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IMPROVING SURFACE FINISH OF DIE CAST PARTS

Inside

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PARTNER IN PROGRESS FOR ALUMINIUM AND DIE CASTING INDUSTRY

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N. Ganeshan
Editor

Dear Readers,

Aluminium die casting process is extensively used in industries such as automotive, aerospace, electronics, and consumer goods due to its ability to produce complex shapes with high dimensional accuracy. However, the surface finish of aluminium die-cast parts often requires improvement to meet functional, aesthetic, and performance requirements. Enhancing surface finish is therefore a critical step in manufacturing of cast components, achieved through a combination of process control and post-processing methods.

Prime method of improving surface finish starts at the die casting stage. Proper die design and maintenance play a crucial role. Smooth cavity surfaces, appropriate draft angles, and high-quality tool steel reduce surface defects such as roughness, porosity, and flow marks. Maintaining optimal die temperature ensures uniform solidification while minimizing surface irregularities. Use of high-quality release agents prevents sticking and contributes to better surface finishes. After casting, several secondary finishing techniques are employed to further enhance the surface finish.

One common method is mechanical finishing, which includes processes like grinding, polishing, and buffing. Grinding removes surface irregularities and excess material, while polishing and buffing produce a smooth and shiny surface. These methods are particularly useful for parts requiring high aesthetic appeal or close tolerances. Shot blasting is another widely used technique. In this process, small abrasive particles are propelled at high velocity onto the surface of the casting. This removes scale, flash, and minor surface defects, resulting in a uniform matte finish. It is especially effective for preparing surfaces before further finishing operations such as painting or coating. Vibratory finishing is also frequently used for bulk processing of small parts. In this method, cast components are placed in a vibrating container along with abrasive media and compounds. The continuous motion smooths edges, removes burrs, and improves overall surface quality. This method is cost-effective and suitable for large-scale production.

Chemical and electrochemical processes also play a significant role. Chemical etching involves using acids or alkaline solutions to remove a thin layer of material, improving surface texture and cleanliness. Electrochemical polishing, or electropolishing, uses an electrical current in an electrolyte solution to smoothen the surface at a microscopic level. This process enhances corrosion resistance and produces a bright, reflective finish. Coating techniques are another essential method for improving surface finish. Powder coating, anodizing, and painting are commonly used depending on the application. Anodizing is particularly effective for aluminium, as it forms a protective oxide layer that improves corrosion resistance, wear resistance, and appearance. Powder coating provides a durable and uniform finish, while painting allows for a wide range of colours and textures.

Improving the surface finish of aluminium die-cast parts is important for several reasons. Firstly, it enhances the aesthetic appeal of the product. Many applications, especially in consumer goods and automotive interiors, require visually pleasing surfaces free from defects. A smooth and uniform finish increases product value and customer satisfaction. Secondly, surface finish directly affects the functional performance of the component. Rough surfaces can lead to increased friction, wear, and fatigue failure. By improving the surface finish, the durability and lifespan of the part are significantly enhanced. This is particularly important in mechanical components subjected to repeated stress and movement. Another key importance is corrosion resistance. Aluminium naturally forms a protective oxide layer, but surface imperfections can compromise this protection. Finishing processes such as anodizing and coating provide additional barriers against environmental factors, extending the service life of the component.

Improved surface finish also facilitates better adhesion for coatings and paints. A clean and smooth surface ensures uniform application and strong bonding, reducing the risk of peeling or flaking over time. This is essential for maintaining both protective and decorative coatings. Furthermore, high-quality surface finishes contribute to improved dimensional accuracy and assembly performance. Smooth surfaces reduce the likelihood of misalignment and ensure better fitting of components, which is critical in precision engineering applications.
In all, improving the surface finish of aluminium die-cast parts involves a combination of optimized casting processes and effective post-processing techniques such as mechanical finishing, shot blasting, chemical treatments, and coatings. The importance of these improvements extends beyond aesthetics to include enhanced performance, durability, corrosion resistance, and overall product quality. As industries continue to demand higher standards, achieving superior surface finish remains a vital aspect of aluminium die casting manufacturing.

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Surface Finish in HPDC Aluminium Castings

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ABSTRACT

Surface finish quality in High Pressure Die Casting (HPDC) of aluminium alloys is determined by a complex, interdependent chain of variables: die lubricant chemistry, spray system accuracy and delivery method, mould temperature distribution, the thermodynamics of die cooling, injection process parameters, gating system design, die face condition and post-casting handling and storage. Each link in this chain can independently produce surface defects.

This article examines the major defect types carbon blackening, cloud-like discolouration, embedded carbon particles, die soldering, cold shuts, flow marks, blistering and drag marks from both a standard HPDC process perspective and in the light of contemporary research into die lubricant science and spray cooling thermodynamics. Practical, plant-level preventive measures are presented for each defect category.

The article draws on published research from Die Casting Engineer covering die lubricant emissions and environmental management, spray cooling heat transfer, the relationship between die spray and die life and the comparative performance of oil-based versus water-based release agent formulations combining this international technical data with current practice guidance applicable to Indian HPDC foundries.

1. INTRODUCTION

Surface finish is the most immediate and visible expression of process quality in die casting. Every defect on a casting surface whether a carbon mark, a cold shut, a drag Mark or a blister has a specific, traceable cause in the upstream process. Understanding these causes at the engineering level, not just the observational level, is the foundation of lasting surface quality improvement.

Aluminium, zinc and magnesium die-casting alloys are inherently reactive metals. They oxidise readily in the presence of high temperature, moisture and organic combustion products all of which are generated in abundance during every HPDC cycle. The die lubricant spray, the shot sleeve plunger oil, the residual moisture on the mould face and the atmospheric conditions in which castings are stored all contribute to the surface quality of the final part.

For Indian HPDC foundries supplying automotive and EV components, the stakes have never been higher. OEM customers specify as-cast surface roughness, per-mould spray volume accountability and MES-traceable process data. Defects that were previously sorted manually now trigger automated rejection on customer inspection lines. This article provides a structured, technical reference for eliminating these defects at source.

2. CLASSIFICATION OF SURFACE FINISH DEFECTS

Table 1 classifies the major surface finish defects encountered in aluminium HPDC by their appearance, origin and the process mechanism responsible. This classification is the starting point for a root-cause investigation before any corrective action is taken, the defect must be correctly identified and its cause family established.

Table 1: Surface Finish Defects in Aluminium HPDC Classification and Root Causes

Defect	Appearance	Root Cause Family	Key Trigger
Oily carbon blackening	Irregular cloud-like black marks; uneven depth; repeats each cycle	Die lubricant combustion	Excess agent concentration: mould temp is high C; graphite plunger oil
Cloud-like blackening	Uniform dark discolouration; same shape each shot	Carbon black on mould face	Release agent residue sintered on die; insufficient cleaning
Dark spots (internal)	Round spots; resist shot blasting; visible after machining	Black particles in alloy	Agglomerated release agent or plunger oil particles inside casting
Carbon deposits	Rough, dark surface imprint; similar to sticky mould mark	Organic sintering on die	High Die temp; poor quality release agent or plunger oil
Cold shut / cold flow	Visible seen; two metal fronts unfused	Premature solidification	Low mould or melt temp; slow Phase 2 fill; poor gating
Flow marks / ripples	Wavy lines parallel to metal flow	Premature skin freezing	Low die temp; slow fill; excessive release agent moisture
Blistering	Sub-surface bubbles after heat exposure	Entrapped gas near surface	Poor venting; incorrect Phase 1 changeover; high hydrogen in melt
Die soldering	Torn, rough surface aluminium adhered to die steel	Adhesion at hot spot	High Die temp ; insufficient release agent at hot zone
Drag marks	Linear scratches in ejection direction	Mechanical / tooling	Insufficient draft; worn ejector pins; poor die polish
Oxidation blackening	Gradual uniform darkening over days to weeks	Post-casting oxidation	High moisture; inadequate packaging

3. DIE LUBRICANT SCIENCE CHEMISTRY, EMISSIONS AND SURFACE DEFECT MECHANISMS

The die lubricant is not the single most influential variable for as-cast surface quality. It is also one of the most technically complex variables in the die-casting process, because it simultaneously performs multiple functions lubrication, cooling and barrier coating. A thorough understanding of lubricant chemistry and behaviour is essential for any surface quality improvement.

