VAJRA

MOULDING & MANUFACTURING TECHNOLOGIES

Precision manufacturing for engineered elastomers, polymers, bonded components and advanced materials.

MATERIAL	PROCESS	PERFORMANCE
Polymer & compound selection	**Tooling & moulding technology**	**Validated finished component**

THE RIGHT MATERIAL. THE RIGHT PROCESS. THE RIGHT COMPONENT.

01 THE VAJRA PROCESS LANDSCAPE

Different component geometries, materials, volumes and performance requirements call for different manufacturing routes.

RUBBER **Compression**	Large / specialised elastomer components
RUBBER **Transfer**	Complex geometry and insert encapsulation
RUBBER **Injection**	Repeatable, higher-volume precision production
BONDED **Rubber-to-metal**	Integrated elastic + structural components
INSERT **Insert moulding**	Metal or engineered inserts integrated into rubber
POLYURETHANE **PU moulding**	High-wear, high-load applications
THERMOSET **Bakelite / thermosets**	Rigid, stable and insulating components
PLASTICS **Engineering plastics**	Precision polymer components
ADVANCED **Composite processing**	Lightweight, high-performance structures

Core principle: Vajra selects the manufacturing process around the component — not the component around the machine.

02 RUBBER COMPRESSION MOULDING

A versatile process for engineered elastomer components.

Rubber preform	→	**Heated mould**	→	**Pressure + heat**	→	**Cured component**

BEST SUITED FOR	KEY ADVANTAGES
• Large rubber parts • Specialty compounds • Rubber-to-metal components • Low-to-medium volumes	• Robust process • Good material control • Large cross-sections • Development flexibility

ENGINEERING VIEW

A measured rubber preform is placed into a heated cavity and compressed while the compound cures. Compression moulding is particularly useful where component size, compound choice or geometry makes it the most practical route.

03 RUBBER TRANSFER MOULDING

Controlled material flow for intricate geometries and inserts.

Rubber charge → **Transfer pot** → **Controlled flow** → **Filled cavity** → **Cured part**

BEST SUITED FOR	KEY ADVANTAGES
• Intricate geometries • Insert encapsulation • Multi-cavity tooling • Precision bonded components	• Controlled flow • Good cavity filling • Repeatable insert positioning • Complex-feature capability

ENGINEERING VIEW

A measured rubber charge is transferred through controlled passages into closed cavities. This can provide enhanced control of filling and insert encapsulation compared with conventional compression.

04 RUBBER INJECTION MOULDING

Automated material delivery for repeatable production.

Rubber strip	→	Plasticise + meter	→	Inject	→	Cure	→	Demould

BEST SUITED FOR	KEY ADVANTAGES
• Higher production volumes • Precision seals • Complex repeat parts • Multi-cavity production	• High repeatability • Controlled dosing • Reduced operator dependence • Efficient production

ENGINEERING VIEW

Uncured rubber is metered and injected into a closed heated mould. The process is valuable when repeatability, cycle efficiency and production consistency are major requirements.

05 RUBBER-TO-METAL BONDING

Creating one integrated component from elastomer and engineered substrate.

Metal preparation	→	**Bonding system**	→	**Rubber moulding**	→	**Vulcanisation**	→	**Integrated part**

BEST SUITED FOR	KEY ADVANTAGES
• Flex seals • Bushes / mounts • Actuator components • Vibration isolation • Aerospace / defence	• Permanent bond • Load transfer • Reduced assembly • Damping + structure

ENGINEERING VIEW

Bonding is a controlled system involving surface preparation, primer/adhesive, compound, moulding and cure. These variables must work together to achieve reliable adhesion and load transfer.

06 INSERT MOULDING

Integrating engineered inserts directly into the moulded component.

Insert	→	**Accurate positioning**	→	**Mould closure**	→	**Elastomer moulding**	→	**Finished assembly**

BEST SUITED FOR	KEY ADVANTAGES
• Metal inserts • Bushes • Valve components • Sealing assemblies • Structural interfaces	• Reduced part count • Integrated assembly • Dimensional control • Permanent encapsulation

ENGINEERING VIEW

A pre-positioned insert is integrated into the elastomer during moulding. Accurate location, retention, surface preparation and material flow are central to component performance.

