Dedicated to Diecasting Industry

ALUCAST®

ALUCAST® PARTNER IN PROGRESS FOR ALUMINIUM AND DIE CASTING INDUSTRY

Official Journal of Aluminium Casters' Association

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DEFECT ANALYSIS & REMEDIES IN DIE-CASTING

Inside

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IMPRINT

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Coimbatore	1	6	2	**9**
Delhi	20	45	12	**77**
Others	7	19	2	**28**
Overseas	5			**5**
Pune	20	79	29	**128**
TOTAL	**68**	**201**	**62**	**331**

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N. Ganeshan
Editor

Dear Readers,

Aluminum die casting is one of the most widely used manufacturing processes for producing complex and accurate metal components in industries such as automotive, aerospace, electrical equipment, and consumer products.

It provides advantages such as high production rate, excellent dimensional accuracy, smooth surface finish, and reduced machining requirements. However, despite these advantages, various defects may occur during the casting process, affecting product quality, strength, and appearance. Therefore, defect analysis and proper remedies are essential for maintaining quality and reducing production losses.

A major cause for defects in aluminum die casting arise due to inadequate control over process parameters, poor die design, improper molten metal handling, and machine-related problems. These defects can be classified into surface defects, internal defects, dimensional defects, and structural defects. Understanding the causes and remedies of these defects is important for achieving defect-free castings.

One of the most common defects in aluminum die casting is porosity. Porosity refers to small cavities or holes formed inside the casting due to trapped gases or shrinkage during solidification. Gas porosity occurs when air or gases get trapped in molten aluminum because of excessive injection speed, poor venting in the die, or moisture contamination. Shrinkage porosity occurs when insufficient molten metal is supplied during cooling and solidification. Porosity weakens the mechanical strength of castings and affects machining and surface finishing operations. Remedies include proper venting of dies, controlling injection speed, maintaining correct molten metal temperature, and using vacuum-assisted die casting techniques. Proper degassing of molten aluminum before pouring also helps reduce gas porosity.

Another frequently observed defect is cold shut. This defect appears as a visible line or crack on the casting surface where two streams of molten metal fail to fuse properly. Cold shuts are caused by low molten metal temperature, slow filling speed, or improper gate design. The defect reduces the strength and appearance of the component. To prevent cold shuts, the pouring temperature should be increased, the gating system should be improved, and die temperature should be regulated properly to ensure smooth metal flow.

Misruns are also common in aluminum die casting. A misrun occurs when molten metal solidifies before completely filling the die cavity, resulting in incomplete castings. This defect is caused by low pouring temperature, insufficient injection pressure, or thin casting sections. Misruns can be avoided by increasing molten metal temperature, improving die design, increasing injection pressure, and ensuring proper flow channels within the die.

Another important defect is flash, which refers to thin unwanted metal projections formed along the parting line of the die. Flash occurs due to excessive injection pressure, worn-out dies, or improper clamping force. Although flash can be removed by trimming, excessive flash increases production cost and material wastage. Remedies include maintaining proper clamping pressure, repairing worn die surfaces, and optimizing injection parameters.

Blisters are surface swellings caused by trapped gas expanding during heat treatment or subsequent machining operations. These defects occur when gas pockets remain beneath the casting surface. Blisters reduce the appearance and reliability of cast components. Proper venting, lower injection speed, proper degassing of molten metal before pouring and adequate cooling help reduce blister formation. Cracks and hot tears are structural defects that occur due to thermal stresses during solidification and cooling. Hot tears develop when the casting contracts unevenly while still in a semi-solid state. Improper die design, sharp corners, and uneven cooling rates are major causes of cracking. These defects can be minimized by providing smooth section transitions, uniform cooling, proper die lubrication, and controlled solidification rates.

Defect analysis in aluminum die casting involves systematic inspection and testing methods. Visual inspection is commonly used for identifying surface defects. X-ray radiography helps detect internal defects such as porosity and cracks. Ultrasonic testing, dye penetrant testing, and dimensional measurements are also used in quality control. Modern industries increasingly use computer simulation software to predict defects before actual production. Simulation helps optimize gate design, cooling channels, and process parameters, reducing trial-and-error methods and production costs.

Statistical quality control and process monitoring also play an important role in minimizing defects. Parameters such as metal temperature, die temperature, injection pressure, and cooling time should be continuously monitored and controlled. Proper operator training and preventive maintenance of machines and dies are equally important for ensuring consistent casting quality.

In conclusion, aluminum die casting is a highly efficient manufacturing process, but defects can significantly effect the quality and performance of cast products. Careful defect analysis and implementation of suitable remedies can improve productivity, reduce rejection rates, and enhance product reliability. With advancements in simulation technology, automation, and quality control systems, modern aluminum die casting industries are increasingly able to produce high-quality defect-free components for various engineering applications.

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High Pressure Die Casting (HPDC) Defects and Their Remedies: Causes, Classification, and Process Optimization

Jayesh M Rathod | Sr. General Manager & Head – Diecasting Dies Tooling | Godrej Enterprises Group

ABSTRACT

High Pressure Die Casting (HPDC) is a widely used manufacturing process for producing high-volume, precision metal components with excellent surface finish and dimensional accuracy. However, defects arising during casting can significantly affect quality, productivity, and cost. These defects originate from mechanical issues in the die, metallurgical inconsistencies in the alloy, and improper interaction between heat flow and fluid flow. This article presents a comprehensive review of common HPDC defects, their root causes, classification, and practical remedies for improving casting quality.

1. INTRODUCTION

High Pressure Die Casting has been continuously evolving by deploying everchanging technological advancements, be it cutting-edge process control with high end monitoring technologies, better understanding of rheology & newer alloys based on research in metallurgy, application of IIoT and digitalization. Despite its advanced capability, several defects occur due to improper process control, design limitations, or operational inefficiencies. Understanding defect mechanisms is crucial for achieving high-quality castings.

