DECOS
HEALTHTECH

# PLASTICS PRODUCT DESIGN AND DEVELOPMENT

(YOUR OWN
END-TO-END
SERVICE PARTNER)

# INTRODUCTION

- At Decos, we specialize in transforming concepts into tangible, high-quality plastic products. Our integrated, end-to-end service approach bridges the gap between an initial idea and mass production. By housing design, engineering, prototyping, and manufacturing expertise under one roof, we streamline communication, reduce risks, and accelerate time-to-market for complex plastic components.
- Below is a detailed overview of the varied services incorporated into our full-lifecycle development process.

# CONCEPT DEVELOPMENT & FEASIBILITY STRATEGY

Before design process begins, we ensure the foundation is solid. We collaborate with stakeholders to define the product requirements, assess technical viability, and establish clear project goals.

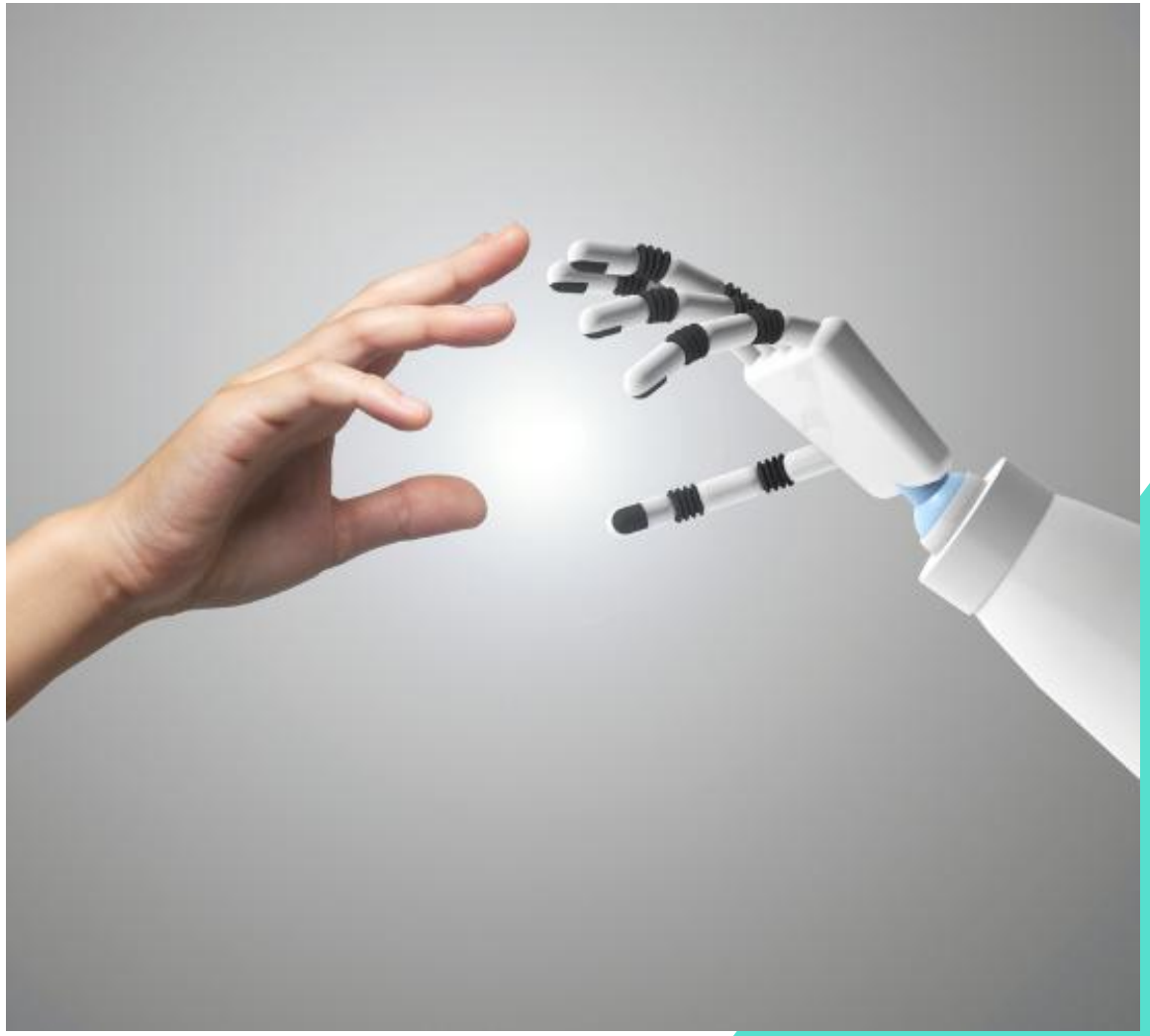
# CONCEPT DEVELOPMENT & FEASIBILITY STRATEGY

**What we provide**

- **Requirement definition:** Translating marketing needs into technical specifications.
- **Feasibility studies:** Early assessment of manufacturing viability based on proposed geometry and functions.
- **Preliminary material selection:** Recommending plastic resins based on environmental, mechanical, and cost requirements.
- **Cost estimation:** Providing early budgetary estimates for tooling and unit costs to ensure project viability.

