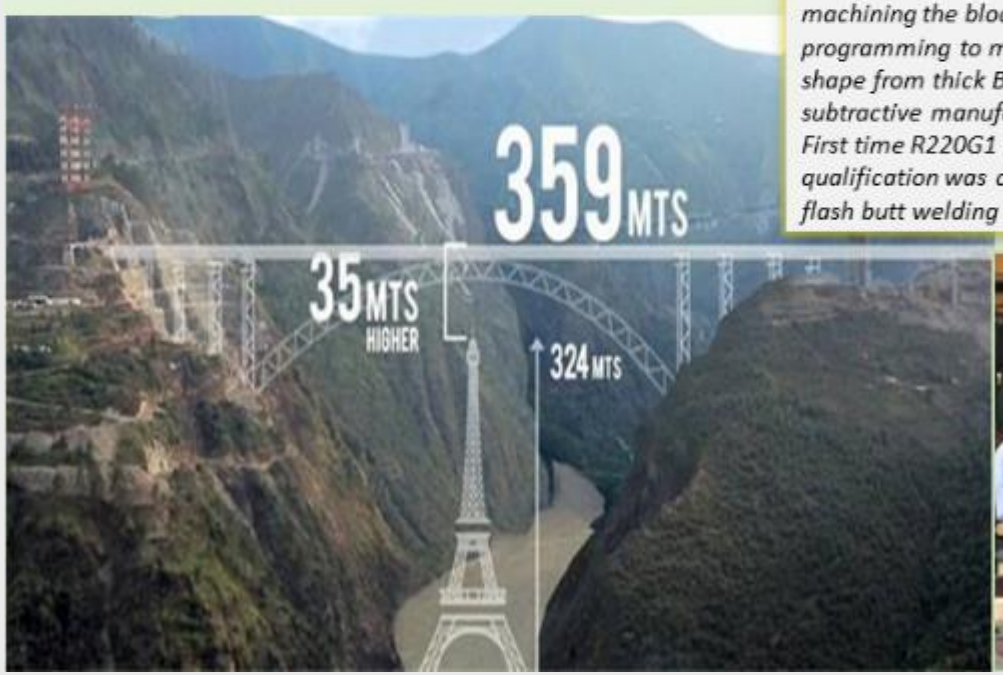
CHENAB RAIL BRIDGE PROJECT

- It is the world's highest railway bridge! Being 359 meters above the riverbed level, which is 35 meters higher than iconic Eiffel Tower, Paris
- Built with steel, the arch will be able to resist temperatures of minus 20°C and wind speeds of above 200 km/h
- This River Bridge is 1,315 meters long and will have the lifespan of 120 years
- The $190M project is a part of Jammu-Udhampur-Srinagar-Baramulla Rail Line that connects Kashmir with the Himalayan foothills
- It is in high seismic zone and special design technology enables it to withstand earthquakes of magnitude eight on the Richter scale
- Vossloh received the project from TENSA for expansion joints manufacturing
- Vossloh Beekay has done machining of the blocks and welded the 1080 HH rails



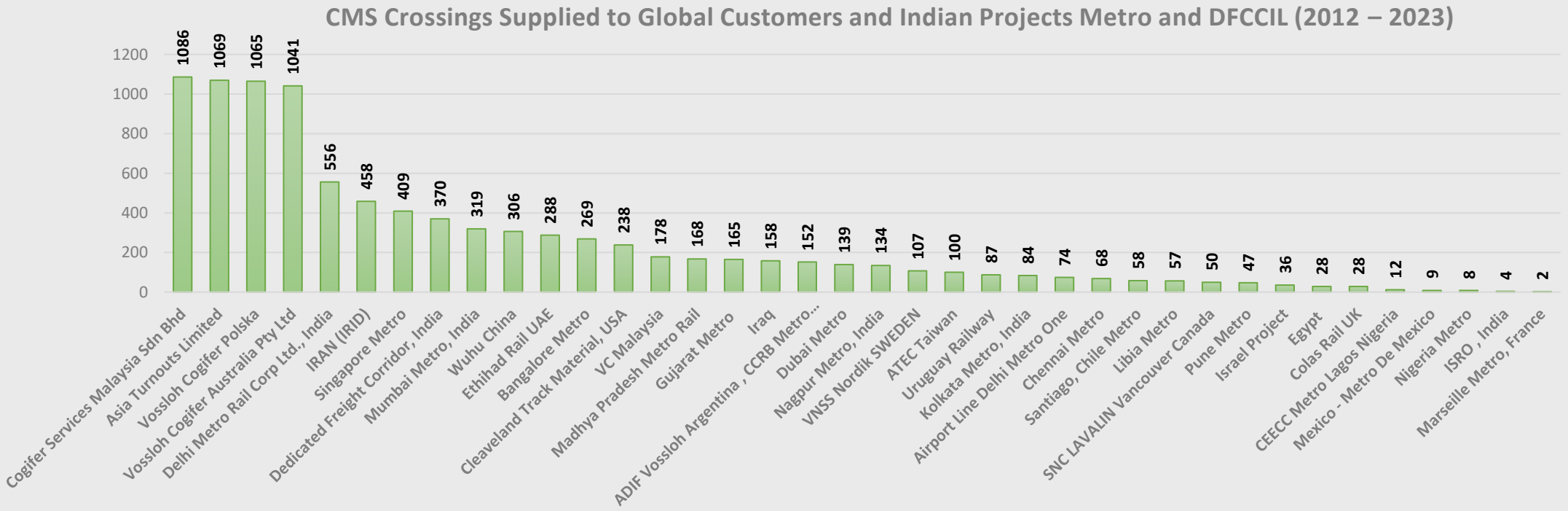
We developed a unique concept of machining the block, with CNC CAM programming to machine the crossing shape from thick Block (310 C1) using subtractive manufacturing.
First time R220G1 & 1080 HH Rail weld qualification was carried out, and the flash butt welding was done in Beekay