Defects in High Pressure Die casting can be broadly categorized into three primary sources:

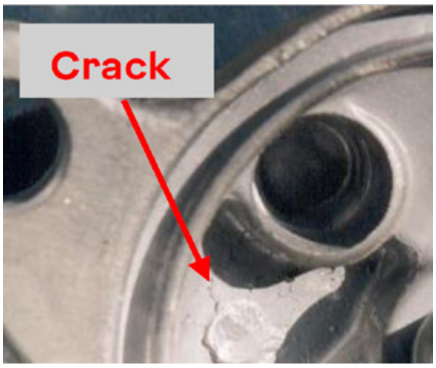
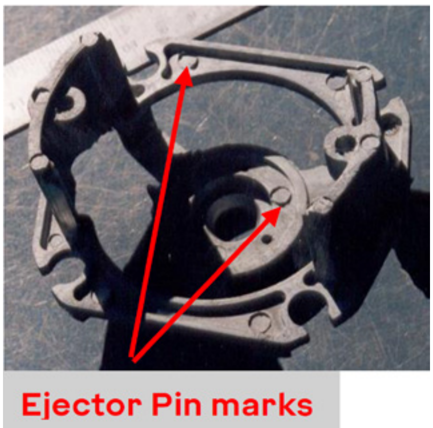
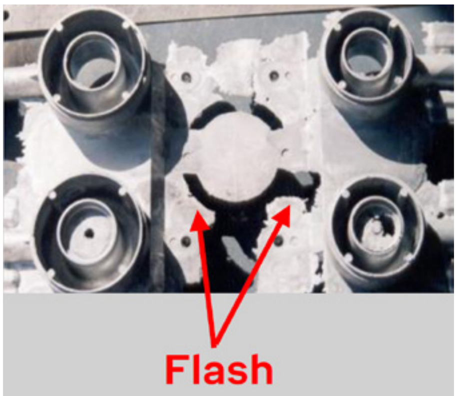
- Mechanical issues in the die
- Metallurgical defects in the alloy
- Interaction between heat flow and fluid flow

Each category contributes uniquely to casting imperfections and requires targeted remedies.

MECHANICAL DEFECTS IN DIE CASTING

Mechanical defects arise due to improper tooling design, misalignment, or poor maintenance of the die.

Common Mechanical Defects	Causes	Remedies
Drag marks, score marks, and galling 	Insufficient draft angle in the die	Provide adequate draft angles for easy ejection

Distortion or cracking of casting 	Poor ejector system alignment	Ensure proper alignment of ejector systems and cores
Ejector Pin Marks 	Improper slide/core alignment	Conduct preventive die maintenance
Flash formation 	Uneven tie bar settings Inadequate machine setup	Optimize die polishing and surface treatment Maintain uniform clamping force

Preventive maintenance remains the most effective strategy for minimizing mechanical defects.

METALLURGICAL DEFECTS

Metallurgical defects are caused by variations in alloy quality and molten metal handling conditions.

Major Contributing Factors	Typical Defects	Remedies
Alloy composition	Gas porosity	Maintain proper melt temperature
Dissolved gas content	Shrinkage porosity	Use degassing techniques
Entrained impurities (oxides, intermetallics)	Hot cracking	Filter molten metal to remove inclusions
Improper temperature control	• Die soldering • Poor fluidity	• Ensure correct alloy composition • Avoid excessive holding time

Effective metallurgical control improves casting density, strength, and surface finish.

INTERACTION OF HEAT FLOW AND FLUID FLOW

The interplay of molten metal flow and heat transfer inside the die significantly affects casting quality.

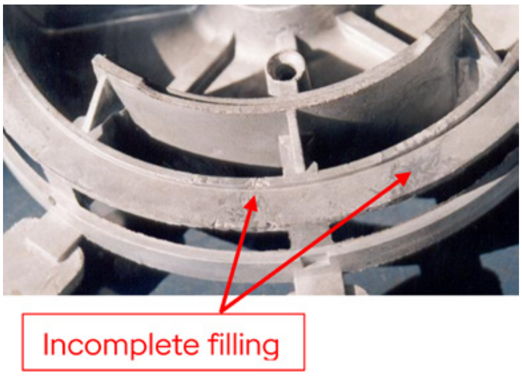
Common Issues	Causes	Remedies
Cold Shuts	• Poor gating and runner design • Low Die temperature	Optimize gating design for uniform flow
Flow lines	Shrinkage porosity	Use degassing techniques
Porosity defects	Improper cooling arrangement	Design proper cooling channels
Heat cracks and soldering	Uneven temperature distribution	Maintain controlled die temperature

DETAILED ANALYSIS OF KEY DEFECTS

Lack of Fill (Incomplete Filling)

Causes:
- Insufficient molten metal in shot sleeve
- Low die or metal temperature
- Slow injection speed
- Inadequate gate or runner design

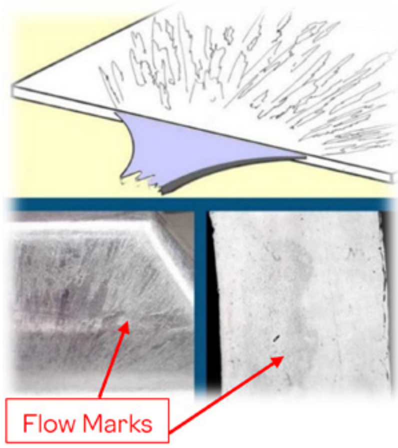
Remedies:
- Maintain proper molten metal level
- Increase die and metal temperature
- Optimize shot speed
- Improve gate and runner cross-section



Flow Marks (Flow Lines)

Causes:
- Low molten metal temperature
- Low die temperature
- Excess lubrication
- Poor overflow design

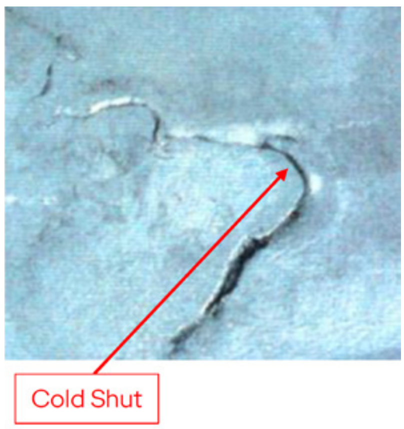
Remedies:
- Increase injection speed
- Reduce lubricant application
- Improve die temperature control
- Modify overflow and gating



Cold Shut

Causes:
- Meeting of two metal streams without proper fusion
- Low metal fluidity due to premature solidification
- Improper gating design
- Insufficient injection pressure

Remedies:
- Increase die and metal temperature
- mprove flow path design
- Increase injection pressure
- Reduce filling time



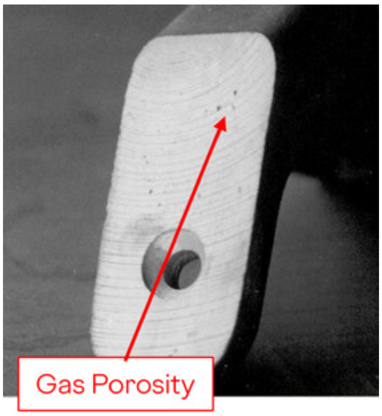
Gas Porosity

Causes:

- Entrapped air due to poor venting
- Excess lubricant or moisture
- Improper metal flow pattern
- Low shot sleeve filling

