PLASTIC PRODUCTS
PRODUCTION TECHNOLOGIES
RIAT PLC is the largest Russian manufacturer of plastic automotive components. Advanced management and a well-formed strategy allow the company to dynamically develop and steadily expand the scope of its activities.

The production facility is equipped with state-of-the-art machinery, such as Hartford machining centres, Cannon and Krauss Maffei molding machines, as well as advanced manufacturing techniques for plastic parts.

One of the key areas in the serial production of automotive components is the PDCPD (Polydicyclopentadiene) Reaction Injection Moulding (RIM) technology, bearing Metton and Telen brand name.

The key competencies of RIAT PLC are:
1. High design and manufacturing engineering potential
2. Full manufacturing cycle for all products
3. State-of-the-art painting equipment
4. Modern system of finished products’ warehousing and storage using a bar-coding
5. Own transport logistics

RIAT PLC has implemented a GOST R ISO 9001-2008 quality management system (meeting the requirements of ISO 9001:2008 international standards). The certificate registration number: РОСС RU ИС 66.К00117.


RIAT PLC is a reliable, well-established mechanism, capable of meeting any production and organizational challenges.
PRODUCTION STAGES

CURRENT TECHNOLOGIES OF AUTOMOTIVE COMPONENTS' MANUFACTURING

- Vacuum molding
- PDCPD RIM-process
- PU foam RIM-process
- RIM-technology
- Painting
- Warehousing

CAM end-to-end design
Tooling manufacture
Parts production
CAD/CAM
END-TO-END DESIGN

HIGHLY-QUALIFIED RIAT EXPERTS DEVELOP PROJECTS USING SUCH LICENSED SOFTWARE PRODUCTS AS SOLID EDGE, UNIGRAPHICS, GEOMAGIC STUDIO.
DESIGN AND MANUFACTURE OF TOOLING

RIAT TOOLING IS MANUFACTURED WITH THE USE OF MODERN HARTFORD MACHINING CENTRES (2010X4010 MM)

LARGE HARTFORD – TABLE SIZE OF 2010X4010 MM

SMALL HARTFORD – TABLE SIZE OF 800X2010 MM
RIM-PROCESS (REACTION INJECTION MOULDING)
PDCPD

MANUFACTURING OF POLYDICYCLOPENTADIENE PRODUCTS BY MEANS OF A CLOSED-MOLD INJECTION

«RIM-technology» term includes an abbreviation in English which can be expanded as «reaction-injection molding» and translated into Russian as “реакционно-литьевое формование”. The material used as a basis for parts’ manufacture is polydicyclopentadiene (PDCPD). PDCPD is a material that can replace metal, fiberglass plastic and a number of polymers due to its unique properties. Polydicyclopentadiene has a low density, high shock resistance which remains even at low temperatures (-60 °C), as well as high resistance to aggressive media, benzine & oil resistance (in particular, tensile strength of 46.8 MPa, flexing strength of 69.6 MPa, Rockwell hardness K 114), there are practically no limitations in the dimensions and thickness of products. The material is easily processed, glued and painted. It is possible to manufacture parts with a total area up to 20 m².

PROPERTIES OF PRODUCTS MADE OF PDCPD:
— Low specific gravity (density of 1.034 g/cm³);
— High strength properties;
— Resistance to acid attacks and other chemical substance exposure;
— High dielectric properties;
— Good machinability (easy drilling, cutting);
— Good paint and glue (binder) adhesion;
— Almost no limitations in dimensions and thickness (products’ dimensions up to 20 m²);
— High quality of final surfaces;
— Wide range of working temperatures.

ADVANTAGES OF PROCESSING SUCH OLIGOMERS:
— SIMPLE COMPONENT MIXING;
— REDUCTION IN TOOLING MANUFACTURING COST, AS THE PRESSURE MAINTAINED DURING INJECTION MOLDING DOES NOT EXCEED 2 BARS. TOOLING MATERIAL IS ALUMINIUM.
RIM-PROCESS (REACTION INJECTION MOULDING) PDCPD

CANNON MOLDING MACHINES.
VERTICAL AND HORIZONTAL MOLD CARRIERS. CROSS-BEAM
OVERALL DIMENSIONS ARE 3000 BY 2700 MM.