3.1 What Is in a Water-Based Die Release Agent?

Modern water-based die release agents are concentrated formulations containing 20–40% active solids waxes, mineral and vegetable oils, silicone fluids, emulsifiers, biocides and corrosion inhibitors diluted with water to the working concentration before use. At a typical working dilution of 1:100, the diluted release agent contains only 0.1–0.7% actual release ingredients. The remainder over 99% is water plus emulsifiers and other additives that do not contribute to mould lubrication. Research done indicates that the emulsifiers used to stabilise these formulations. Water hardness minerals (calcium, magnesium, iron) left on the die surface from hard water contribute to deposit build-up and lost production time when cleaning.

3.2 The Organic Combustion Mechanism How Oil Fume Causes Blackening

The conventional release agents are thermally stable up to approximately 200–220°C. When the die face temperature exceeds this threshold, these organic constituents undergo incomplete thermal decomposition into oil fume, carbonaceous particles (carbon black) and combustion gases (CO, CO_2, H_2O, oxidised hydrocarbons). These products cause surface defects through three mechanisms:

- **Surface contamination:** Carbon black deposits on the die cavity face before the shot. When alloy liquid contacts this contaminated surface, the black film transfers to the casting, producing the characteristic cloud-like blackening pattern that repeats from mould to mould.

- **Alloy oxidation:** Oxygen and steam from burning organic matter react with aluminium to form Al_2O_3 during fill. This oxidised skin if not vented ahead of the metal front appears as surface blackening or sub-surface oxide inclusions.

- **Embedded black particles:** Partially combusted release agent or plunger oil condenses into viscous droplets on the sleeve or mould surface. These are swept into the casting by the alloy liquid. Because they are embedded inside the metal, not on its surface, shot blasting and vibratory finishing cannot remove them. They appear as dark spots after machining a reliable diagnostic indicator.

3.3 Graphite and Oil-Based Plunger oil

Plunger oil in the shot sleeve is a far more concentrated source of oil fume than the die release agent, because it contacts the alloy liquid directly and at maximum temperature the moment the ladle pours. Research evidence is clear:

- **Graphite-bearing plunger oils:** Produce dense black particles that are exceptionally effective at contaminating the alloy liquid. These particles are carried through the gate with the metal and appear as dark spots throughout the casting cross-section, including on fracture surfaces and machined bores. They cannot be removed by any post-casting treatment.

- **Graphite-free, water-soluble plunger oil:** Produces significantly less carbon and fewer contaminating particles. The switch from graphite to water-soluble plunger oil, combined with reduced application volume (the biscuit outer circumference should show no blackening as the acceptance criteria), is one of the fastest and most cost-effective surface quality improvements available.

- **Oil accumulation in the sleeve:** When plunger oil is applied by drip into the sleeve bore, it accumulates shot by shot. A concentrated pool of oil that ignites all at once when the next ladle pours is a known cause of severe gate-area blackening and internal contamination.

4. DIE SPRAY, THERMAL SHOCK AND THE CONNECTION TO SURFACE QUALITY

The relationship between die spray, die temperature and die life is fundamental to surface finish quality and it is frequently misunderstood in production environments. Research by Edward Herman (Creative Concepts Company, Die Casting Engineer 2003) provides the clearest technical explanation. The spray cycle does not just apply a lubricant coating it imposes a severe thermal shock on the die steel with every shot.

4.1 The Thermal Cycle and Heat Checking

The temperature of the die cavity surface follows a repeating cycle. When molten aluminium fills the cavity, the surface temperature spikes toward the metal temperature. When the part ejects and the spray is applied, the surface temperature is depressed in some cases by 95 degrees C or more below the base die temperature (Figure 1 in Herman 2003). The total temperature excursion from the lowest temperature (after spray) to the peak temperature (during fill) determines the thermal shock magnitude. This thermal shock causes cyclic expansion and contraction of the surface material at the microscale. The resulting stress, calculated at nearly 400,000 psi for a typical cold die, is close to or exceeding the tensile strength of H13 die steel which is why heat checking (surface crack networks) develops progressively.

4.2 Running the Die Hotter The Counterintuitive Solution

Edward Herman analysis shows that the correct response to heat checking is, counterintuitively, to run the die hotter not colder. By raising the base die temperature from 204 to 316 degrees C and simultaneously reducing the thermal depression caused by the spray (through improved internal cooling that removes more heat, reducing reliance on spray cooling), the total thermal shock on the cavity surface can be reduced from 482 degrees C to 260 degrees C a 40% reduction. Herman estimates this change alone would double die life.

The surface quality implication is direct: a die running at the correct higher base temperature, with well-engineered internal cooling channels removing most of the process heat, requires less aggressive spray cooling. This means less thermal depression per cycle, less residual moisture on the die face, less oil fume generation from spray contacts and a more stable lubricant film all of which directly reduce surface contamination defects.

4.3 Spray Cooling Thermodynamics What Actually Removes Heat

Research on spray cooling thermodynamics (Die Casting Engineer, 2003) quantifies the heat removal capacity of die spray. The key finding is that the percent vaporisation of the cooling water is the dominant factor in die heat removal not the spray air flow rate or the total water volume. A nozzle bank that produces a spray pattern which vaporises readily upon contact with a hot die surface removes dramatically more heat than one that causes water to run off the surface.

This thermodynamic principle explains why the steam barrier effect is so damaging: when the spray jet is applied as a continuous stream to a hot surface, the initial water vaporises instantly, forming a steam blanket that prevents subsequent water from reaching the die face.

The lubricant component falls to the floor. No cooling occurs and no coating is deposited. Pulsed spray application breaks up the steam barrier, allowing each pulse to vaporise efficiently and the lubricant film to build incrementally. This improves both cooling effectiveness and surface coating uniformity.

DIE TEMPERATURE AND SPRAY KEY TECHNICAL PARAMETERS

Base die temperature target: 150-220 degrees C die face for aluminium alloys. Higher end of this range is preferable for die life and surface quality.

Total thermal shock: Peak temp minus lowest (after spray). Minimise this by raising base temp through internal cooling, not by reducing spray.

Heat checking threshold: Begins when thermal stress ap proaches tensile strength of H13 (approx. 200,000 psi). Reducing temperature excursion by 40% doubles die life. Carbon deposit formation: Begins when die face exceeds 220 degrees C at mould open. Progressive and rapid above 240 degrees C.

Steam barrier threshold: Forms when die face temperature is so high (typically > 200 degrees C) that the first spray water instantly vaporises. Use pulse spray to prevent this.

5. MOULD TEMPERATURE MANAGEMENT

Mould temperature is the process variable with the broadest and most direct influence on surface finish quality. Every defect category blackening, soldering, cold shuts, flow marks, blistering, carbon deposits have a component that is worsened by incorrect or unbalanced mould temperature. The objective is not to achieve a target average temperature but to maintain thermal balance a uniform die face temperature within the 150–220 degrees C process window across every zone of the mould, every shot, every shift.