Remedies:

- Improve vent design
- Minimize lubricant usage
- Dry dies properly
- Optimize injection conditions



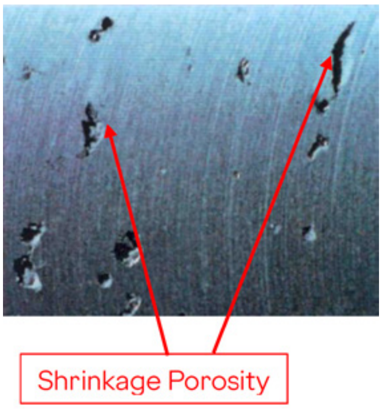
Shrinkage Porosity (Blowholes)

Causes:

- Thick casting sections
- Inadequate cooling
- Poor die temperature control
- Low injection pressure

Remedies:

- Improve cooling system design
- Maintain uniform die temperature
- Optimize pressure and solidification
- Modify casting design to avoid thick sections



PROCESS OPTIMIZATION STRATEGIES

To minimize defects, the following process improvements are recommended:

- Design Optimization: Proper gating, runner, and vent design
- Thermal Control: Maintain stable die and metal temperatures
- Machine Parameters: Optimize shot speed and pressure
- Material Handling: Ensure clean and properly treated molten metal
- Maintenance: Regular inspection of dies and equipment

CONCLUSION

Defects in pressure die casting are inevitable but can be significantly reduced by understanding their root causes and implementing systematic corrective actions. Mechanical, metallurgical, and thermal-flow factors must be controlled holistically to ensure defect-free castings. By adopting optimized design practices, proper process control, and preventive maintenance, manufacturers can achieve improved product quality, reduced rejection rates, and enhanced operational efficiency.

All Case studies – Courtesy - Tooling, Godrej Enterprises group, Mumbai
Image courtesy – Published articles & journals in public domain

Jayesh M Rathod
Sr. General Manager & Head
– Diecasting Dies Tooling
Godrej Enterprises Group

ALUCAST® 2026

INTERNATIONAL EXHIBITION & CONFERENCE - ALUMINIUM DIE-CASTING
YASHOBHOOMI, DWARKA, NEW DELHI | 10TH - 12TH DECEMBER 2026

SHAPING THE FUTURE OF DIE CASTING: AI, TRENDS AND TECHNOLOGIES

Papers are invited for the Technical Conference on the suggested topics:

Sr. No.	Suggested Paper Topics
1	Nano Particles in Alloys
2	AI in Diecasting - Hope, Hype or High ROI?
3	Rheocasting
4	Thixomolding
5	Use of Alternate Materials such as Magnesium Alloys for Light weighting solutions in Die Casting applications
6	AI in defect analysis, testing and Statistical quality control
7	Application of AI in energy Conservation
8	AI assisted low cost automation for MSME
9	AI-Driven Process Optimization in Die Casting
10	Smart Foundries: Integrating AI with Industry 5.0 in Die Casting
11	Predictive Maintenance of Die Casting Machines Using AI
12	Smart Sensors and IoT for Real-Time Monitoring of Die Casting Operation
13	Data Analytics through AI for Process Control in Die Casting
14	Workforce Transformation: Skills Needed for the AI-Driven Foundry
15	Reducing Porosity and Defects Using AI-Based Monitoring

Timelines:

- **Abstract Submission Date:** 20th June 2026
- **Full Paper Submission Date:** 31st July 2026
- **Approval & Confirmation Date:** 15th September 2026

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Contact for Paper Submission: **Ms.Vidhi Daryanani**
Abstract to be submitted on alucastindia@alucast.co.in

Common Casting Defects when using sand cores In Aluminium Die casting

B.B. Lohiya | Director | Compax Industrial Systems Pvt. Ltd.

Sand cores are used commonly in Gravity die casting and Low Pressure Die casting processes of producing Aluminum castings besides the Sand casting method. They create cavities of desired shape and size in the castings where use of permanent metallic core is not feasible.

With increasing demand for Aluminium castings, the use of sand cores – which are consumable in nature, is also rising. These sand cores are produced with different binder systems that use organic and inorganic compounds for various purposes like Higher core strength, faster production rates, ease of de-coring etc. The quality of the cores is important to achieve high quality of casting production with minimal casting rejection.

The chemicals involved in core production stage will influence the strength, Shelf life , dimensional accuracy & the shake out properties. More importantly, they may also evolve gases during the casting stage. This will cau some use defects in the castings that fect the casting quality as well as casting reliability.

Over the years, the Quality norms & standards of the castings are continually being upgraded and becoming more stringent as we aim for thin walled castings with good surface finish & dimensional accuracy besides higher casting strength.

The stringent emission norms and increasing stress on ESG (Environmental Social Governance) practices during Aluminium casting production, result in a need to assess the impact of the sand cores on the quality of these castings and to plan remedial actions to avoid the potential casting defects. This is also important for optimizing the casting manufacturing cost

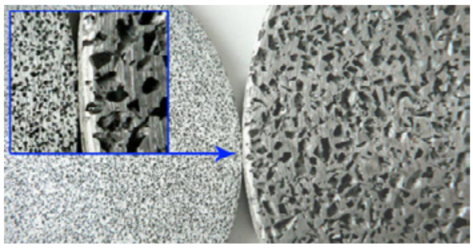
Some common casting defects and quality issues related to use of sand cores for producing Aluminium castings are :

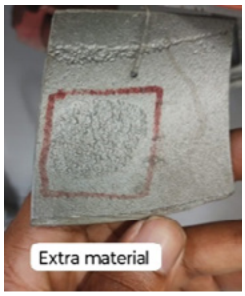
- Surface Roughness & Finish
- Blow holes. Porosity and pin holes on surface
- Sand inclusion
- Dimensional Inaccuracy of the cavities

SURFACE FINISH

The surface finish of the casting cavity depends on the core surface finish which in turn depends on the surface finish of the core box cavity, quality of sand. Sand grain fineness and the core manufacturing process. Good surface finish is achieved by using sand with uniform shape & size of sand grains with peaky sand distribution, tooling with good finish of the cavity surface and good core making equipment. Finer sands result in better surface finish.

High core strength ensures that the core surface is not disturbed during metal flow, erosion does not take place, molten metal does not penetrate in the core and prevents surface roughness. Low core strength can result in erosion of sand core surface resulting in uneven casting surface and extra metal deposition.