PDCPD PRODUCTS’ APPLICATION AREAS:

— Chemical and electrochemical industry (containers, tanks).
— Agricultural vehicles and farm cranes (bumpers, fenders, pads, hoods, etc.).
— Tractors (hoods, fenders, cabin parts, etc.).
— Trucks (bumpers, sidewalls, spoilers, linings, deflectors, containers, etc.).
— Passenger transport: buses, minibuses, minivans (bumpers, sidewalls, spoilers, linings, deflectors, wheel arch liners, facing panels, etc.).
— Other: construction, big irregular-shape products.
RIM-PROCESS (REACTION INJECTION MOULDING) PDCPD

SAMPLES OF PRODUCTS MANUFACTURED USING THIS TECHNOLOGY

Bumper face guard 63501
Bumper 5490
Front fender front part panel 5308
Step guard 6520
Spoiler 6520
Front fender front part panel 6520
Front fender front part panel 6520
Front fender front part panel 5490
Hood components
MTZ tractor hood assembly
COMPARISON CHART WITH PDCPD PROPERTIES AND THOSE OF EQUIVALENT MATERIALS (COMPETITORS)

<table>
<thead>
<tr>
<th>№</th>
<th>PERFORMANCE</th>
<th>PDCPD</th>
<th>FIBERGLASS PLASTIC (RTM)</th>
<th>ABS PLASTIC (VACUUM-FORMING)</th>
<th>POLYPROPYLENE (INJECTION MOLDING)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Density, g/cm³</td>
<td>1,03</td>
<td>1,7</td>
<td>1,7</td>
<td>1,09</td>
</tr>
<tr>
<td>2</td>
<td>Hardness (Shore)</td>
<td>65</td>
<td>60-80</td>
<td>65-80</td>
<td>69</td>
</tr>
<tr>
<td>3</td>
<td>Heat resistance, degrees C</td>
<td>120</td>
<td>100</td>
<td>95</td>
<td>105</td>
</tr>
<tr>
<td>4</td>
<td>Ultimate tensile strength, MPa</td>
<td>46,8</td>
<td>85</td>
<td>55</td>
<td>26</td>
</tr>
<tr>
<td>5</td>
<td>Flexural modulus, MPa</td>
<td>1882</td>
<td>2800</td>
<td>2400</td>
<td>1000</td>
</tr>
<tr>
<td>6</td>
<td>Ultimate elongation, %</td>
<td>4,7</td>
<td>3</td>
<td>30</td>
<td>200</td>
</tr>
</tbody>
</table>
RIM-PROCESS (REACTION INJECTION MOULDING)

PU FOAM

Polyurethane foam (PU foam) is the most universal group of currently produced polymers. It has unique properties due to changes made in the composition and processing conditions. Using of initial components A and B makes it possible to produce polyurethane foams (PU foams), both rigid and flexible ones, with open and closed pores and a wide range of specific gravity and strength. Polyurethane foam is 85-90% composed of air. The formation of polyurethane foam occurs during the reaction of two components in a liquid state: a polyol and a polyisocyanate. When the components are mixed, an exothermic (heat-producing) foaming and volume increasing reaction takes place, which is followed by curing of the material.

DISTINCTIVE FEATURES:

— HIGH TECHNOLOGICAL EFFECTIVENESS OF Parts’ PRODUCTION PROCESS.
— THE PROCESS TAKES PLACE AT RELATIVELY LOW TEMPERATURES AND Pressures.
— MOREOVER, EVEN THICK-WALLED PRODUCTS HAVE ALMOST THE MINIMUM LEVEL OF RESIDUAL STRESSES.
— THE COST OF INJECTION MOLDS FOR THE PRODUCTS MANUFACTURED USING THE RIM-TECHNOLOGY IS BY FAR LOWER THAN THAT FOR SIMILAR PRODUCTS MANUFACTURED THROUGH THE INJECTION MOLDING. THE INJECTION MOLDS HAVE THINNER WALLS, BUT THEY NEED TO BE HEATED.
— THE MOLDING PROCESS TAKES 3 TO 5 MINUTES, I.E. THIS PROCESS, AS WELL AS INJECTION MOLDING, REFERS TO HIGH-PERFORMANCE METHODS FOR THE PRODUCTION OF POLYMER PRODUCTS

PU FOAM ADVANTAGES

— DURABLE (THE PU FOAM LIFE CYCLE IS OVER 30 YEARS WITH FULL RETENTION OF ALL PROPERTIES).
— RESISTANT TO MOISTURE (MASS ABSORPTION IS ONLY 2%).
— NOT EXPOSED TO MICROORGANISMS, MOLDS AND FUNGI, DOES NOT ROT.
— HAS A HIGH AND DURABLE ADHESION TO ALMOST ALL CONSTRUCTION MATERIALS.
— DOES NOT SUSTAIN COMBUSTION AND IS A SLOW-COMBUSTIBLE MATERIAL (IN THE ABSENCE OF OPEN FIRE, THE PU FOAM DOES NOT BURN).
PLASTIC PRODUCTS. PRODUCTION TECHNOLOGIES RIAT PLC