07 POLYURETHANE MOULDING

High-performance elastomers where wear, tear and load capacity are critical.

PU system → **Mould** → **Cast / mould** → **Cure** → **Finish**

BEST SUITED FOR	KEY ADVANTAGES
• Wear components • Rollers • Scrapers • Hydraulic parts • Heavy-duty engineering	• Exceptional wear resistance • High tear strength • High load capacity • Wide hardness range

ENGINEERING VIEW

Polyurethane is selected where wear, tear, load and resilience requirements exceed what a conventional rubber system may economically provide. Hardness, hydrolysis resistance and wear mechanism are key selection factors.

08 THERMOSET & BAKELITE MOULDING

Rigid, dimensionally stable components from thermosetting materials.

Thermoset charge → **Heated mould** → **Pressure + heat** → **Crosslink** → **Finished part**

BEST SUITED FOR	KEY ADVANTAGES
• Electrical insulation • Industrial components • Rigid mouldings • Thermal environments	• Dimensional stability • Electrical insulation • Thermal resistance • Low creep

ENGINEERING VIEW

Thermosetting materials undergo an irreversible crosslinking reaction during moulding. The finished component cannot simply be remelted and reshaped like a conventional thermoplastic.

09 ENGINEERING PLASTIC MOULDING

Precision processing of thermoplastic and engineering polymer systems.

Polymer pellets → **Plasticise** → **Inject** → **Cool** → **Eject**

BEST SUITED FOR	KEY ADVANTAGES
• POM • PP • PA • Engineering thermoplastics • Precision mouldings	• Repeatability • Fast cycles • Complex geometry • Reprocessable materials

ENGINEERING VIEW

Engineering plastics are selected around strength, stiffness, wear, chemical resistance, temperature and dimensional stability. Processing parameters are matched to the specific polymer grade and geometry.

10 ADVANCED MATERIALS & COMPOSITE PROCESSING

Lightweight material systems for demanding structural applications.

Fibre / reinforcement → **Lay-up / architecture** → **Matrix** → **Consolidate + cure** → **Finished composite**

BEST SUITED FOR	KEY ADVANTAGES
• Aerospace • Defence • Lightweight structures • Specialised industrial systems	• High specific strength • Low mass • Tailored stiffness • Application-specific architecture

ENGINEERING VIEW

Composite performance depends on reinforcement architecture, matrix chemistry, fibre orientation, consolidation and cure. Manufacturing is therefore integral to final material performance.

11 FROM MATERIAL TO FINISHED COMPONENT

Vajra integrates material selection, tooling, moulding and validation into one engineering workflow.

Applicatio n → **Material** → **Design** → **Tooling** → **Process** → **Moulding** → **Inspectio n** → **Validation**

APPLICATION	Temperature • pressure • media • motion • life
MATERIAL	Polymer • compound • reinforcement • hardness
DESIGN	Geometry • tolerances • sealing / structural function
TOOLING	Cavity • flow • shrinkage • inserts • demoulding
PROCESS	Compression • transfer • injection • specialised routes
VALIDATION	Dimensions • material properties • application testing

12 VAJRA — MANUFACTURING AS AN ENGINEERING CAPABILITY

Material science. Tooling. Process engineering. Precision manufacturing.

ELASTOMERS	BONDED COMPONENTS	ENGINEERING POLYMERS
NR • NBR • XNBR • HNBR • EPDM • FKM • FVMQ • Silicone and specialty compounds	Rubber-to-metal • insert moulding • integrated assemblies	PU • TPU • POM • PP • PA and other engineering polymers

THE VAJRA DIFFERENCE

We do not simply mould a specified material. We engineer the complete route from application requirements to material selection, tooling, process, inspection and repeatable production.

THE RIGHT MATERIAL • THE RIGHT PROCESS • THE RIGHT COMPONENT • THE RIGHT PERFORMANCE

Technical note: This literature describes manufacturing processes at a general engineering level. Actual process availability, machine configuration, dimensional capability and qualification requirements should be confirmed against Vajra's current manufacturing specifications.