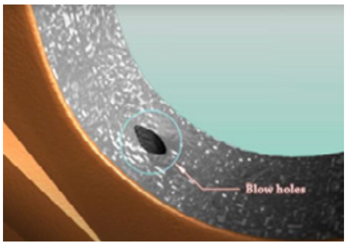




Cores produced with shell process or cold box process render better casting surfaces compared to those produced by other processes as a result of their higher core strength.

BLOW HOLES, POROSITY & PIN HOLES ON SURFACE

Binders used in core making evolve gases on decomposition of organic material, when subjected to heat during metal poring. The amount of the evolved gases depends on the binder type and binder levels used. These gases can get entrapped in the casting during solidification of molten metal, to cause porosity or blow holes in the inside layers of the casting, if the evolved gases fail to move out of the molten metal before solidification.

Any moisture in the sand core can also lead to similar condition.

If any of the decomposed organic materials and residual moisture interreact with the molten Aluminium to release Hydrogen or form oxides, it can lead to surface pin holes or blisters. Traces of amine if left in a cold box core, an also come to the surface to create pin holes.

Therefore. it is always advisable to use lesser binder levels. Inorganic binders using CO 2 gas for curing, result in minimum gas evolution (only additives evolve gases) but exhibit poor shake out properties.

Cold box process has the least amount of. gases when compared to other organic binder systems. Of late Cold Box binders have been developed with good strength development at lower binder levels and also have good de-coring properties, Some New Inorganic binder systems wtih water soluble components have been developed that show good results with ease of de-coring and sand reclamation.

Core sand with better permeability helps faster release of gases from the core. Therefore, judicious selection of core making process, binder levels, sand type, proper venting of core boxes and dies can help to minimize such defects.

The Blow holes could take the shape of rounded or elongated holes often close to the casting surfaces or thick core sections. The Pin holes may be visible on the surface. Internal porosity can be detected only by use of X Ray . Such defects are many times visible only during machining stage.

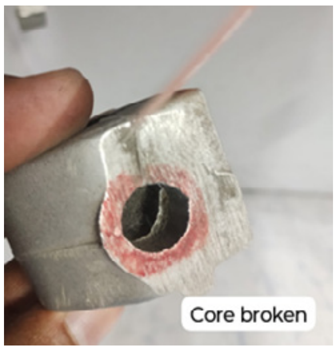
SAND INCLUSION

The sand core needs to have good strength when being used at the casting stage. High strength of the core will not only prevent metal penetration in the core when molten metal is poured, but will also protect the core surface from erosion and avoid loosening of sand grains doe to weakened bond between sand particles. Loose sand particles may get entrapped in the molten metal or form metal sand fusion. This results in castings with embedded sad particles or rough surfaces and many times comes to light only at the machining stage. Sometimes the core geometry itself may result in a turbulent molten metal flow during metal filling and cause erosion of the core surface or loosening of sand grains. This will result in sand inclusion defect in the casting during solidification.

Refractory coatings on core surfaces are often employed to take care of such issues. While it is necessary that the core is strong enough to resist such erosion and loosening of the sand particles, the core sand used for such cores should also be free from fines. Otherwise, the fines will appear on the core surfaces during core shooting. They have poor adhesion and may get detached from core surface during core placing, thus causing sand inclusion / sand drop or get mixed up with core coating to make the core surface rough.

DIMENSIONAL INACCURACY OF THE CAVITIES

The casting cavity is replica of the sand core.. It assumes the dimensions of the core. Therefore, it is of prime importance that care is taken to see that the sand core itself is perfect. Mismatch of Tooling , worn out dowels, Improper machine alignments result in cores that are dimensionally inaccurate and cause inaccuracies of the casting cavity dimensions.



The core has to be placed properly and supported correctly in the Die so that it remains stable during metal pouring & solidification. . Any improper placement / improper support will result in dimensional variations attributed to "Core shift" defect.

Thus maintenance of the tooling either for core making or Die casting, assumes importance and needs periodical checks.

It can be observed that common causes of most of the defects are: Poor core strength / sand erosion , improper coating, Moisture in sand, Gas evolution from Binders, Improper venting, Improper Tooling maintenance, Turbulent filling etc.

Aluminium castings like Cylinder heads, water jackets, EV components, structural castings etc. are increasingly in demand now. T these castings have stringent requirements for critical parameters like surface finish, dimensional accuracy & Mechanical strength. Sand cores are commonly used in these castings. Besides, their cavities have complex designs. Hence care has to be taken at every stage from design of the tooling, selection of the core making process, selection of sand & Binders, core making equipment etc. up to the casting stage so that the various defects commonly experienced as described above are avoided. This will increase reliability & quality of the casting production with minimal rejection rates and will lay the foundation of sustained growth for the casting producers.

B.B Lohiya
Director
Compax Industrial Systems Pvt. Ltd., Pune

ALUCAST ACTIVITY REPORT: APRIL - MAY 2026

1.INDUSTRY STUDY VISIT IN PUNE TO GABRIEL INDIA LIMITED AND FANUC INDIA PVT. LTD.

Date : Thursday 02nd April 2026

Key Discussion Areas:

- Provided first-hand exposure to advanced manufacturing practices at Gabriel India Limited and automation solutions at FANUC India Pvt. Ltd.
- Offered insights into quality systems, productivity enhancement, and innovation in real-time industrial environments
- Enabled understanding of robotics and smart manufacturing applications
- Created opportunities for networking and peer learning

2. IN-PERSON SEMINAR ON ENERGY SAVING SERVO SOLUTIONS FOR ALUMINIUM PRESSURE DIE-CASTING MACHINES (ALUCAST INDIA IN ASSOCIATION WITH BHARAT BIJLEE LTD)

Date: Friday, 17th April 2026
Time: 06:00 PM – 07:30 PM
Venue: Radisson Hotel, Sector 29, Gurugram
Speaker: Mr. Sanjay Shah, DGM – Business Development, Bharat Bijlee Ltd.

AND

Date: Friday, 15th May 2026
Time: 06:00 PM – 07:30 PM
Venue: The Residency Towers, T-Nagar, Chennai
Speaker: Mr. Sanjay Shah, DGM – Business Development, Bharat Bijlee Ltd

Key Discussion Areas:

- Technical session & case study with ROI
- ADEETIE scheme insights
- Interactive Q&A
- Reduce Power Cost & Improve ROI
- Real Case Studies with up to 55% Energy Savings
- Payback Period: 12–18 Months
- Networking with Industry Experts

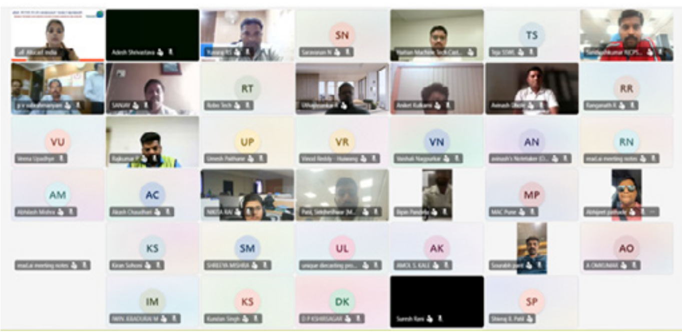
3. LEAPING FORWARD IN DIE CASTING : PRECISION MACHINES, SMART AUTOMATION & ADVANCED DIE COAT SOLUTIONS (ALUCAST INDIA IN ASSOCIATION WITH HAITIAN DIE CASTING & MACHINE TECH.)