# INDUSTRIAL DESIGN (ID) & HUMAN FACTORS

A successful product must not only work; it must be usable and desirable. Our ID team focuses on the user experience, aesthetics, and ergonomics of the plastic part.



# INDUSTRIAL DESIGN (ID) & HUMAN FACTORS

**What we provide**

- **Comprehensive ideation & aesthetic exploration:** We go beyond simple sketching to define a visual language that aligns with your brand identity. This involves creating mood boards, analysing current market trends, and generating a wide range of initial concepts (2D sketches and digital illustrations). We iterate rapidly to explore various form factors, ensuring the product stands out on the shelf while remaining functional.
- **Advanced ergonomics & human-centric design:** We prioritize the physical relationship between the user and the product. Using anthropometric data and user-scenario analysis, we optimize grip, button placement, weight balance, and interface accessibility. This ensures that handheld devices, wearables, or tools are intuitive to use, minimize user fatigue, and prevent repetitive strain, ultimately enhancing the user experience.

# INDUSTRIAL DESIGN (ID) & HUMAN FACTORS

**What we provide**

- **Class-a surface modelling (complex geometry):** Our CAD specialists utilize high-end surfacing techniques to create "Class-A" surfaces - the gold standard in consumer electronics and automotive design. We focus on curvature continuity (G2/G3) to ensure perfect light reflection and seamless transitions between surfaces. This results in a premium finish free from visual defects, flow lines, or unwanted shadows, ready for high-gloss texturing.
- **CMF definition & photorealistic rendering:** Before a single dollar is spent on prototyping, we bring the design to life visually. We define the **Color, Material, and Finish (CMF)** strategy, specifying exact textures (e.g., VDI sparking, matte, high gloss). We then produce studio-quality, photorealistic renderings in context environments to support marketing campaigns, investor presentations, and internal stakeholder buy-in.

# MECHANICAL ENGINEERING & DFM ANALYSIS

This is the crucial phase where design meets physical reality. We convert surface models into engineered parts ready for the rigors of plastic injection molding.

# MECHANICAL ENGINEERING & DFM ANALYSIS

**What we provide**

- **Detailed CAD engineering & feature integration**: We transition cosmetic surface models into fully functional, parametric solid models. This involves meticulously engineering plastic-specific features such as structural ribs, mounting bosses, and intricate snap-fits. We apply strict design guidelines (such as proper rib-to-wall thickness ratios) to ensure features are robust without causing cosmetic defects like sink marks on the visible side (A-surface).
- **Design for Manufacturability (DFM) review:** We bridge the gap between design and tooling with a critical manufacturability audit. We analyse draft angles to ensure smooth part ejection and verify uniform wall thickness to prevent uneven cooling. We also identify potential undercuts that might require costly side-actions or lifters in the mold, helping to optimize the design for the most cost-effective tooling strategy without compromising functionality.

# MECHANICAL ENGINEERING & DFM ANALYSIS

**What we provide**

- **Finite Element Analysis (FEA) & Structural Optimization**: We don't guess; we validate. Using advanced simulation tools, we subject the digital model to virtual stress tests, including static loading, impact/drop simulation, and thermal cycling. This helps us identify high-stress concentrations and optimize the geometry - adding material where strength is critical and coring out material where it isn’t - to ensure structural integrity while minimizing part weight.
- **Moldflow simulation & rheology analysis:** Before a single piece of steel is cut, we simulate the injection molding process to predict how molten plastic will flow, pack, and cool. We use this data to optimize gate locations (to hide weld lines and air traps), predict clamping force requirements, and analyse volumetric shrinkage. This predictive approach minimizes warpage issues and significantly reduces the number of physical tool trials (T1 to T-Final) needed later.

# RAPID PROTOTYPING & VALIDATION

We never move to costly tooling
without validating the design first.
We utilize various technologies to create physical models for functional testing and fit checks.