5.1 Consequences of High and Low Mould Temperature

The consequences of operating outside the mould temperature process window are defect-specific:

Condition	Primary Surface Defects Produced	Process Mechanism
Die face > 240 deg C (hot spot)	Carbon deposits, die soldering, blistering	Release agent organic material; aluminium adhesion to die steel increases; sub-surface gas expands
Die face 220-240 deg C	Carbon deposits beginning; increased soldering tendency	Marginal sintering of organic residues; elevated thermal shock
Die face 150-220 deg C	Target zone minimal surface defects	Organic residues evaporate cleanly; lubricant film forms correctly; metal flows without premature freezing
Die face 120-150 deg C	Release agent moisture not fully evaporating; flow marks beginning	Slow moisture evaporation causes surface oxidation; marginal fill at thin sections
Die face < 120 deg C (cold zone)	Cold shuts, flow marks, surface oxidation blackening	Premature solidification; alloy liquid contacts residual water; oil fume not volatilised

6. INJECTION PROCESS PARAMETERS AND FILL QUALITY

The injection process determines how the alloy liquid flows through the gating system, how it contacts the die face and whether it carries air and oil fume into the casting or vents them correctly into the overflow system. Each of the three injection phases contributes differently to surface finish.

6.1 Phase 1 Slow Shot and Air Management

The slow shot phase (0.2–0.5 m/s plunger velocity) advances the alloy liquid to the gate without creating a wave that folds over and entraps air in the shot sleeve. The changeover point from Phase 1 to Phase 2 is critical: too early a changeover causes the metal wave to splash, entrapping air that appears as gate-area porosity and blistering. Too late causes premature gate freezing. Shot monitoring systems that record actual plunger velocity and position per shot allow verification that the changeover is occurring correctly in production not just at setup.

6.2 Phase 2 Gate Velocity and Surface Formation

Gate velocity during Phase 2 fill should be 30–50 m/s for aluminium alloys. Below 25 m/s: the metal front contacts the die walls for too long before filling, causing premature solidification cold shuts and flow marks. Above 60 m/s: turbulent jetting entraps large volumes of air and erodes the die face near the gate, accelerating die wear and degrading surface finish in the gate zone. Gate velocity is determined by the gate area and the plunger velocity it cannot be directly measured by the machine but must be calculated from process data and validated by shot monitoring.

6.3 Phase 3 Intensification and Machined Surface Quality

Intensification pressure (600–1200 bar after cavity fill) compacts solidifying metal to close shrinkage voids. Low intensification is the primary cause of sub-surface porosity that becomes visible after machining the pits and black holes that appear on bored surfaces, sealing faces and critical functional areas. For automotive pressure-tight components, intensification pressure is the most important injection parameter affecting post-machining surface acceptance.

6.4 Melt Temperature

Melt temperature at the ladle: 650–700 degrees C for aluminium alloys. Below 640 degrees C: fluidity drops, thin sections fail to fill, cold shuts and flow marks increase. Above 720 degrees C: dissolved hydrogen rises sharply, dross formation accelerates and die soldering tendency increases. Temperature must be measured at the ladle by thermocouple not assumed from furnace setpoint.

7. GATING SYSTEM, VENTING AND CASTING STRUCTURE

7.1 Last-Fill Zones and Blackening

Surface blackening is most severe in three locations: zones distant from the gate (last-fill areas), zones with eddy-current or jetting flow and deep cavity features and blind holes. The mechanism: oil fume accumulates in these zones because the alloy liquid arrives last and has been in contact with the fume-contaminated atmosphere the longest. The slow-moving metal front in the last-fill zone also scours the die face less aggressively, leaving carbon black deposits undisturbed. The solution is to redesign the gating to directly fill the blackened zone as early as possible in the fill sequence. Published data shows that widening the gate to directly fill previously blackened heat-sink side walls eliminated the blackening completely the alloy liquid now scoured the die face before oil fume had time to accumulate.

7.2 Overflow Wells and Venting Design

Overflow wells collect the initial, oxide-laden, cooler metal front and provide the exit path for displaced air and oil fume. Vent depth for aluminium HPDC should be 0.08–0.12 mm deep enough for gas to escape at full speed, shallow enough to prevent metal breakthrough. The total cross-sectional area of the venting system must be sufficient to exhaust all cavity gas within the fill time. Vacuum-assisted die casting (cavity pressure below 50 mbar before injection) is the most effective investment for large, thin-wall castings where gas-entrapment blackening and blistering are persistent.

7.3 Casting Structure Thin Walls and Blind Features

Thin-walled sections have lower mould temperatures in their vicinity and accumulate proportionally more residual release agent moisture per unit area. Blackening, cold shuts and flow marks are more frequent on thin sections, isolated walls and features far from the gate. The corrective approach is to increase local mould temperature through oil or water temperature controller adjustment not to increase release agent concentration.

Deep blind holes and narrow cavity features trap oil fume and create eddy currents during fill. Dedicated vents at the blind end are required. Where geometry prevents venting, release agent volume in these features must be minimised and blow-dry dwell time extended.

8. DIE DESIGN, CONDITION AND SURFACE TREATMENT

8.1 Die Surface Polish

Die cavity surfaces should be polished to Ra 0.2–0.4 µm for A-class surfaces and Ra 0.8–1.6 µm for functional surfaces. The surface must be polished in the direction of metal flow and part ejection. EDM re-cast layers must be fully removed by polishing before production these layers are brittle and crack under thermal cycling, producing surface crack patterns on the casting that are often misdiagnosed as heat checking but are actually die-surface defects.

The rougher the die face, the more strongly oil fume adheres and the faster carbon deposits build up. A well-polished surface accumulates deposits more slowly and is easier to clean. Scheduled re-polishing (every 20,000–50,000 shots depending on alloy, temperature and gating) prevents progressive degradation of as-cast surface quality.

8.2 PVD Die Coatings

Physical Vapour Deposition (PVD) coatings CrN, TiAlN, DLC (diamond-like carbon), 2–6 µm thick, 2,500–3,500 HV hardness provide three surface quality benefits simultaneously: they reduce the chemical affinity between aluminium and H13 die steel (reducing soldering); they resist erosion at high-velocity gate zones (extending polish intervals); and they provide mild thermal insulation at the die face (moderating temperature spikes during fill). In production trials, a high-temperature wetting lubricant with good film-forming properties at hot spot temperatures, combined with CrN coating of the hot spot zone, extended die polishing intervals from once per 3 hours to once per 72 hours by eliminating soldering.

8.3 Draft Angles and Ejection System

Minimum draft angles: 1–2 degrees on external walls, 2–3 degrees on internal walls and deep features. Insufficient draft causes the casting to grip the die on ejection, producing drag marks that run the full depth of the feature. Ejector pin condition must be checked at every scheduled maintenance a worn or bent pin creates a visible raised witness mark and can cause localised surface tearing on ejection.

9. POST- CASTING SURFACE DEFECTS OXIDATION, HANDLING AND STORAGE

9.1 Natural Oxidation and Atmospheric Blackening

A casting that leaves the die in good condition can be progressively damaged by oxidation before it reaches final inspection. Research on die casting blackening shows that a casting left unprotected in a die-casting workshop for 10 days will show dark spots and patchy blackening from oil fume that cannot be removed by shot blasting because the contamination has oxidised into the surface layer, not merely deposited on it. In humid Indian climates, particularly during monsoon season, atmospheric moisture condenses on casting surfaces and accelerates corrosive attack. White mould spots can develop within days on inadequately protected castings. A casting exposed to this environment after shot blasting which removes the dense protective oxide film formed during high-temperature ejection is particularly vulnerable, because the freshly exposed aluminium surface is more reactive than the as-ejected surface.