WELDED CMS CROSSINGS

Welded CMS Crossings assembly

Welded CMS Crossings under Inspection

CMS WELDABLE CMS CROSSINGS EXPORTED AND SUPPLIED TO INDIAN METROS AND DFCCIL



Our Customers:

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WELDED CMS CROSSINGS EXPOTED GLOBALLY, INDIAN METROS & INDIAN RAILWAY PROJECTS

WELDED CMS CROSSING SUPPLIED TILL DEC 2023											
INDIAN RAILWAY & INDIAN METRO	QTY		**ASIA METRO PROJECTS**	QTY		**AUSTRALIA & AMERICAN PROJECTS**	QTY		**EUROPE PROJECTS**	QTY		**GULF & AFRICA PROJECTS**	QTY
DELHI METRO	556		MALAYSIA	1264		VC AUSTRALIA	1041		POLAND	1065		IRAQ	158
MUMBAI METRO	319		THAILAND BS 100	479		CTM	84		SWEDEN & NORDIC	9		ALGERIA	1
KOLKATA METRO	84		THAILAND BS 80	116		METRO DE RIO	5		FRANCE	52		UAE	139
NAGPUR METRO	134		SINGAPORE	409		CANADA	49		VC UK	10		ISRAIL	83
GUJARAT METRO	165		TAIWAN	100		ARGENTINA	152					NIGERIA	8
BANGALORE METRO	269		INDONESIA	57		URUGUAY	87					EGYPT	28
CHENNAI METRO	68		TAICHUNG	109								IRAN	458
DELHI AIRPORT LINE METRO	74		ATO	307								LIBYA	57
MADHYA PRADESH METRO	168		MANILA	11								SENEGAL	6
PUNE METRO	47		WUHU CHINA	59									
DFCCIL	370												
	2254			2911			1418			1136			938

Since 2005: We have supplied more than 53,000 Conventional Crossings

Since 2009 : We have supplied more than 8,500 Weldable CMS Crossings

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CMS CROSSINGS CAPACITY AND CAPABILITY

CAPACITY	
CONVENTIONAL CMS CROSSINGS	3000 YEARLY
WELDABLE CMS CROSSINGS	1500 YEARLY
CAPABILITY	
MAXIMUM LENGTH OF CROSSINGS	9 METERS
RAIL PROFILES	
CONVENTIONAL	60 E1/60 E1A1 , 52 Kg
WELDABLE CMS CROSSINGS (RAIL PROFILES)	UIC60 / 60E1, UIC54 / 54E1, 60 E2 BS 80, 49 E1,BS 100,BS 100,115 RE 136 RE, AS 60, AS 50