RIM-PROCESS (REACTION INJECTION MOULDING)

PU FOAM

TO MEET ITS OWN NEEDS THE COMPANY SET UP THE PRODUCTION OF PARTS MADE OF FLEXIBLE AND RIGID POLYURETHANE FOAM, INCLUDING SEAT (BACKREST, CUSHION) FILLER COMPONENTS

TO IMPROVE THE CONSUMER PROPERTIES OF KAMAZ VEHICLES, RIAT SET UP THE PRODUCTION OF HEAT AND SOUND INSULATION PU FOAM PRODUCTS

DOUBLE-STIFFNESS PU FOAM PRODUCTS

IN ORDER TO IMPROVE THE CONSUMER PROPERTIES OF THE SEATS PRODUCED BY RIAT, THE TECHNOLOGY FOR MANUFACTURING OF DOUBLE-STIFFNESS FILLERS HAS BEEN DEVELOPED AND MASTERED. WHEN MOLDING THE CUSHION FILLERS, WE USE A PRINCIPLE OF PU FOAM DENSITY REDISTRIBUTION DUE TO THE RATIO OF COMPONENTS, WHICH ALLOWS DISTRIBUTING THE FILLER RIGIDITY. THE USE OF SUCH FILLERS MAKES IT POSSIBLE TO INCREASE COMFORT AND IMPROVE THE FIXATION OF A PERSON’S POSITION DURING A VEHICLE MANEUVERING.

Passenger seat backrest filler

KAMAZ cabin front lining

KAMAZ cabin floor heat and sound insulation

KAMAZ cabin mudguard heat and sound insulation

KAMAZ cabin front side lining
RIM-PROCESS (REACTION INJECTION MOULDING) PU FOAM

TAKING INTO ACCOUNT THE UNIQUE HEAT-INSULATING PROPERTIES OF POLYURETHANE FOAMS, RIAT HAS MASTERED AND LAUNCHED THE PRODUCTION OF HEAT-INSULATING SHELLS MADE OF PU FOAM.

RIAT manufactures and sells PU foam shells (semi-cylinders made of polyurethane foam) for heat insulation of various pipeline applications. Modern production equipment and the availability of home-made tooling for all nominal sizes of pipes make it possible to manufacture PU foam shells on a commercial scale. The PU foam shells are semi-cylinders of different diameters and thickness with formed longitudinal and diametric joints or without them. They are intended for insulation of pipelines with a medium temperature in the range of -120 to 150°C.

PU FOAM UNIQUE PROPERTIES

— HIGH HEAT RESISTANCE. The PU foam shells can withstand temperatures from -120 °C to 130 °C, which allows them to be used for the heat insulation of high-temperature heat pipelines, including main ones.

— LOW THERMAL CONDUCTIVITY. The PU foam has one of the lowest heat-conductivity factors (0.022-0.028 W/mK°), which gives it an advantage over other heat insulating materials.

— ENVIRONMENTAL FRIENDLINESS. The PU foam does not pollute the environment with toxic substances.

— LOW WATER ABSORPTION. Water does not impair the effectiveness of PU foams. Closed-cell structure prevents from moisture penetration. Water absorption within 24 hours does not exceed 1.5-2.5%.

— DURABILITY AND BIOCHEMICAL STABILITY. Rigid PU foam is resistant to solvent and alkaline attacks: oils and gasoline; fungosity and mold damage, therefore its heat insulation properties remain over a period of 25-30 years.
MANUFACTURING OF PRODUCTS FROM THERMOPLASTIC SHEETS BY MEANS OF VACUUM MOLDING

Thermal vacuum molding allows to produce all kinds of plastic structures, vehicle interior and exterior parts, acrylic bathtubs, sinks, shower cabins, etc. in a very efficient, profitable and fast way.

Vacuum molding is one of the main ways to manufacture special-quality bulky plastic products with limited production volumes.

The description of the vacuum molding process: the sheet is installed on a pressure plate and fixed in it. Then the sheet surface is cleaned from dirt and dust by means of compressed air. Afterwards, the sheet is heated to the required temperature (sometimes up to 200 °C) and formed by a vacuum between the part and the mold. A finished part is cooled, then removed and transferred for trimming.