9.2 Shot Blasting Media and Surface Darkening

Shot blasting media must be regularly screened to remove fine dust and aluminium oxide particles that adhere to the steel shot surface and are driven into the casting face, producing a uniformly darkened, matt appearance on every casting. Adding 20–30% aluminium shot to stainless steel shot achieves a whiter, brighter surface result than steel shot alone. Zinc shot (high specific gravity, low hardness) provides good deburring without marking the casting surface, but is itself prone to oxidation and produces oxide dust that darkens castings.

9.3 Handling, Machining Fluids and Contamination

Conveyor belts, trimming dies, storage platforms, worktables and handling gloves are all sources of oil and moisture contamination that blacken casting surfaces. Oil contact from a belt or glove leaves a mark that oxidises into the surface and cannot be polished off the surface alloy is contaminated. Bare-hand contact always leaves fingerprints that oxidise into visible marks. Neutral cutting fluids (pH 7.0–8.0) must be used for all machining of aluminium HPDC parts. Acidic or alkaline fluids cause immediate surface oxidation and blackening on freshly machined surfaces. After machining, castings must be washed, blown dry with compressed air and passed to the next process or packaging within a defined time limit.

9.4 Post-Casting Management Corrective Measures

- **Immediate cleaning:** Ultrasonic or immersion washing after die casting and after machining. Neutral pH solution, no chlorides. Hot-water rinse followed by compressed-air blow-dry.
- **Passivation:** Chromate-free chemical conversion coating applied immediately after cleaning. Blocks further aluminium oxidation and improves paint adhesion.
- **Packaging:** Sealed packaging with desiccant immediately after cleaning and passivation. Sealed plastic bag within carton, or large plastic bag with desiccant sealed inside the box.
- **Temperature transitions:** Do not unpack castings moved from cold outdoor to warm indoor environment until they have reached ambient temperature inside sealed packaging condensation on cold castings causes rapid oxidation.
- **Workshop air quality:** Mechanical ventilation and extraction at the die-casting machine reduce ambient release agent mist, protecting freshly ejected castings during cooling and handling.
- **Regular inspection**: Castings boxed for 6 months should be reopened and inspected before despatch. The first 2–3 months of storage are the highest-risk period for oxidation initiation.

10. POST- CASTING SURFACE TREATMENTS

Table 2 summarises the available surface treatment options for aluminium HPDC parts. The fundamental principle applies: post-casting treatment supplements, but cannot substitute for, upstream process control. A treatment applied to a surface with an uncorrected root-cause defect will not produce a durable result.

11. CONCLUSION

Surface finish quality in HPDC aluminium castings is not a single-variable problem it is the visible output of the entire process chain. Every defect has a traceable cause. The engineer who approaches surface quality through systematic root-cause analysis, supported by accurate per-shot process data, will eliminate defects more efficiently and more permanently than one who relies on empirical trial-and-error or post-casting remediation.

For Indian foundries building capability for the automotive and EV supply chain, these are not academic findings they are the technical levers by which consistent, auditable, export-quality surface finish is achieved. The intelligent HPDC cell, with closed-loop thermal management, precision spray control and shot-level MES traceability, is the infrastructure that locks these levers in place permanently.

Table 2: Post-Casting Surface Treatment Options for Aluminium HPDC Parts

Treatment	Function	Key Notes
Passivation	Chromate-free conversion coating; blocks oxidation; improves paint adhesion	Must be applied to clean surface immediately after casting or machining
Shot blasting	Removes scale, burrs, minor flow marks; uniform matte texture	Removes protective oxide layer must be followed immediately by passivation or coating
Vibratory finishing	Deburrs edges; removes minor flash; mild smoothing particles	Cannot remove sub-surface contamination or embedded black
Impregnation (vacuum)	Seals microscopic surface and sub-surface porosity with polymer resin	Salvage for pressure-critical leaking parts; does not improve visual appearance
Anodising	Electrochemical oxide layer; improved corrosion and wear resistance	High-Si alloys (ADC12, A380) difficult to anodise uniformly; defect-free surface required
Powder coating	Durable protective finish; wide colour range; excellent corrosion resistance	Requires clean, passivated surface; will not conceal as-cast surface waviness
PVD coating (CrN, DLC)	Hard ceramic coating; anti-soldering; erosion resistance; applied to die not casting	Prevents surface defects at source; most cost-effective for high-volume hot-spot affected parts
Painting	Wide colour range; functional coating over primer on passivated surface	Primer telegraphs any surface waviness as-cast quality still matters
Hard anodising	High hardness (400-600 HV); wear-resistant surface	Rough surface and grey colour; used for functional, not cosmetic, applications

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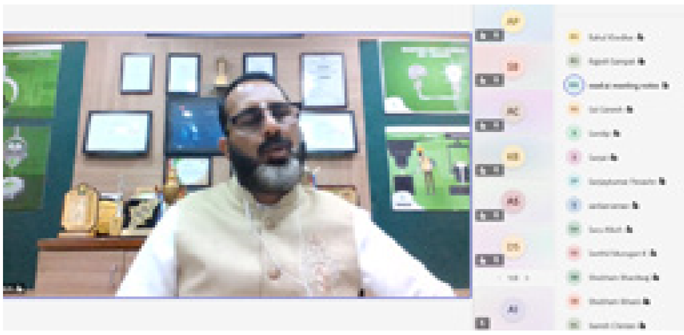
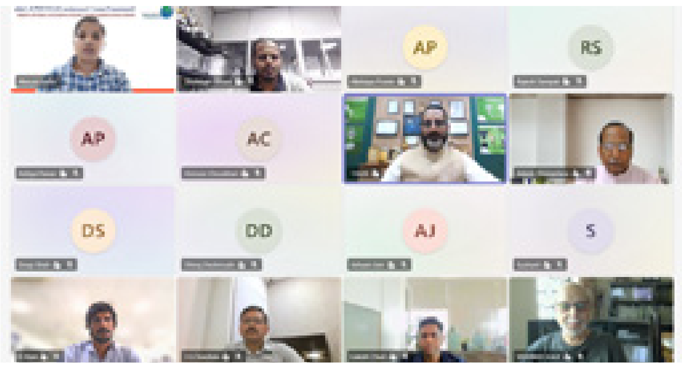
ALUCAST WEBINARS HELD IN FEBRUARY - MARCH 2026

Title	7 Layers of Cashflow
Date	Wednesday, 25th February 2026
Time	03:00 PM – 04:15 PM
Venue	Microsoft Teams
Speaker	**Mr. G. Praburam** Managing Director – Alubee Die Casters Honorary Secretary - ALUCAST Bangalore Zonal Centre

Key Discussion Areas:

1. Why cash flow decides survival
2. Price & volume control
3. Cost and efficiency leaks
4. Receivables & payables discipline
5. Inventory as blocked cash
6. Strategy that accelerates inflow
7. Turning growth into cash

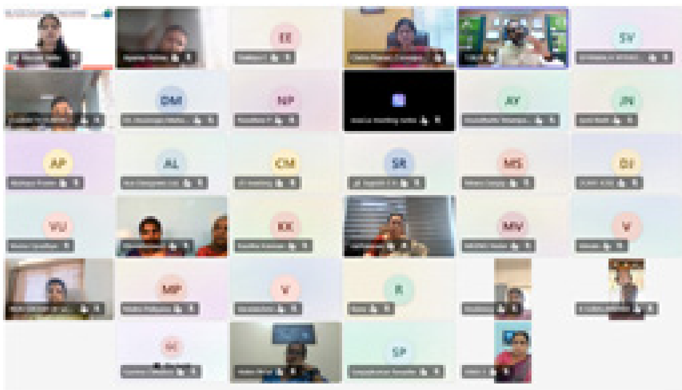




Title	Women Wisdom & Workplace Leadership
Date	Friday, 6th March 2026
Time	03:00 PM – 04:00 PM
Venue	Microsoft Teams
Moderator	**Mr. G. Praburam** Managing Director – Alubee Die Casters
Chief Guest & Speaker	**Mrs. Chitra Prasad** Correspondent - NSN Group