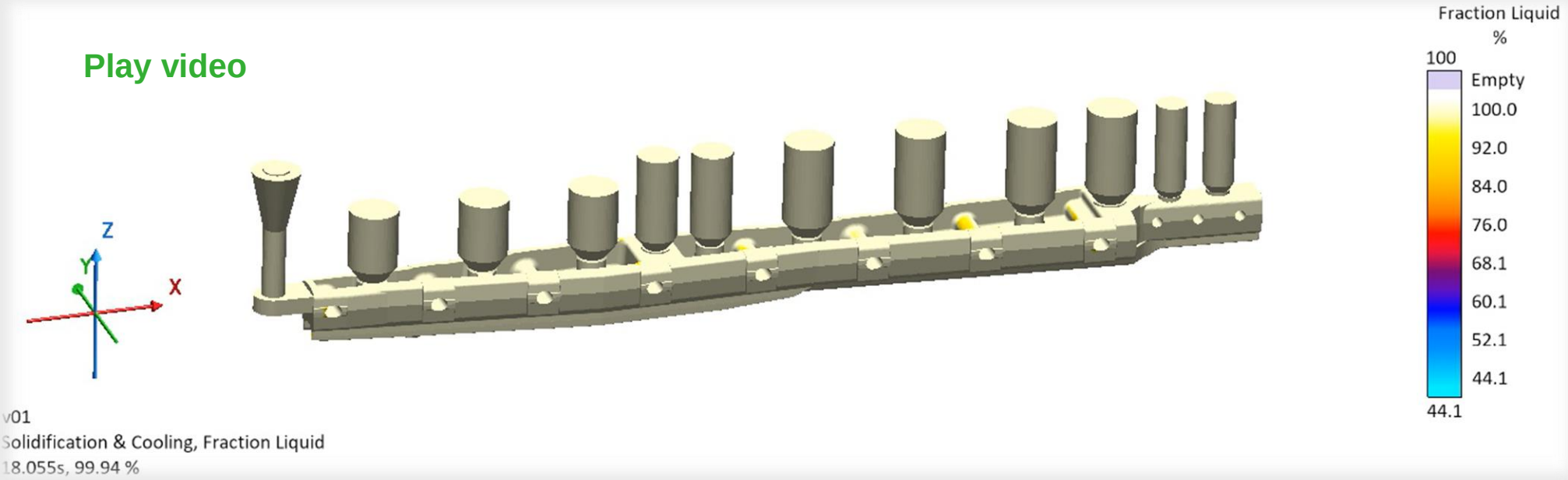
TOPIC

DESIGN MODIFICATIONS TO REDUCE SHRINKAGE & IMPROVE YIELD IN 1IN12 RBM CROSSING

FRACTION LIQUID

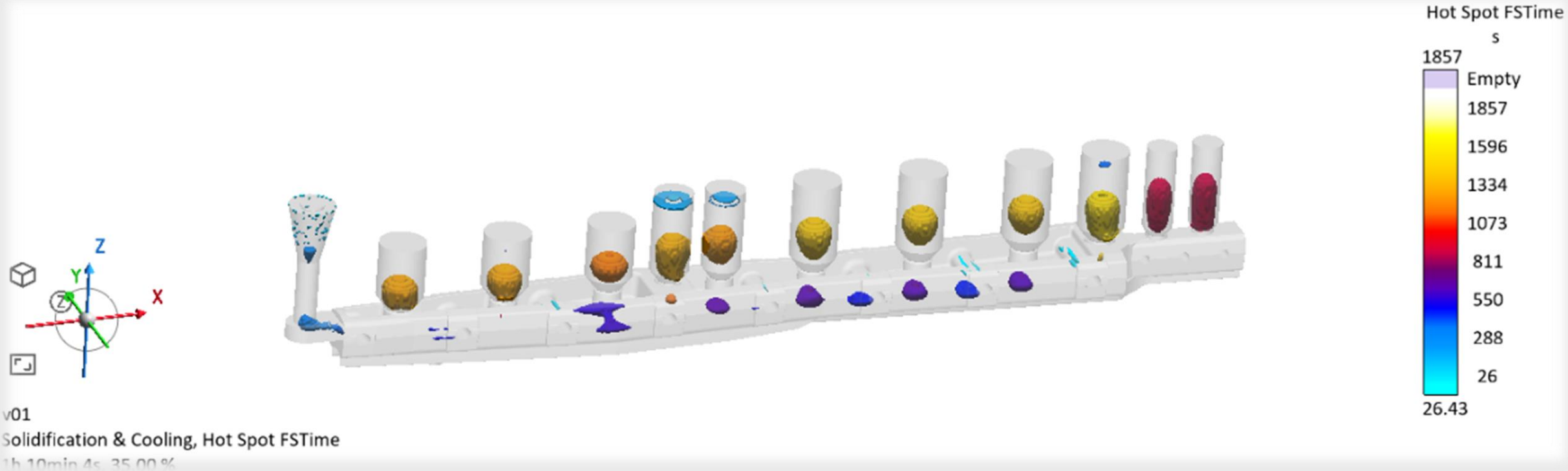
The fraction liquid analysis shows an isolated area within the riser pad where solidification is slower. This "hot spot" lacks sufficient feeding, leading to shrinkage defects as the metal contracts during cooling. This isolation causes porosity and voids, particularly in thicker sections of the riser pad.