MATERIALS APPLIED:
— ABS (acrylonitrile-butadiene-styrene).
— PP (polypropylene).
— HIPS (high-impact polystyrene).
— PET-G (transparent and painted, suitable for vacuum molding).
— Illuminating polystyrene.
— HDP (high-density polyethylene).
— ABS+PC (acrylonitrile-butadiene-styrene + polycarbonate).
— ABS/PMMA — co-extrusion (acrylonitrile-butadiene-styrene/polymethyl methacrylate).
— ABS /TPE — co-extrusion (acrylonitrile-butadiene-styrene/thermoplastic elastomer).
— PP/TPE — co-extrusion (polypropylene/thermoplastic elastomer).

THE WHOLE CYCLE FROM SHEET LOADING TO RECEIVING A FINISHED PRODUCT TAKES FROM 5 TO 20 MINUTES

A VACUUM MOLDING MACHINE MAKES IT POSSIBLE TO PRODUCE THE PARTS OF THE FOLLOWING DIMENSIONS:
— THE MAXIMUM OVERALL DIMENSION OF A MOLDED PRODUCT IS 1000X2200 MM.
— THE MAXIMUM DRAWING DEPTH IS 600 MM.
— THICKNESS OF MOLDED SHEETS IS 3 TO 7 MM.
A RESIN TRANSFER MOLDING (RTM) METHOD IS APPLIED FOR THE PRODUCTION OF SMALL AND MEDIUM PRODUCT BATCHES.

The equipment is a tooling consisting of two parts: a die and a punch (mating mold). The principle of injection manufacturing of fiberglass plastic parts is as follows: a pre-cut reinforcing material, such as glass-fiber mat or fiberglass, is laid between a punch and a die. Where necessary, the die can be coated with a decorative layer (gel coat) before the glass-fiber mat is laid. Then, the die and the punch are tightly sealed and the resin pre-mixed with the catalyst is pumped into a closed mold. After its hardening, a finished product is removed from the mold and machined. The difference of a Light RTM method is that the die and the punch are held down by the vacuum, and the punch represents a light positive die impression. Vacuum is also created in the mold working cavity, resulting in optimal impregnation characteristics of the reinforcing material. The fiberglass plastic manufacturing technology based on resin transfer molding requires certain financial expenses, both for polyester resin injection equipment, auxiliary equipment and for the production of double-sided tooling required for the manufacture of fiberglass plastic products. However, the fiberglass plastic injection manufacturing method has some significant advantages versus the fiberglass plastic manual molding technology or fiberglass plastic sputtering technology. In such a way, the better surface quality can be achieved on both sides of the part.

RESINS:
EPOXIDE, POLYESTER, VINYL ESTER.

FIBERS: ANY. IT IS ADVISABLE TO USE DEDICATED GLASS MATERIALS WITH A CONDUCTIVE LAYER AND MECHANICALLY COUPLED FIBERS.
RTM TECHNOLOGY

EQUIPMENT: APPLICATOR APPLIKATOR–8000, SWEDEN.

KAMAZ VEHICLE BOTTOM PARTS

- BUMPER FACE GUARD
- FRONT FENDER REAR PART PANEL
- STEP MUDGUARD
- REAR SHIELD OF A STEP MUDGUARD
ROBOT SYSTEM FOR CUTTING PARTS WHEN USING A PDCPD RIM TECHNOLOGY
PRODUCTION SITE.
PAINTING OF PLASTIC PARTS

PAINT EQUIPMENT SYSTEM
Equipment: NOVA VERTA and SAIMA state-of-the-art Italian paint and drying chambers.
Tools: SATA (Germany), DeWitbes (England), IWATA (Japan).
Materials: automotive enamels from leading manufacturers, such as PPG (acrylic, metallic, pearl) and Helios (alkyd, acrylic, metallic).
STORAGE FACILITIES
PACKAGING AND SPECIAL CONTAINERS FOR FINISHED PRODUCTS

RIAT EXPERTS DEVELOP, DESIGN AND MANUFACTURE THE IN-PROCESS AND SPECIAL CONTAINERS FOR THEIR OWN FINISHED PRODUCTS.
QUALITY MANAGEMENT SYSTEM CERTIFICATE OF CONFORMITY WITH GOST R ISO/TU 16949-2009 REQUIREMENTS.
ALL NECESSARY CERTIFICATES AND LICENSES FOR PERFORMANCE OF THE ABOVEMENTIONED WORKS.
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