Key Discussion Areas:

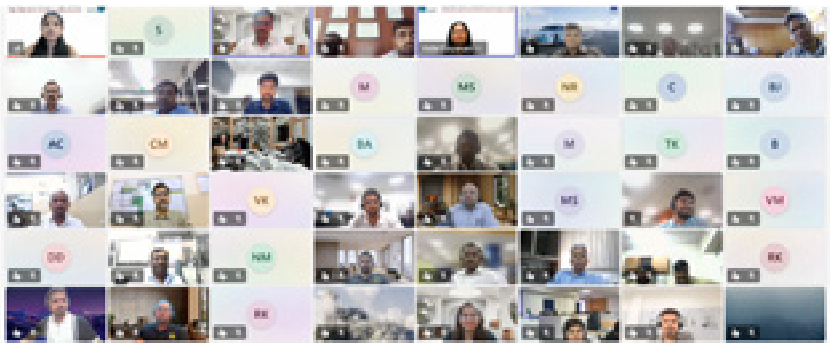
- Understanding the inherent strength of women
- Recognising self-transformation as the foundation of leadership
- Leveraging emotional maturity as a professional advantage
- Rethinking work–life balance through emotional intelligence
- Aligning intelligence with direction for purposeful growth
- Appreciating parenting as a leadership responsibility
- Exploring how education shapes tomorrow's workforce
- Live Dialogue with Chief Guest & Moderator



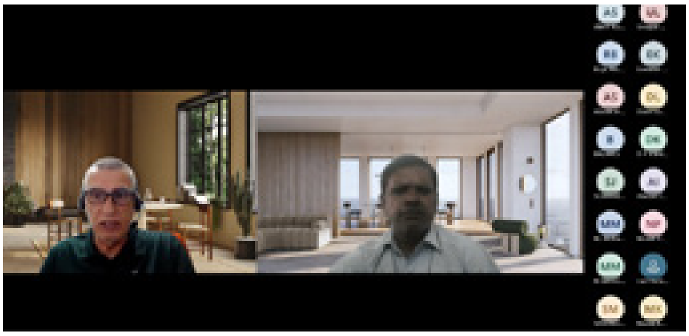
Title	Eliminate Defects to Meet International Standards: Advanced X-Ray Inspection for Aluminum Die-Casting		
Date	Wednesday, 11th March 2026	**Time**	03:00 PM - 04:00 PM
Venue	Microsoft Teams		
Speakers	**Mr. Suresh Babu Gurunathan** Product Sales Manager, ZEISS India	**Mr. Manoj K Sundaram** Head - Business Dev., ZEISS India	

Session Highlights:

- Overview of Industrial X-ray technology
- Flexible & quick Inspection of Casting Parts using at-line and In-line X-ray machines
- 3D Inspection//Computed tomography solution for deeper analysis of casting defects
- ASTM Standards and Automated Defect Detection Software
- Latest Trends in the Industrial X-ray technology



Title	AI in Production & Engineering in Die-Casting
Date	Wednesday, 18th March 2026
Time	02:00 PM – 03:30 PM IST
Venue	Microsoft Teams
Speaker	**Mr. Christian Kleeberg,** Founder & Managing Partner, RGU Asia Pte Ltd.



Key Discussion Areas:

- Industry Context & AI Today
- AI in Operations & Foundries
- Data, Scrap & Defect Reduction
- Process Stability & Energy Efficiency
- AI in Planning, Industry 4.0 & Integration

Contribute Articles for ALUCAST Journal

Themes for the year 2026

June 2026	Defect Analysis & Remedies in Die-Casting
August 2026	Cost Optimisation in Aluminium Casting Process
October 2026	Productivity Improvement in Die-Casting
December 2026	ALUCAST 2026 Special

Email your articles to: alucastindia@alucast.co.in

ALUCAST® 2026

INTERNATIONAL EXHIBITION & CONFERENCE - ALUMINIUM DIE-CASTING
YASHOBHOOMI, DWARKA, NEW DELHI | 10^{TH} - 12^{TH} 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:** 30^{th} June 2026
- **Full Paper Submission Date:** 15^{th} August 2026
- **Approval & Confirmation Date:** 15^{th} September 2026

ALUCAST® PARTNER IN PROGRESS FOR ALUMINIUM AND DIE CASTING INDUSTRY

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

ALUCAST - COEP Industry Connect Session on Career Pathways in Die Casting

Aluminium Casters' Association (ALUCAST)®, India, in association with **COEP Technological University, Pune**, successfully conducted an interactive session titled **"Career Pathways in Diecasting for Metallurgy Students"** on 25th March 2026 at 4:00 PM at the Department of Metallurgy and Materials Engineering.

The session was organized to provide valuable industry exposure and career guidance to metallurgy students. The program witnessed active participation from engineering students of the department.

The session was conducted by experienced experts from ALUCAST India:

- Mr. B. B. Lohiya, Director - Compax Industrial Systems Pvt. Ltd. & Treasurer of Pune Centre - ALUCAST
- Mr. N. Ganesan Trustee & Editor of ALUCAST Journal, fmr. Director - Ultraseal India Pvt. Ltd.
- Mr. N. Toraskar Trustee & Hon. Treasurer - ALUCAST, former GM - Die Casting - Buhler (India) Pvt. Ltd.
- Ms. Vidhi Daryanani, Secretary General, Alucast

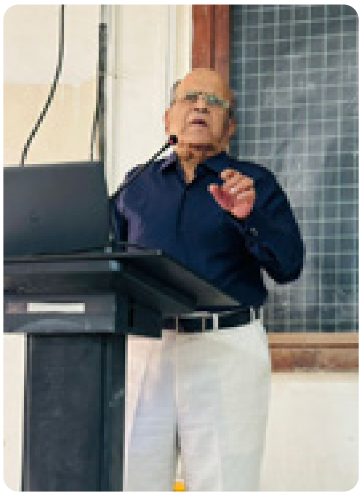
They shared their extensive industry experience and guided students on career opportunities in the die casting sector, highlighting practical challenges, growth prospects, and the skills required to excel in the industry.

Key Highlights of the Session:

- Industrial Careers in Diecasting
- Fundamentals of Diecasting & Metallurgy
- Industry Experience Sharing
- ALUCAST as a Bridge for Students

As part of the session, informative videos on various die casting processes such as **HPDC (High Pressure Die Casting), LPDC (Low Pressure Die Casting), and GDC (Gravity Die Casting)** were presented. This helped students gain a better understanding of real-world manufacturing practices. The interaction continued with discussions on industry components and applications, enabling students to connect theoretical knowledge with practical exposure. Students were also apprised of ALUCAST's initiatives, such as, Industry events (International Exhibition & Technical Conference), Webinars and Training Programs, Industrial Visits, Internship & Placement Opportunities.

ALUCAST acts a bridge between industry and academia, thereby further strengthening the industry–academia connect. The session concluded with a Thank You note and an interactive Q&A segment. It concluded on a positive note, with students gaining valuable insights and motivation to pursue careers in the die casting and metallurgy domain.