# RAPID PROTOTYPING & VALIDATION

**What we provide**

- **Advanced 3D Printing (SLA/SLS/FDM):** We utilize a diverse suite of additive manufacturing technologies to deliver rapid results. We select the specific method to match your need: SLA (Stereolithography) for high-resolution, smooth surface finish parts ideal for aesthetic review; FDM for durable, cost-effective concept models; and SLS (Selective Laser Sintering) for functional nylon parts with complex geometries. This ensures you can hold and inspect your product within hours of the design being finalized.
- **CNC Machining (Engineering Grade):** For functional testing where material properties are critical, we machine prototypes directly from solid blocks of the actual production resin (e.g., ABS, Polycarbonate, Delrin, or PEEK). This process achieves tight tolerances and provides the exact structural strength, chemical resistance, and thermal properties of the final product, allowing for rigorous testing that 3D printing cannot support.

# RAPID PROTOTYPING & VALIDATION

**What we provide**

- **Vacuum casting (Low-volume production):** Ideal for marketing samples or pilot runs (10–50 units), we use master patterns and silicone molds to cast high-quality polyurethane parts. This method allows us to simulate complex features like over-molding (soft-touch grips), varying hardness levels (Shore A/D), and specific surface textures. The result is a "production-lookalike" part perfect for trade shows, investor demos, or user field trials.
- **Functional testing & validation protocols:** We don't just build the part; we prove it works. We design and fabricate custom inspection fixtures (jigs) and verify dimensional accuracy against the print. Furthermore, we execute comprehensive validation plans - including life-cycle durability testing, drop testing, and assembly fit checks - to ensure the design meets all performance requirements before investing in hard tooling.

# MOLD DESIGN & TOOLING FABRICATION

The quality of the plastic part is dictated by the quality of the mold. We design and build high-precision injection molds tailored to anticipated production volumes.

# MOLD DESIGN & TOOLING FABRICATION

**What we provide**

- **Precision mold design & engineering:** We engineer high-performance molds using full 3D solid modeling. This goes beyond simple cavity layout; we meticulously design complex actions such as sliders, lifters, and collapsing cores to handle intricate undercuts. We prioritize thermal management by designing optimized cooling circuits (including conformal cooling where necessary) to ensure uniform heat dissipation, which is crucial for minimizing warpage and reducing cycle times in production.
- **Strategic tooling material selection:** We tailor the mold construction material to match your specific production volume and resin requirements (SPI Class 101 to 105). We select high-grade tool steels - such as **H13 or S7** (hardened) for high-volume, abrasive glass-filled materials, or **P20** (pre-hardened) for cost-effective medium runs. We also offer specialized surface treatments and coatings (like Chrome plating or DLC) to enhance release properties and corrosion resistance.

# MOLD DESIGN & TOOLING FABRICATION

**What we provide**

- **Advanced EDM & High-Speed CNC Machining:** We utilize state-of-the-art manufacturing technologies to achieve micron-level accuracy. We employ **High-Speed Machining (HSM)** centers to cut hardened steel with superior surface finishes, reducing bench time. For features that cannot be milled (such as deep ribs, sharp internal corners, or complex textures), we utilize **Wire and Sinker EDM (Electrical Discharge Machining)** to burn precise geometries into the steel with exacting tolerances.
- **Comprehensive tool trial & debugging (T1 to T-Final):** We execute a systematic validation process. Starting with the T1 trial (first shots), we inspect parts for cosmetic and dimensional compliance. We then perform "tool grooming“ - optimizing venting, adjusting gates, and fine-tuning steel dimensions based on metrology reports. This iterative process continues until we achieve a stable, capable process and the parts are fully approved (PPAP ready) for mass production.

# MASS PRODUCTION & QUALITY ASSURANCE

The final stage is delivering a consistent, high-quality product at scale. We transition smoothly from tooling to manufacturing.

# MASS PRODUCTION & QUALITY ASSURANCE

**What we provide**

- **Scientific injection molding:** Utilizing decoupled molding techniques to ensure consistent part weight and dimensions, regardless of material viscosity variations.
- **Process optimization:** Minimizing cycle times to reduce unit costs without sacrificing quality.
- **Quality control (metrology):** Using CMM (Coordinate Measuring Machines) and optical inspection to verify critical dimensions against the print.
- **Secondary operations & assembly:** Ultrasonic welding, pad printing, inserting, and final packaging ready for shipment.

# CONCLUSION

By partnering with Decos for end-to-end plastic product development, you eliminate the friction of managing multiple vendors. We take ownership of the entire technical journey, ensuring that the design intent is preserved from the first sketch to the final molded part off the assembly line.

# HOW CAN WE HELP?

From first concept to regulatory approval, Decos is your strategic partner in bringing safe, reliable, and innovative medical devices to life. With a deep bench of expertise across embedded systems, software, hardware, and compliance, we simplify the complexity of product development; so, you can focus on what matters most: improving patient outcomes.

Ready to transform your next medical device idea into a market-ready, compliant solution?

Let's talk. Book a free consultation today.

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