Play video



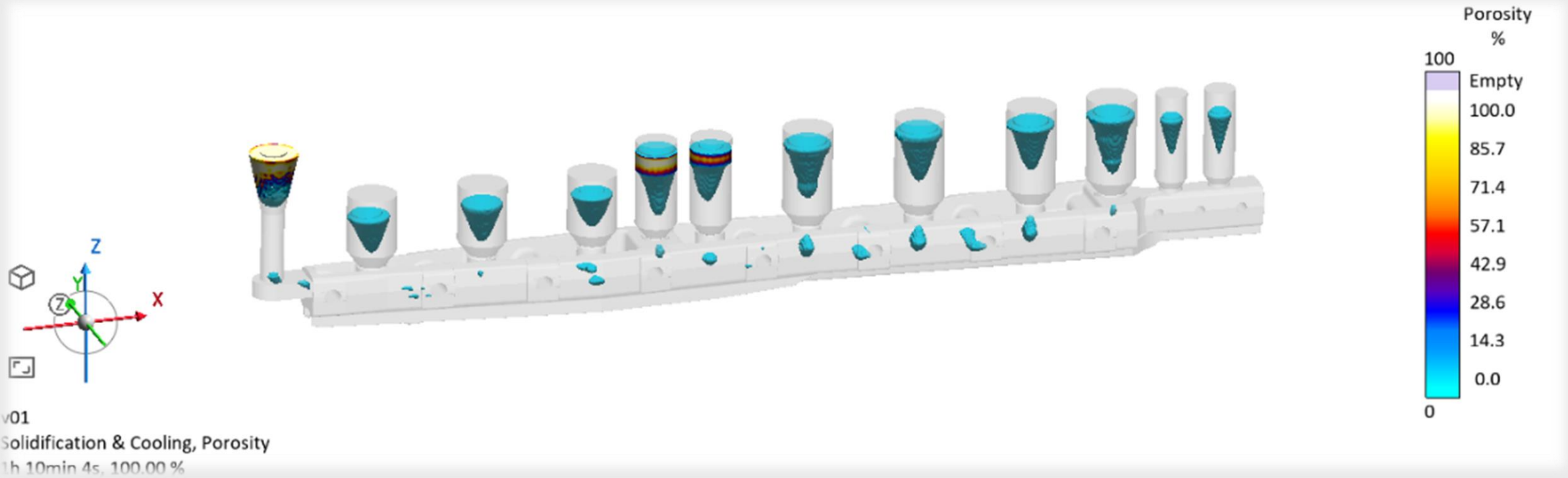
HOT SPOT FSTIME

The hot spot FS time results highlight areas in the casting that experience significantly slower cooling and solidification compared to surrounding regions. These delayed-cooling zones are highly prone to shrinkage porosity.



POROSITY

As we can see, there is porosity within the riser pad and hole area, which indicates insufficient feeding and suggests that this area will likely experience shrinkage.



We have identified 5 improvement actions based on our observation.

1. Thick Section Identification
2. Request for Internal Design Modification
3. Feeder Design Optimization
4. Padding Implementation
5. Chill Placement

•**Thick Section Identification:** We have identified a thick section in the critical area of the casting that may cause potential defects or issues during solidification. See fig.1

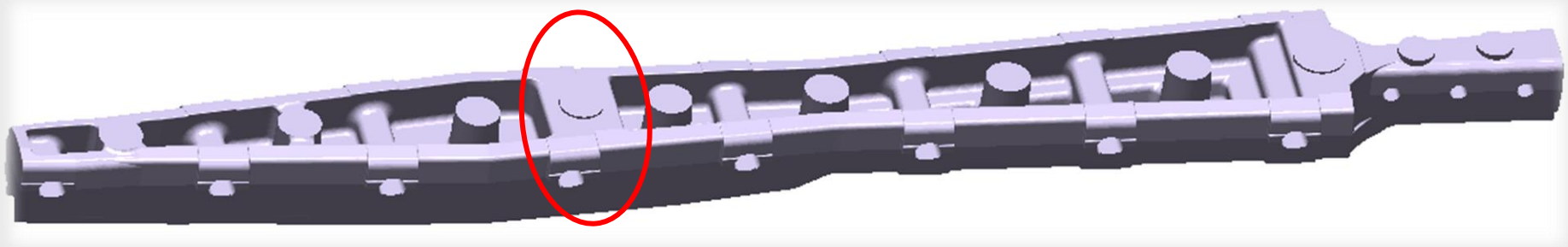


Fig.1

•**Request for Internal Design Modification:** We have requested the customer to modify the internal design to optimize flow and reduce the thickness in critical areas. See fig 2

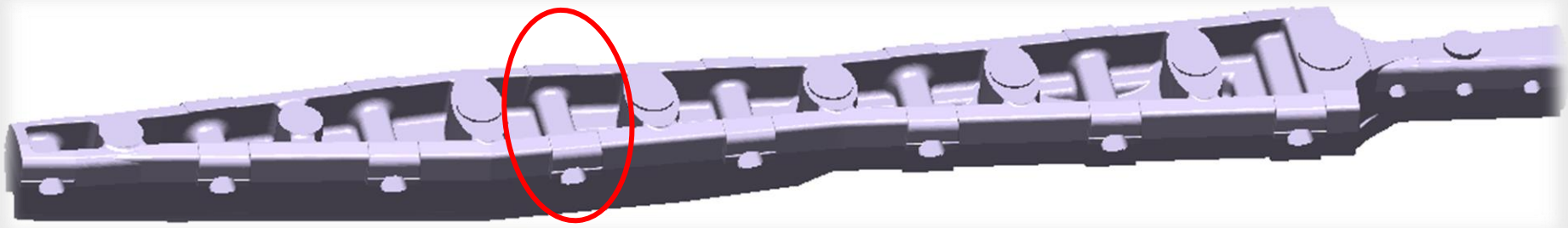


Fig.2

•**Feeder Design Optimization:** Transition the feeder geometry from a circular to an elliptical shape to enhance metal flow and improve feeding efficiency. See Fig 3