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Front Inner Page	96800	114224	2178	2570	-	-	-	-
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Back Inner Page	80465	94949	1784.75	2106	-	-	-	-
Inside pages	40232.5	47474	883.30	1042	8391.35	9902	201.1625	237

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Full Page	**Final Trim Size:** Width 210mm X Height 297mm **Bleed:** 3mm all sides
Half Page	Width 180mm X Height 135mm (non-bleed)
Quarter Page	Width 90mm X Height 135mm (non-bleed)
File Format	Print ready PDF in CMYK color space. No spot colors. All fonts embedded & images @ 300dpi resolution

Please send cheque in the name of ALUMINIUM CASTERS' ASSOCIATION (ALUCAST) payable at Pune to:

Aluminium Casters' Association (ALUCAST)
702, AMar Neptune, Baner Road, S. No. 6/1/1
Plot No. 45, 46A, 46B, Pune 411045
T: +91 20 27290014 E: alucastindia@alucast.co.in

Sand cores and Surface Finish of Aluminium castings

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

Sand cores are used to create cavities of desired shape and size in Aluminium castings while producing the castings by Gravity Die casting (GDC) or by Low Pressure Die casting process (LPDC). The quality of the sand core directly influences the quality of the casting not only in terms of dimensional accuracy but also in terms of the soundness of the casting and the surface finish of the cavity created in the casting using the sand core. In complex and critical castings, this Quality parameter may carry higher weightage.

Therefore, achieving a good surface finish of the cavity amounts to improving the quality of sand cores (especially the surface finish and the strength of the core) and producing these cores with consistently high quality. Some of the factors that affect the quality of sand core, with special relation to the surface finish of the casting are;

- Sand quality
- Binder system employed
- Process parameters
- Tooling design & Equipment
- Refractory coating
- Core handling

A strong sand core with good core surface can be a good Assurance to have the Aluminium casting with desired surface finish.

Sand with high silica content gives better results. Fine sand (AFS 70-80) with uniform and rounded grain size is preferred. The sand should be very dry and free from clay or impurities. In the case of gas hardened curing processes, slightly coarse sand (AFS 60-65) is preferred so that permeability of the sand mass is not compromised. Use of too fine sand can be counterproductive as the grains coated with binders may exhibit poor surface adhesion and may spoil the surface during handling. During core shooting stage, such fines will accumulate on the surface, have poor adhesion and damage the surface during handling or get entrapped in the subsequent Refractory coating stage which can disturb the surface.

Selection of proper **Binder system** is important from the point of view of strength development of the core and the surface hardness as also the gas evolution pattern. Shell cores have superior surface finish, high core strength and better handling properties. However, they can produce higher level of gases that can result in blow holes.

Phenolic Urethane cold Box popularly known as the Amine Cold box process, has become quite popular for manufacturing cores for Aluminium castings due to the high core strength developed, good handling properties, low gas evolution besides high productivity. Another alternative quite close to Cold Box will be the Phenolic Resin binder system cured by CO2 gas.

Of late few Inorganic binders have also been developed which are being used for Aluminium castings because of easy de-coring and easy sand reclamation advantages. Another advantage is the least Gas evolution property.

Process parameters need to be properly controlled during core production. Higher binder levels shall result in more gases evolved during casting stage – a cause for blow holes in the casting. It must be balanced as per the strength requirement. As cores wit lower strength are employed in case of Aluminium as compared to cast iron or steel castings, lower binder levels can be used. Shooting air pressure has also to be controlled properly. Higher shooting pressures result in fine particles with low adhesion strength coming to the surface and can damage the surface during handling or coating. The high sand velocities can also result in binder in the sand mass getting converted to the gaseous form to reach casting surface.

Tooling used to produce the core and its design has a bearing on the quality of cores produced. The surface of the tooling cavity is directly responsible to impart the finish to the core surface. Proper selection of the shooting hole sixes and location and the venting pattern of the core box (tooling) the besides compaction and strength development and hence the strength of the core. Any mis match of Tooling parts or defective clamping mechanism will result in patting line defects as well as surface defects besides dimensional inaccuracies.

Use of **Refractory coatings** (Zircon/Graphite/Alumina) is a common practice to coat the cores to create thin layer on the surface that acts as a barrier between the metal and sand and imparts a smoot finish to the casting cavity. Mostly water-based coatings are used that call for a core drying stage before it's use.

While it is important that the sand core to be used should have good strength and good surface finish when produced, it is equally necessary that care is taken to ensure that the surface is not damaged during **handling** at various stages like core Retrieval from core machine, core transfer & transport, coating & drying. While locating in the Die casting mould etc. Any dents, scratches or cracks at any stage will be translated in castings with poor surface finish. It is also a good practice to clean the core by dry low-pressure air by using a smooth brush before locating in the mould.

Some care is also necessary during Liquid metal pouring stage to ensure that the sand core imparts a good surface finish to the casting cavity. Proper pouring temperature and pouring technique will ensure that the core surface is not eroded during pouring and a casting with good surface finish is prepared.

It must be remembered that as Liquid Aluminium is highly fluid and can easily seep in pores or gaps, a strong sand core with good surface finish, handled properly and with proper care during pouring, is the real assurance of an Aluminium casting with good surface finish.

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

Summary Report: Cumulative Production, Domestic Sales & Exports data for the period of April-January 2026									
Report I - Number of Vehicles									
Category	**Production**			**Domestic Sales**			**Exports**		
Segment/Subsegment	**April-January**			**April-January**			**April-January**		
	2024-25	**2025-26**	**% Change**	**2024-25**	**2025-26**	**% Change**	**2024-25**	**2025-26**	**% Change**
Passenger Vehicles (PVs)*									
Passenger Cars	14,20,959	14,87,446	4.7%	11,03,580	11,23,748	1.8%	3,38,840	3,76,696	11.2%
Utility Vehicles(UVs)	25,33,660	27,98,621	10.5%	22,61,715	24,52,614	8.4%	2,89,327	3,62,320	25.2%
Vans	1,28,252	1,39,021	8.4%	1,25,303	1,30,189	3.9%	7,509	8,736	16.3%
Total Passenger Vehicles (PVs)	**40,82,871**	**44,25,088**	**8.4%**	**34,90,598**	**37,06,551**	**6.2%**	**6,35,676**	**7,47,752**	**17.6%**
Three Wheelers									
Passenger Carrier	7,60,121	9,53,229	25.4%	5,05,769	5,67,200	12.1%	2,48,819	3,79,122	52.4%
Goods Carrier	98,662	1,07,024	8.5%	94,963	1,02,650	8.1%	3,129	4,470	42.9%
E-Rickshaw	17,361	11,275	-35.1%	16,660	11,147	-33.1%	34	23	-32.4%
E-Cart	3,405	4,233	24.3%	3,427	4,388	28.0%	-	-	-
Total Three Wheelers	**8,79,549**	**10,75,761**	**22.3%**	**6,20,819**	**6,85,385**	**10.4%**	**2,51,982**	**3,83,615**	**52.2%**
Two Wheelers									
Scooter/ Scooterette	62,09,660	71,22,864	14.7%	57,53,946	66,26,749	15.2%	4,90,532	5,59,099	14.0%
Motorcycle/Step-Throughs	1,34,07,901	1,44,25,471	7.6%	1,03,78,782	1,07,99,738	4.1%	29,46,077	36,82,432	25.0%
Mopeds	4,41,260	4,32,446	-2.0%	4,33,060	4,31,953	-0.3%	5,574	17,862	220.5%
Total Two Wheelers	**2,00,58,821**	**2,19,80,781**	**9.6%**	**1,65,65,788**	**1,78,58,440**	**7.8%**	**34,42,183**	**42,59,393**	**23.7%**
Quadricycle									
Quadricycle	6,020	5,109	-15.1%	117	4	-96.6%	5,984	4,950	-17.3%
Grand Total of All Categories	**2,50,27,261**	**2,74,86,739**	**9.8%**	**2,06,77,322**	**2,22,50,380**	**7.6%**	**43,35,825**	**53,95,710**	**24.4%**
* BMW, Mercedes, JLR, Volvo Auto data are not available and Tata Motors data is available only for Apr-Dec. Society of Indian Automobile Manufacturers (13/2/2026)									