Date: Wednesday, 22nd April 2026
Time: 03:00 PM – 04:00 PM IST
Platform: Microsoft Teams

Speakers:
1. Mr. Abhayakumar Akkolkar – Managing Partner, Galaxy Equipments & Machineries
2. Mr. Vaibhav Karmarkar – Business Head, Machine Tech
3. Mr. Deepak Kasbe – Partner & CTO, Castshield Tech LLP

Key Highlights:

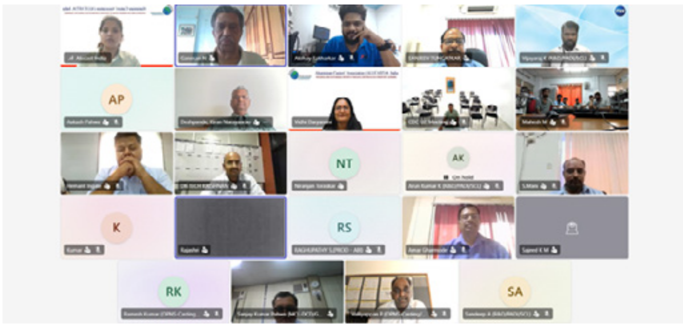
- Haitian Die Casting Machines
- Machine Tech Make Automations
- Premium Die Coats – GDC & LPDC Process



4. FUNDAMENTALS OF ALUMINUM ALLOYS & HEAT TREATMENT

Date: Wednesday, 29th April 2026
Time: 03:00 PM to 05:00 PM IST
Platform: Microsoft Teams
Speaker: Mr. Ganeshan Natarajan, Trustee & Editor of ALUCAST Journal

Key Highlights :
- Introduction to Aluminum Alloys
- Properties of Alloying Elements
- Basics of Heat Treatment in Aluminum



5. BUILDING AI DEFECT RECOGNITION FOR INDUSTRIAL RADIOGRAPHY IN DIE CASTING–A DATA-FIRST APPROACH TO ANNOTATION, TRAINING, AND MEASUREMENT

Date: Wednesday, 27th May 2026
Time: 10:00 AM – 12:00 NOON IST
Platform: Microsoft Teams
Speaker: Mr. Adith Muralidharan, M.Tech (Robotics & Autonomous Systems), IISC Bangalore, Junior Research Engineer, VJ Imaging Technologies Pvt. Ltd.

Key Highlights:
- Role of data quality in AI defect recognition
- Annotation strategies for accurate defect detection
- Handling edge cases & real-world production challenges
- Measuring and improving AI model performance

Contribute Articles for ALUCAST Journal

Themes for the year 2026

August 2026	Cost Optimisation in Aluminium Casting Process
October 2026	Productivity Improvement in Die-Casting
December 2026	ALUCAST 2026 Special

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Quarter Page	Width 90mm X Height 135mm (non-bleed)
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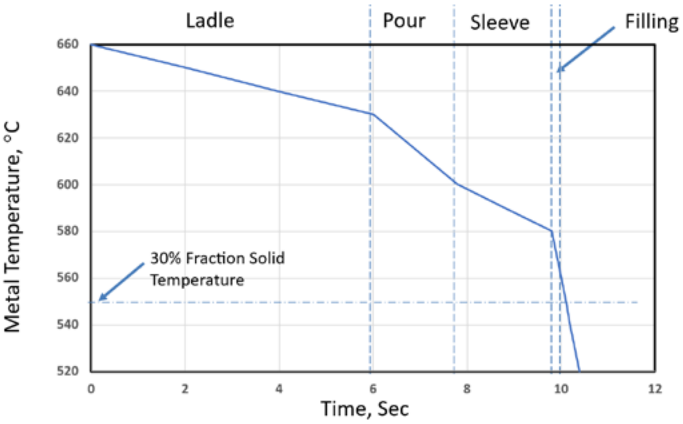
Integrated approach to casting defect resolution

Rajesh Aggarwal | Founder | TechSense Engineering Services

INTRODUCTION

High pressure die casting process is driven by fundamentals of Heat transfer and Fluid Aluminium castings made thru HPDC process are basically porous structures with air mixed in the liquid metal, hence it can not be free of porosity or internal defects but can be minimized close to elimination. The question remains whether the defect is acceptable or not as per the product requirement.

High pressure die casting process is driven by fundamentals of Heat transfer and Fluid mechanics. As the HPDC process is very dynamic and constantly changing, the metal filling in the cavity and solidification process goes hand in hand which makes it more complex to understand and create defects related to filling and solidification.



Mapping of metal temperature of a typical HPDC Cycle for ADC 12 alloy

The liquid metal once leaves the Holding furnace, it continuously looses heat. It can not regain the melt temperature even though addition of fresh hot metal may increase the metal temperature slightly but not up to the Holding furnace temperature.
This indicates that the whole process is very much dependent on the temperature conditions in and around the process.

Various temperature conditions in the process:

1. Liquid Metal temperature in the melting furnace
2. Liquid metal temperature in the holding furnace
3. Ladle cup temperature
4. Shot sleeve temperature
5. Plunger tip temperature
6. Die surface temperature (after spray)
7. Cooling water temperature
8. Hot oil temperature (in case of Thermoregulation application).
9. Casting ejection temperature
10. Heat input from the liquid metal
11. Heat output from the die by internal cooling, spray and other enviornmental conditions

IMPACT OF TEMPERATURE CONDITIONS

The more the metal temperature drops during filling, more the risk of metal start to freeze before cavity filling. This will lead to:

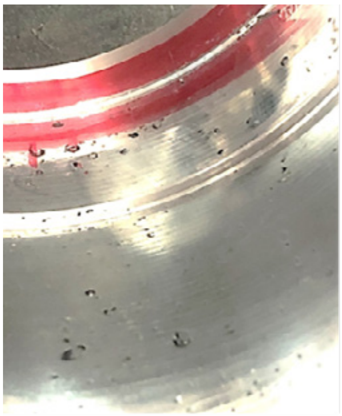
- Non filling in the casting
- Lack of intensification impact

Both these phenomena go hand in hand and affect each other. Non filling leads to visual casting defects before and after machining. Lack of intensification impact results in more internal defects like shrinkage porosity and gas porosity.