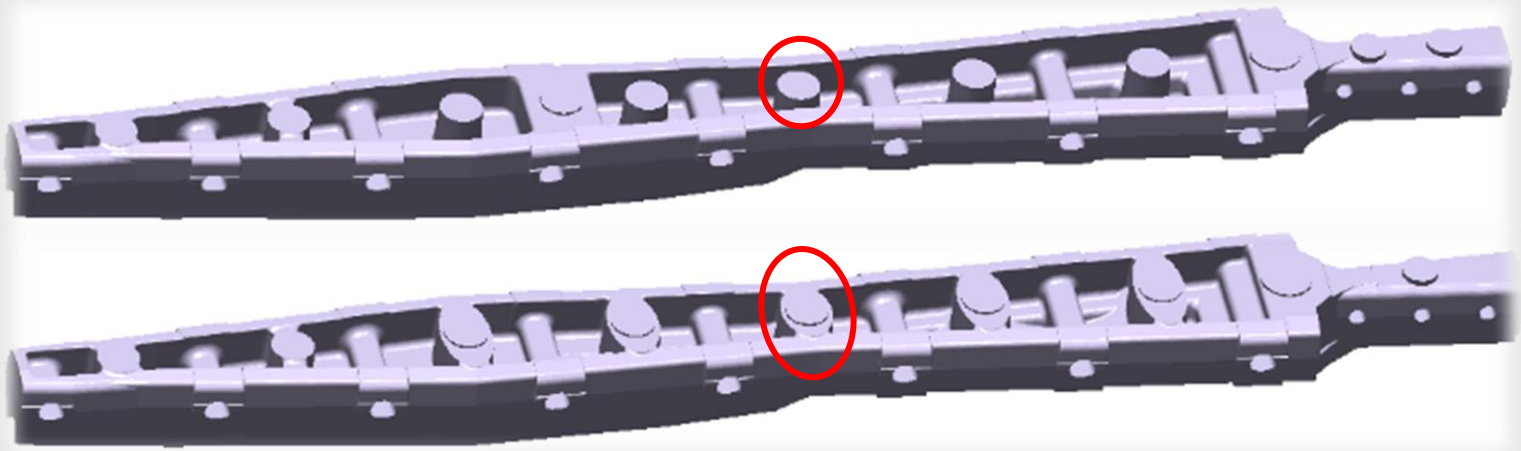


Fig.3

•**Padding Implementation:** Implement padding around the feeder to enhance feeding distance and promote uniform metal distribution. See Fig 4

Fig.4

•**Chill Placement:** A chill has been strategically placed to control cooling rates and reduce the risk of shrinkage defects in the casting. See Fig 5

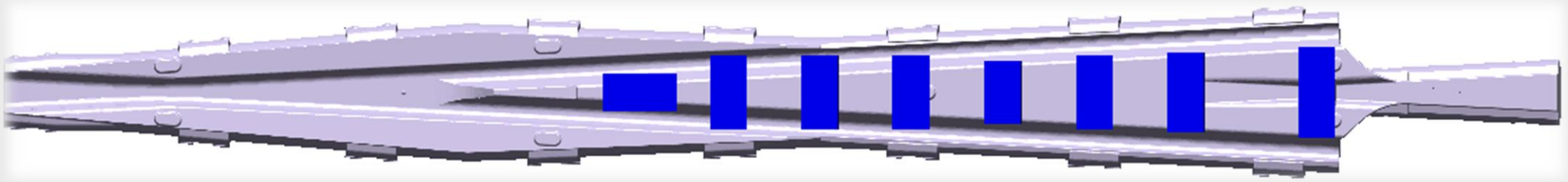


Fig.5

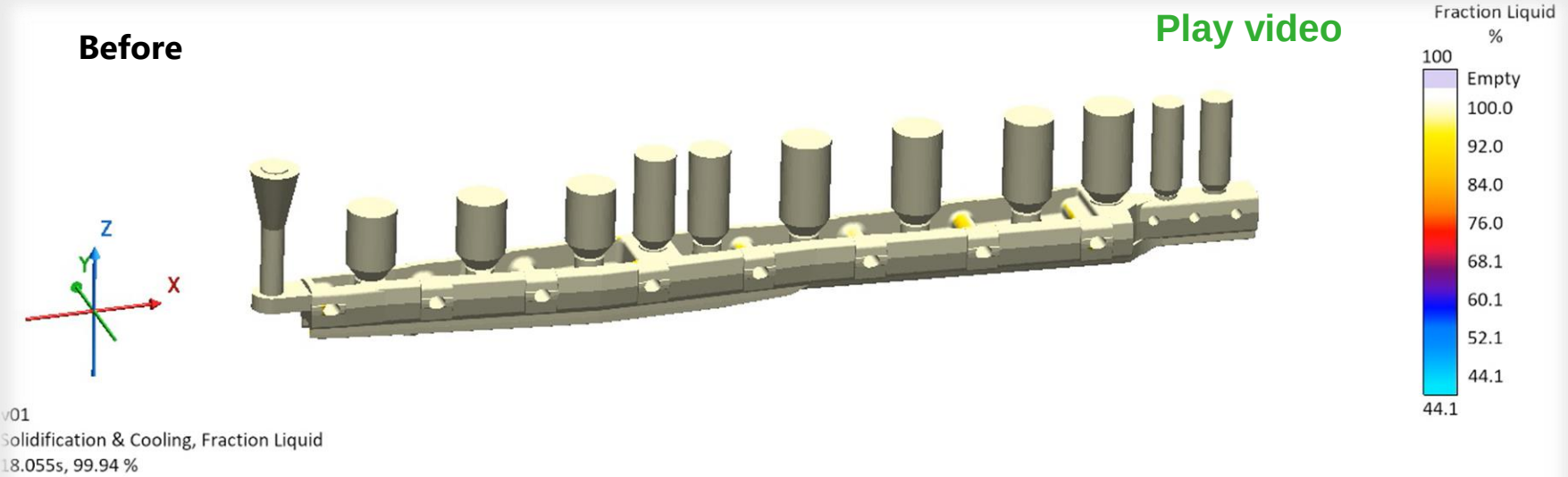
After taking all the necessary action.