Summary Report: Cumulative Production, Domestic Sales & Exports data for the period of April-February 2026									
Report I - Number of Vehicles									
Category	**Production**			**Domestic Sales**			**Exports**		
Segment/Subsegment	**April-February**			**April-February**			**April-February**		
	2024-25	**2025-26**	**% Change**	**2024-25**	**2025-26**	**% Change**	**2024-25**	**2025-26**	**% Change**
Passenger Vehicles (PVs)*									
Passenger Cars	15,67,224	16,34,723	4.3%	12,14,546	12,30,547	1.3%	3,63,088	4,09,838	12.9%
Utility Vehicles(UVs)	27,79,168	30,82,012	10.9%	24,70,510	26,89,571	8.9%	3,20,715	4,04,135	26.0%
Vans	1,40,672	1,51,961	8.0%	1,36,796	1,41,809	3.7%	8,511	9,671	13.6%
Total Passenger Vehicles (PVs)	**44,87,064**	**48,68,696**	**8.5%**	**38,21,852**	**40,61,927**	**6.3%**	**6,92,314**	**8,23,644**	**19.0%**
Three Wheelers									
Passenger Carrier	8,31,814	10,45,743	25.7%	5,51,880	6,27,213	13.7%	2,74,644	4,17,573	52.0%
Goods Carrier	1,09,127	1,20,775	10.7%	1,05,566	1,15,921	9.8%	3,328	4,783	43.7%
E-Rickshaw	18,011	12,645	-29.8%	17,401	12,037	-30.8%	34	24	-29.4%
E-Cart	3,849	4,752	23.5%	3,760	4,787	27.3%	-	1	-
Total Three Wheelers	**9,62,801**	**11,83,915**	**23.0%**	**6,78,607**	**7,59,958**	**12.0%**	**2,78,006**	**4,22,381**	**51.9%**
Two Wheelers									
Scooter/ Scooterette	68,15,161	79,12,705	16.1%	62,66,729	73,56,523	17.4%	5,35,276	6,27,684	17.3%
Motorcycle/Step-Throughs	1,46,16,439	1,59,00,860	8.8%	1,12,17,032	1,18,96,275	6.1%	32,91,799	41,04,671	24.7%
Mopeds	4,85,683	4,78,810	-1.4%	4,66,632	4,77,048	2.2%	6,516	19,452	198.5%
Total Two Wheelers	**2,19,17,283**	**2,42,92,375**	**10.8%**	**1,79,50,393**	**1,97,29,846**	**9.9%**	**38,33,591**	**47,51,807**	**24.0%**
Quadricycle									
Quadricycle	6,371	6,365	-0.1%	120	4	-96.7%	6,242	6,162	-1.3%
Grand Total of All Categories	**2,73,73,519**	**3,03,51,351**	**10.9%**	**2,24,50,972**	**2,45,51,735**	**9.4%**	**48,10,153**	**60,03,994**	**24.8%**
* BMW, Mercedes, JLR, Volvo Auto data are not available and Tata Motors data is available only for Apr-Dec. Society of Indian Automobile Manufacturers (13/2/2026)									

Reflections from the Foundry Floor...

The Invisible Cost of Variations...

"The success of die casting largely depends on how well the process variables are controlled"

In a foundry, it is easy to be impressed by speed...
cycle times, shift output, tonnage per day.

Yet, experienced operations quietly focus on something far more powerful.

Two machines may both be running at 42 seconds/shot.

On paper, they look identical.

But they are not delivering the same result.

One produces predictable castings.

The other produces surprises.

Variation rarely announces itself loudly.

It shows up quietly...in porosity trends, dimensional drift, flash, soldering, and tool wear.

Over time, these small fluctuations accumulate and begin to erode confidence in the process.

A clearer way to view process control

When we prepare a technical data sheet or process approval, we usually list all parameters on a single page... alloy temperature, injection speeds, pressures, switch positions, lubrication, and cycle time etc.,

They look equal on paper.

But on the shop floor, they are not.

Some parameters are inherently variable.

They change with ambient conditions furnace & machine behavior. These include:

- Alloy temperature
- Oil temperature
- Air pressure
- Intensification pressure
- Biscuit thickness

These parameters drift continuously and require constant attention.

Then there are setting parameters...
the ones we deliberately define during setup and expect to remain stable ,example...

- First phase speed
- Second phase speed
- Limit switch positions

These are meant to change only when the process itself is being tuned.

When both types are treated the same way, something important is lost.

We stop seeing what truly needs watching...and what simply needs discipline.

Where variation really comes from

Most instability in a foundry does not come from wrong settings.

It comes from drifting variables that go unnoticed.

A small drop in alloy temperature.

A gradual rise in oil temperature.

A slow change in biscuit thickness.

Each one looks harmless on its own.

Together, they create a process that no longer behaves the same way.

That is when defects begin to appear...
and teams shift from control to firefighting.

Stability builds trust

When variable parameters are clearly separated and actively monitored, behavior changes.

Operators know what to watch.

Supervisors know what to control.

Engineers know where to focus.

The process becomes calmer, more predictable, and more reliable.

High output is attractive.

Low variation is transformative.

In the end, world-class foundries are not those that run the fastest...
they are the ones that run the same way, every time.

Happy die casting!

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

Carat 720: engineered for high-performance megacasting

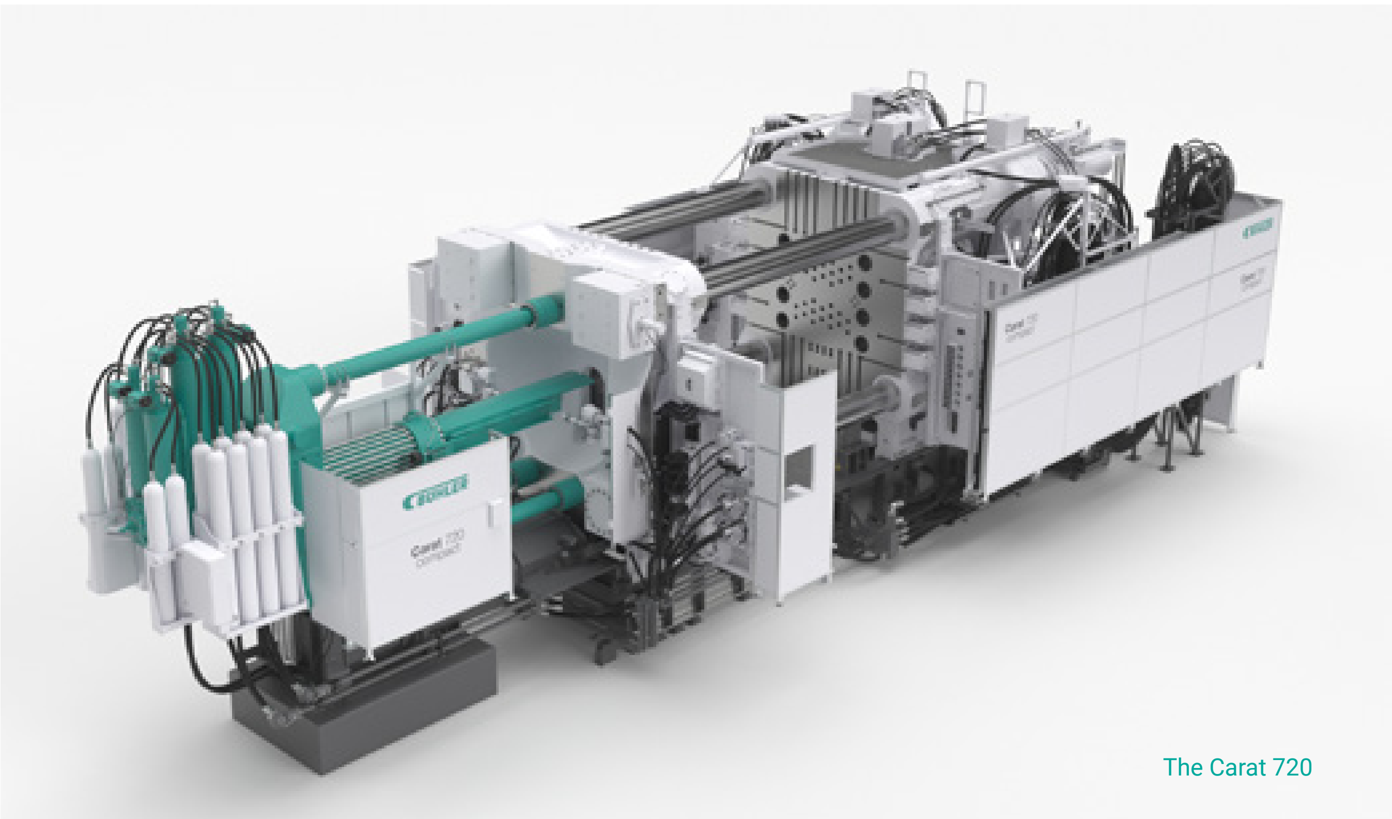
As the automotive industry undergoes a major transformation, megacasting is taking on a key role – it enables the production of large, integrated structural components while simplifying vehicle manufacturing. To support these demands, die-casting technology continues to evolve, reaching new levels of size and precision. Bühler's new Carat 720 is designed for these requirements. As the latest addition to the proven Carat family, with more than 950 installations worldwide, it is built for die-casting parts requiring 72,000 kN locking force while enabling high productivity, reliable operation, and low cost per part.