CASE STUDY

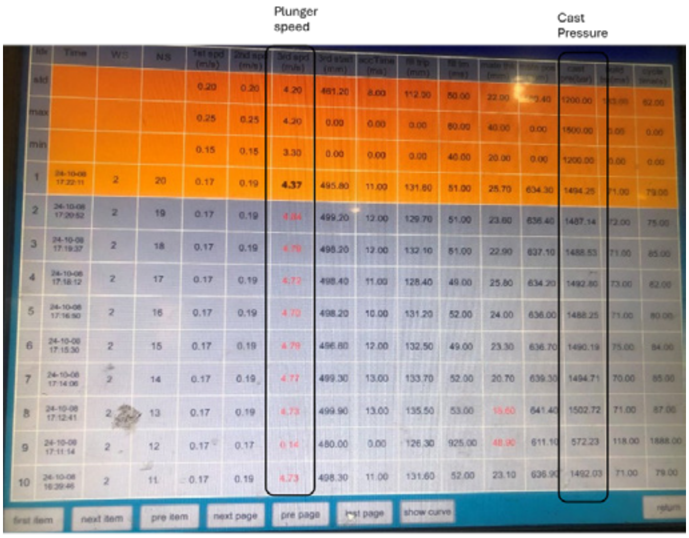
The average porosity rejection for the subject part is 7%. Porosity rejection increased to 18% due to some variables in the process. To overcome the rejection, Phase 2 plunger speed and casting pressure were increased.

This led to more unstable process. Some time the rejection is less, some time it is increased multifold. Rejection varied between 7% ~30%. The increased plunger speed further leads to soldering in the die due to very high gate speed.



Gas Porosity

Soldering

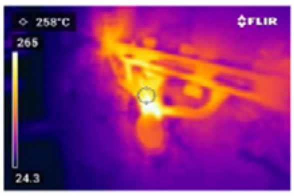


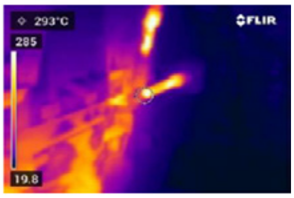
Increased parameters

THE ROOT CAUSE ANALYSIS FOR REJECTION

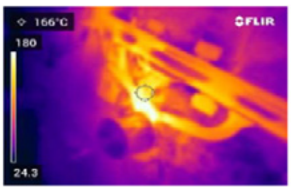
1. Die temperature too low: Increasing the Plunger speed reduced the fill time and compensate for the low temperature up to some extent but render the process unstable. At the same time due to reduced fill time, the venting area requirement is increased which is not feasible to increase in the die or in the process during production. The risk of gas entrapment is increased leading to more porosity with unstable process.
a. Die temperature before spray in the range of 150~250 DegC
b. Die temperature after spray in the range of 110 ~190 DegC

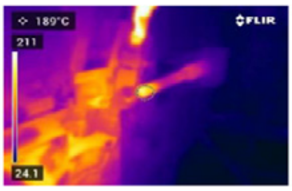
2. Addition of manual spray: As the standard spray not able to cover the entire casting region. This leads to an interrupted production cycle and variation in die temperature.





Before spray





After spray

Actions taken

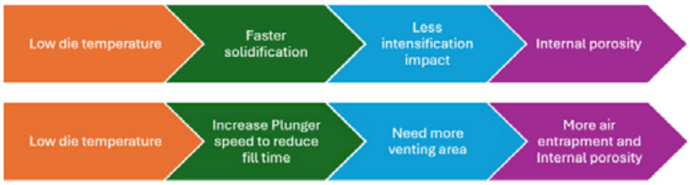
The production cycle was optimized by minimizing the manual spray. The production parameters were restored. Even though the casting pressure is still on the higher side and need further reduction. The die temperature was stabilized to the maximum.

The casting rejection was brought back to average porosity rejection below 7%. Following actions were taken to further reduce the porosity rejection:
1. Customized spray head to cover the entire region of the casting
2. Optimize the spray cycle to minimize the water retention in the die and run the die in dry condition.

Optimized parameters

CONCLUSION

The above case study helps to understand the impact of die temperature variation in the process due to various factors and its impact on the casting rejections.



In both the above scenarios, the porosity rejection will remain as long as the root cause of low die temperature is not resolved.

Hence to achieve defect free castings It is very important to ensure the stable die temperature during the process.