FRACTION LIQUID

There is no isolation within the feeder pad.

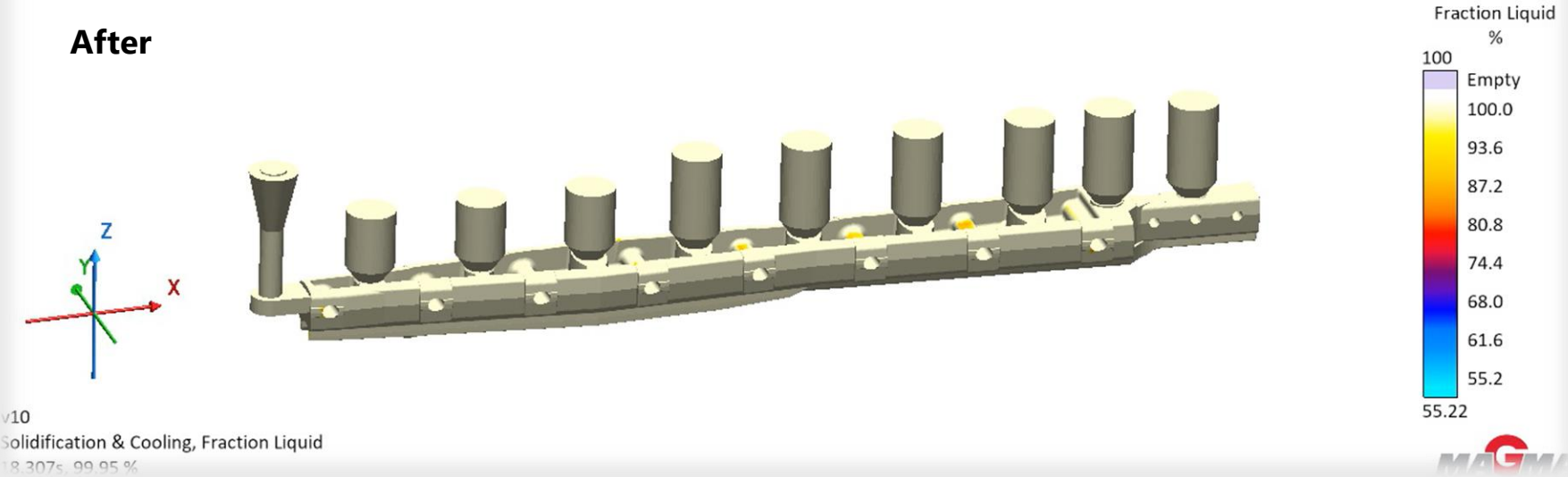
Before

Play video



v01
Solidification & Cooling, Fraction Liquid
18.055s, 99.94 %

After