Its optimized machine design, including a new tie bar geometry, ensures a compact footprint and seamless integration into your production environment. Designed to deliver the lowest cost per part, it combines faster cycle times, easier machine handling and superior part quality to maximize uptime and efficiency, making it the ideal solution for high-performance megacasting.

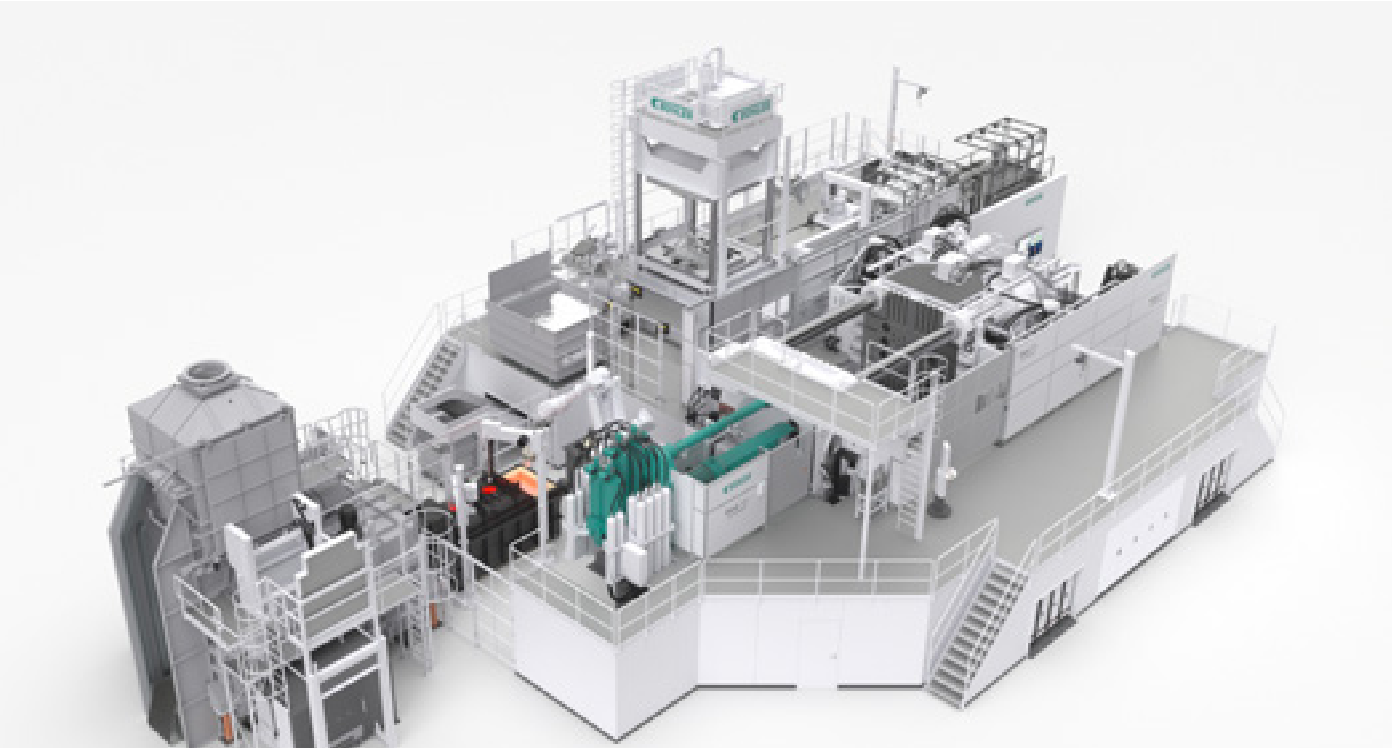
Superior part quality – less scrap for more profitability

At the heart of the Carat 720 is a strong focus on repeatable, high-precision die filling. With an injection power of 6,300 kW and patented, topology-optimized platens, the machine ensures dynamic and highly controlled metal flow. This results in excellent part accuracy, even for large and geometrically demanding components.

The injection unit is designed for consistent performance. The repeatability reaches a standard deviation of less than 0.02 meters per second (m/s) at maximum speed and less than 0.3 m/s in filling time. This level of precision reduces process variation, helping to minimize scrap and lower the cost per part. For manufacturers, this means more stable production, predictable quality, and improved profitability over the full lifecycle of the machine.



The Carat 720



Bühler megacasting cell with Carat 720

Optimized handling and uptime – built for megacasting

In megacasting, machine availability is a decisive factor. The Carat 720 was therefore engineered with a strong emphasis on efficient handling and maximum uptime. New features of the DataView control system provide enhanced production monitoring and transparency, enabling operators to identify deviations early and keep processes under control.

Practical design elements further support fast and reliable operation. Quick couplings, optimized die support, and a modular, clearly labeled energy frame simplify setup and maintenance work. In combination with a dedicated spotting function, these features help to reduce die exchange times and minimize downtime.

Faster cycle times – up to 15% improvement

Productivity was another central driver in the development of the Carat 720. Thanks to a new modular hydraulic drive unit concept and enhanced machine control movements, the machine achieves shorter cycle times of up to 15%, depending on the application.

These improvements allow manufacturers to increase output without compromising part quality or process stability. Especially in high-volume operations, reduced cycle times translate directly into higher productivity and better utilization of installed capacity.

A focused solution for demanding applications

The Carat 720 is designed for manufacturers who require high locking force, excellent repeatability, and reliable performance for large structural aluminum parts. By combining superior part quality, optimized handling, and faster cycle times in a compact and well-structured machine design, it supports efficient megacasting at industrial scale.

With more than 50 megacasting cells sold globally and three regional hubs in Europe, North America, and Asia, Bühler supports customers across the entire megacasting process, from part design and layout planning to commissioning. Today, Bühler's customers supply components to more than 15 OEMs worldwide.

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