Rajesh Aggarwal
Founder, **TechSense Engineering Services**

Summary Report: Cumulative Production, Domestic Sales & Exports data for the period of April-March 2026									
Report I - Number of Vehicles									
Category	Production			Domestic Sales			Exports		
Segment/Subsegment	April-March			April-March			April-March		
	2024-25	2025-26	% Change	2024-25	2025-26	% Change	2024-25	2025-26	% Change
Passenger Vehicles (PVs)*									
Passenger Cars	17,49,506	18,26,441	4.4%	13,53,287	13,78,771	1.9%	3,98,879	4,49,279	12.6%
Utility Vehicles(UVs)	31,55,312	35,40,772	12.2%	27,97,229	31,05,025	11.0%	3,62,190	4,45,152	22.9%
Vans	1,56,346	1,71,902	9.9%	1,51,332	1,59,643	5.5%	9,325	10,769	15.5%
Total Passenger Vehicles (PVs)	**50,61,164**	**55,39,115**	**9.4%**	**43,01,848**	**46,43,439**	**7.9%**	**7,70,394**	**9,05,200**	**17.5%**
Commercial Vehicles (CVs) - M & HCVs									
Passenger Carrier	71,380	84,860	18.9%	67,307	67,149	-0.2%	11,241	16,874	50.1%
Goods Carrier	3,23,441	3,73,646	15.5%	3,07,491	3,55,849	15.7%	12,015	16,829	40.1%
Total M&HCVs	**3,94,821**	**4,58,506**	**16.1%**	**3,74,798**	**4,22,998**	**12.9%**	**23,256**	**33,703**	**44.9%**
Commercial Vehicles (CVs) - LCVs									
Passenger Carrier	65,550	65,084	-0.7%	54,807	61,597	12.4%	4,889	4,656	-4.8%
Goods Carrier	5,74,576	6,46,560	12.5%	5,29,074	5,95,276	12.5%	52,606	56,434	7.3%
Total LCVs	**6,40,126**	**7,11,644**	11.2%	**5,83,881**	**6,56,873**	12.5%	**57,495**	**61,090**	6.3%
Total Commercial Vehicles (CVs)	**10,34,947**	**11,70,150**	**13.1%**	**9,58,679**	**10,79,871**	**12.6%**	**80,751**	**94,793**	**17.4%**
Three Wheelers									
Passenger Carrier	9,05,821	11,46,571	26.6%	6,01,642	6,88,477	14.4%	3,03,141	4,55,440	50.2%
Goods Carrier	1,21,195	1,34,955	11.4%	1,17,156	1,29,288	10.4%	3,739	5,102	36.5%
E-Rickshaw	18,715	13,905	-25.7%	18,474	13,009	-29.6%	34	24	-29.4%
E-Cart	4,289	5,374	25.3%	4,148	5,457	31.6%	-	1	-
Total Three Wheelers	**10,50,020**	**13,00,805**	**23.9%**	**7,41,420**	**8,36,231**	**12.8%**	**3,06,914**	**4,60,567**	**50.1%**
Two Wheelers									
Scooter/ Scooterette	74,37,681	87,19,739	17.2%	68,53,214	81,17,945	18.5%	5,69,093	6,82,931	20.0%
Motorcycle/Step-Throughs	1,59,22,027	1,74,44,978	9.6%	1,22,52,305	1,30,64,789	6.6%	36,20,886	44,76,516	23.6%
Mopeds	5,24,149	5,27,199	0.6%	5,01,813	5,23,240	4.3%	8,424	20,982	149.1%
Total Two Wheelers	**2,38,83,857**	**2,66,91,916**	**11.8%**	**1,96,07,332**	**2,17,05,974**	**10.7%**	**41,98,403**	**51,80,429**	**23.4%**
Quadricycle									
Quadricycle	6,488	6,998	7.9%	120	4	-96.7%	6,422	6,696	4.3%
Grand Total of All Categories	**3,10,36,476**	**3,47,08,984**	**11.8%**	**2,56,09,399**	**2,82,65,519**	**10.4%**	**53,62,884**	**66,47,685**	**24.0%**

* BMW, Mercedes, JLR and Volvo Auto data are not available ** Daimler data is not available - Society of Indian Automobile Manufacturers (14/04/2026)

Summary Report: Production, Domestic Sales & Exports data for the month of April 2026									
Report I - Number of Vehicles									
Category	Production			Domestic Sales			Exports		
Segment/Subsegment	April			April			April		
	2025	2026	% Change	2025	2026	% Change	2025	2026	% Change
Passenger Vehicles (PVs)*									
Passenger Cars	1,35,819	1,46,552	7.9%	91,148	1,20,945	32.7%	27,947	31,335	12.1%
Utility Vehicles(UVs)	2,41,581	2,80,446	16.1%	2,01,062	2,44,280	21.5%	31,115	35,289	13.4%
Vans	11,854	12,261	3.4%	11,438	13,087	14.4%	333	684	105.4%
Total Passenger Vehicles (PVs)	**3,89,254**	**4,39,259**	**12.8%**	**3,03,648**	**3,78,312**	**24.6%**	**59,395**	**67,308**	**13.3%**
Three Wheelers									
Passenger Carrier	67,252	96,260	43.1%	40,167	52,655	31.1%	27,278	50,471	85.0%
Goods Carrier	8,513	11,571	35.9%	8,135	11,806	45.1%	246	182	-26.0%
E-Rickshaw	571	215	-62.3%	830	728	-12.3%	-	1	-
E-Cart	267	415	55.4%	309	479	55.0%	-	1	-
Total Three Wheelers	**76,603**	**1,08,461**	**41.6%**	**49,441**	**65,668**	**32.8%**	**27,524**	**50,655**	**84.0%**
Two Wheelers									
Scooter/ Scooterette	6,48,633	8,27,750	27.6%	5,48,370	6,91,993	26.2%	53,879	80,810	50.0%
Motorcycle/Step-Throughs	11,66,462	15,02,645	28.8%	8,71,666	11,38,452	30.6%	3,13,008	4,26,499	36.3%
Mopeds	37,771	43,192	14.4%	38,748	42,246	9.0%	1,314	1,890	43.8%
Total Two Wheelers	**18,52,866**	**23,73,587**	**28.1%**	**14,58,784**	**18,72,691**	**28.4%**	**3,68,201**	**5,09,199**	**38.3%**
Quadricycle									
Quadricycle	211	1,120	430.8%	3	-	-	210	966	360.0%
Grand Total of All Categories	**23,18,934**	**29,22,427**	**26.0%**	**18,11,876**	**23,16,671**	**27.9%**	**4,55,330**	**6,28,128**	**38.0%**

* BMW, Mercedes,JLR, Tata Motors and Volvo Auto data is not available - Society of Indian Automobile Manufacturers (14/05/2026)

Reflections from the Foundry Floor...

Pillar 1 – Column 3

The 4M Strength Behind Successful Die Casting

In die casting, discussions often revolve around machines, alloys, cycle times, and productivity.
But over years on the shop floor, one truth becomes increasingly clear:

Successful die casting is not built by a single factor.
It is sustained by the strength of four interconnected elements.

THE 4MS:

- **Machine Health**
- **Mould Health**
- **Mental Strength**
- **Method Strength**

When all four remain strong, stability follows naturally.

When even one weakens, the process begins to drift.

1.Machine Health

The heartbeat of consistency

A die casting machine does far more than inject metal.

It controls rhythm.

Pressure, Repeatability, Timing.

A machine may still run while slowly losing stability.

Hydraulic fluctuations.

Oil temperature variation.

Wear in tie bars.

Accumulator inconsistency.

Sensor drift.

None of these may stop production immediately.

But each one slowly affects casting quality.

In many foundries, maintenance begins after breakdown.

World-class foundries think differently.

They protect machine health before failure appears.

Because a healthy machine does not simply produce more castings…

It produces predictable castings.

2. Mould Health

The silent foundation of quality

The mould absorbs the greatest stress in the entire process.

Extreme temperatures.

Thermal cycling.

Injection pressure.

Mechanical wear.

Yet mould deterioration is often gradual and invisible.

A small vent blockage.

Minor soldering.

Reduced cooling efficiency.

Tiny cracks near gate areas.

At first, the process compensates.

Then rejection begins to rise quietly.

Many casting issues blamed on process parameters actually originate from declining mould health.

A mould is not a static tool.

It is a living production asset that requires continuous observation and care.

Polishing, nitriding, alignment checks, vent cleaning, cooling validation, and preventive restoration are not maintenance activities alone…

They are quality assurance activities.