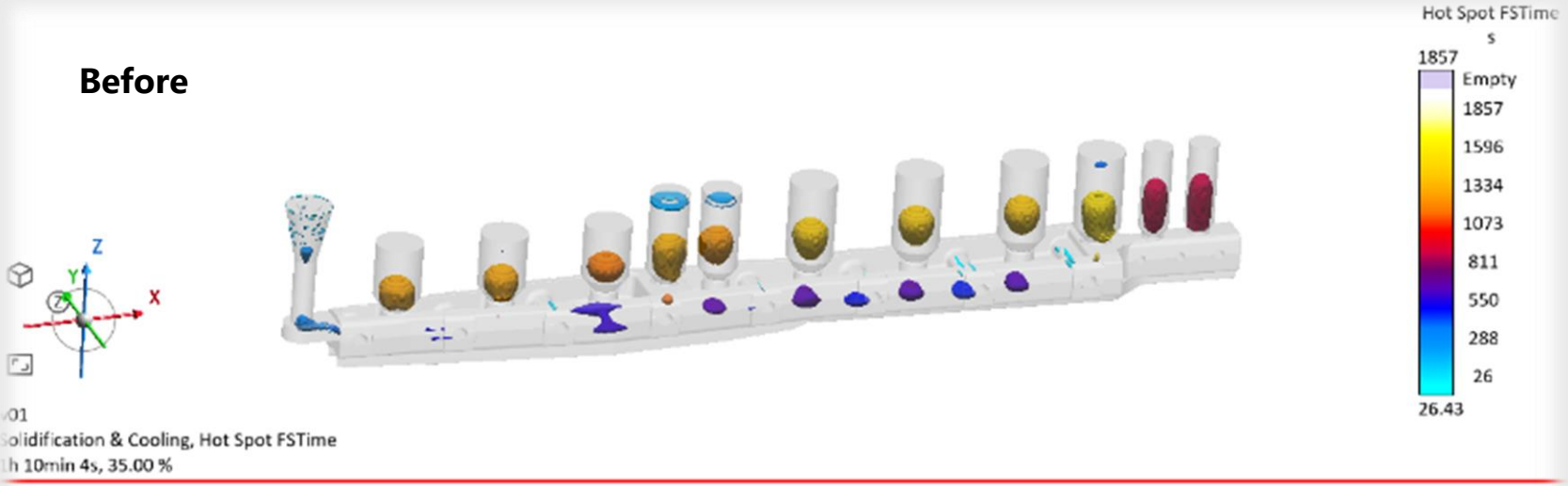


v10
Solidification & Cooling, Fraction Liquid
18.307s, 99.95 %

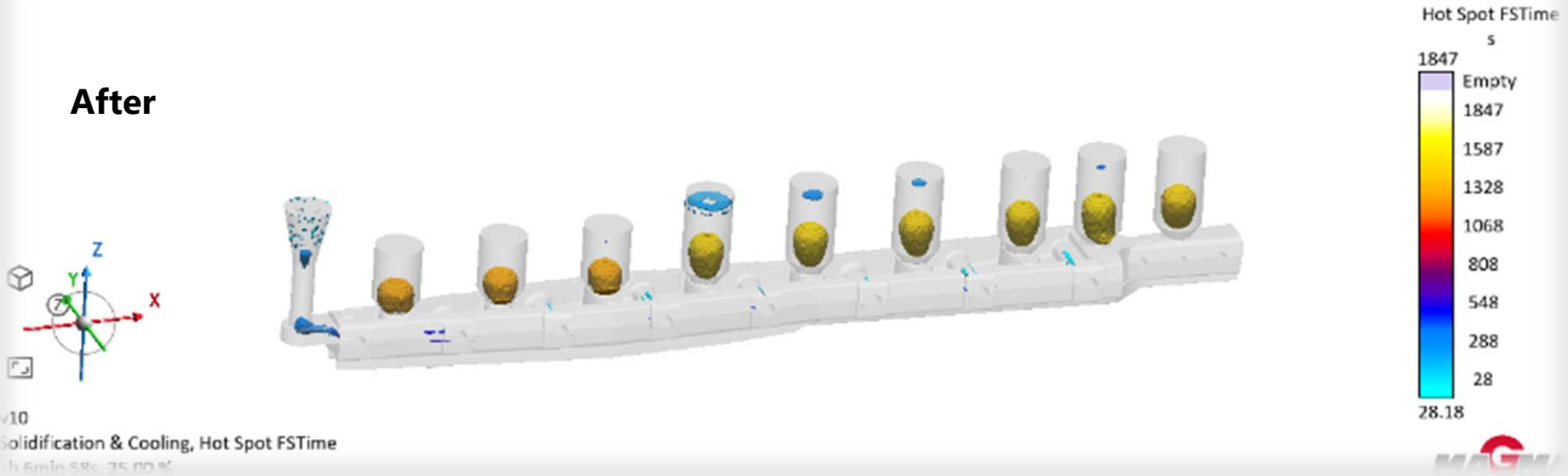
HOT SPOT FSTIME

There is hot spot zone in the casting.

Before

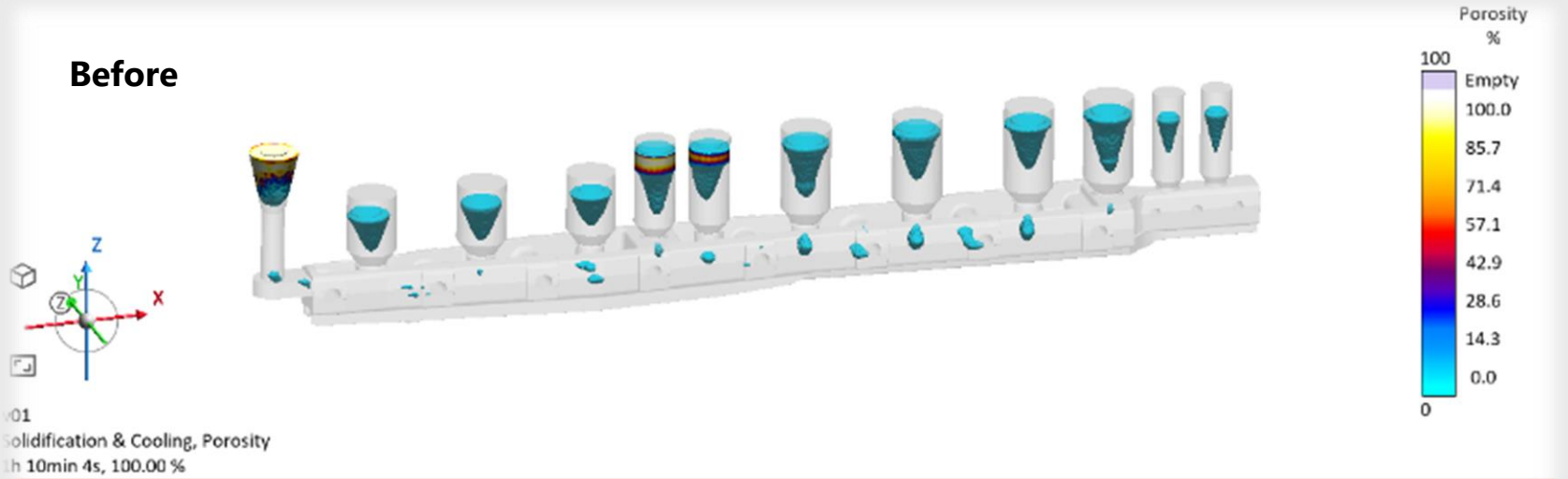


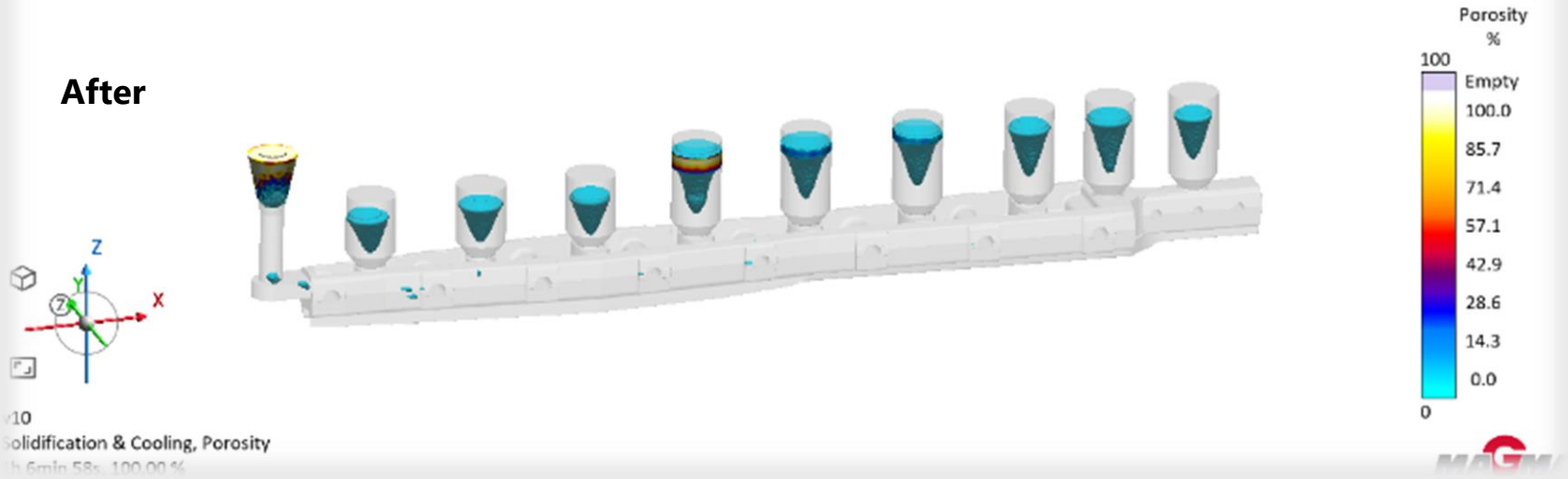
After



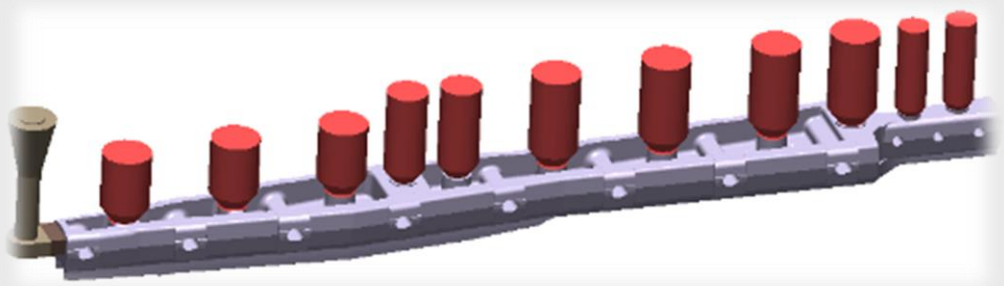
POROSITY

There is no porosity in the casting.



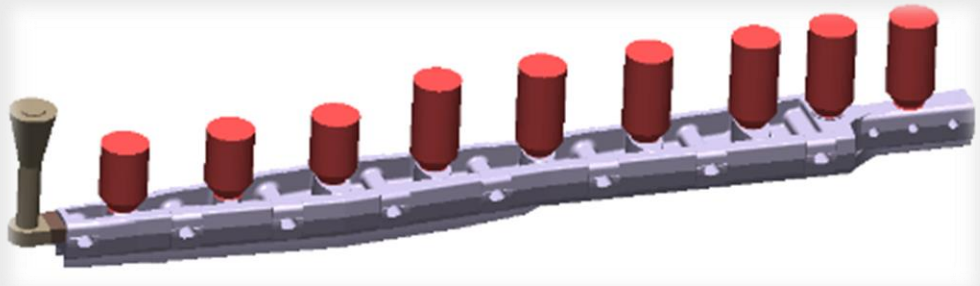


Before



- Gross weight - 800kg
- Cast weight - 475kg
- Yield - 59%

After



- Gross weight - 700kg
- Cast weight - 490kg
- Yield - 70%

Yield has improved from 59% to 70%. Defect levels have also been reduced, which means we now have better-quality castings.

THANK YOU