3. Mental Strength

The most underestimated strength on the shop floor Foundries are demanding environments. Heat,Noise, Pressure,Targets,Unexpected failures,Customer urgency…

In such environments, technical skill alone is not enough.

Stable operations require stable minds.

An operator under stress notices less.

A supervisor under pressure reacts emotionally.

An engineer rushing decisions often creates larger problems.

Mental strength is what allows teams to remain calm during instability.

To observe clearly.

To troubleshoot logically.

To recover without panic.

Many shop floor mistakes do not happen because people lack knowledge.

They happen because pressure overrides awareness.

Strong foundries are not built only with skilled people.

They are built with composed people.

4. Method Strength

Discipline that outlives individuals

A strong process should not depend entirely on memory or experience.

It should be supported by method.

Clear parameter definition.

Layered process checks.

Visual controls.

Reaction plans.

Startup validation.

Preventive systems.

Without method strength, every shift behaves differently.

The process becomes person-dependent instead of system-driven.

The best foundries create methods that help ordinary days remain stable ,not just extraordinary days perform well.

Because consistency is never accidental.

It is designed.

When the 4Ms align

A healthy machine supports repeatability.

A healthy mould supports quality.

A strong mind supports judgment.

A strong method supports consistency.

Together, they create something every foundry seeks:

Process confidence.

Not temporary success.

Not one good batch.

Not one good shift.

But stable, repeatable performance over time.

In the end, successful die casting is not determined only by the metal we pour…

It is determined by the strength behind the process.

Happy die casting!

G Praburam
Managing Director
Alubee Die Casters Pvt. Ltd., Hosur

ALUCAST SNIPPETS

INDIA'S PRIVATE SECTOR GROWTH ACCELERATES IN APRIL AS MANUFACTURING LEADS

India's private sector activity accelerated in April, with the HSBC Flash Composite PMI rising to 58.3 from 57.0 in March. Manufacturing was the key driver, showing notable rebounds in output and new orders compared to a more moderate services expansion. Companies reported building buffer stocks amid supply-side uncertainties and continued to pass higher input costs to customers. Employment growth reached a ten-month high, supported by business expansion plans and positive forecasts. India's private sector activity expanded faster in April, driven by strong manufacturing growth and improved services, according to HSBC's flash PMI data. India's private sector grew faster in April, with strong expansion in both manufacturing and services, according to HSBC's latest flash Purchasing Managers' Index data.

The HSBC Flash India PMI Composite Output Index rose to 58.3 in April, up from 57.0 in March, indicating solid growth compared to the long-term average.The improvement comes after a slower March. Businesses reported better demand and a pickup in activity. The survey noted that overall output and new orders increased at a faster pace at the start of the new fiscal year, supported by capacity expansion, stronger demand, more new work, and technology investments

"Aggregate activity and new orders in India's private sector expanded at quicker rates at the start of this fiscal year, after growth receded in March due to the Middle East war," The report noted, Manufacturing emerged as the key driver of growth. The report highlighted that "manufacturing led the resurgence with notable rebounds in rates of increase for output and sales," while goods producers recorded faster increases in both output and new orders compared to services firms. Services activity also improved, albeit at a more moderate pace. The survey said services companies "still noted accelerations, though they were marginal in comparison" to manufacturing. Commenting on the data, HSBC Chief India Economist Pranjul Bhandari said, "The survey indicated that firms are building buffer stocks to manage the uncertainties around the longevity of the supply-side shock. On the price front, inflationary pressures remained elevated but eased slightly from March levels." Companies continued to pass on higher costs to customers, with the report noting that "Indian companies lifted their selling prices again at the start of the first fiscal quarter," even as output price inflation remained below input cost increases. Employment trends were positive, with hiring picking up across sectors. The survey indicated that the rate of job creation reached a ten-month high in April, driven by rising business requirements, expansion plans and upbeat year-ahead forecasts.

Looking ahead, firms remain optimistic about growth prospects, supported by marketing efforts, pending projects and rising client enquiries, although overall confidence dipped slightly from March.

- ANI

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Reducing scrap in die casting with digital process transparency and targeted defect analysis

Die casting foundries are under growing pressure to deliver more good parts with fewer production interruptions. Customers expect consistent quality, reliable delivery, and competitive costs, while many plants face shortages of experienced process specialists. In markets such as India, where growth opportunities are strong but cost pressure is high, scrap reduction has become a direct driver of competitiveness.

Indicators of process instability

Defects in die casting rarely appear without warning. Porosity, filling issues, surface defects, dimensional deviations, or cold shuts are often the visible result of process instability. The root cause often originates earlier in the production cycle: a drifting parameter, an alarm, an unplanned stop, a die program change, a restart condition, or a maintenance-related issue. If these signals are not visible, teams are forced into reactive troubleshooting. Production stops, discussions begin, assumptions are made, and valuable time is lost.

The role of digital monitoring in process transparency

This is where digital services can create practical value. Digital monitoring and analytics improve transparency at the die casting cell level by making machine status, alarms, parameter deviations, downtime events, and program changes visible in a structured way. One example of such an approach is Bühler Insights.

This results in faster and more focused defect analysis. Instead of asking, “What do we think happened?”, teams can review what actually changed before the defect occurred. Was there a parameter deviation? Did an alarm appear repeatedly? Did scrap increase after a short stop or restart? Was a die program changed? This reduces guesswork and helps teams identify the most likely root causes faster.

Less guesswork also means less production interruption. Traditional defect analysis often requires stopping, searching, testing, and discussing. With better digital transparency, teams can focus their actions more precisely. In addition, proactive alarm notifications support customers in taking action before small challenges become major issues.

Understanding scrap as a broader process challenge

Scrap is not only a quality issue. It is also a process transparency issue, a response-time issue, and often a consequence of limited specialist capacity.

Structured digital defect analysis helps foundries understand why defects occur, where instability begins, and which corrective actions are likely to have the greatest effect. In addition, specialists from Bühler are available to provide support in interpreting analysis results and implementing process improvements as needed.

In one customer case, structured analysis of machine events, parameter deviations, and process instability contributed to a reduction in total scrap from 11% to 4% within six months.

Summary

For die casters operating under increasing pressure on quality, cost, and delivery, scrap reduction depends not only on machine capability but also on the ability to detect instability early, analyze causes systematically, and respond quickly.

Digital transparency at the machine and cell level can therefore become a practical lever for improving the number of good parts.

Bühler Insights can improve process transparency and help reduce scrap

Your feedback is appreciated! Do you have any additional wishes to improve your digital experience, or are you missing any features? Get in touch with us directly at: die-casting@buhlergroup.com