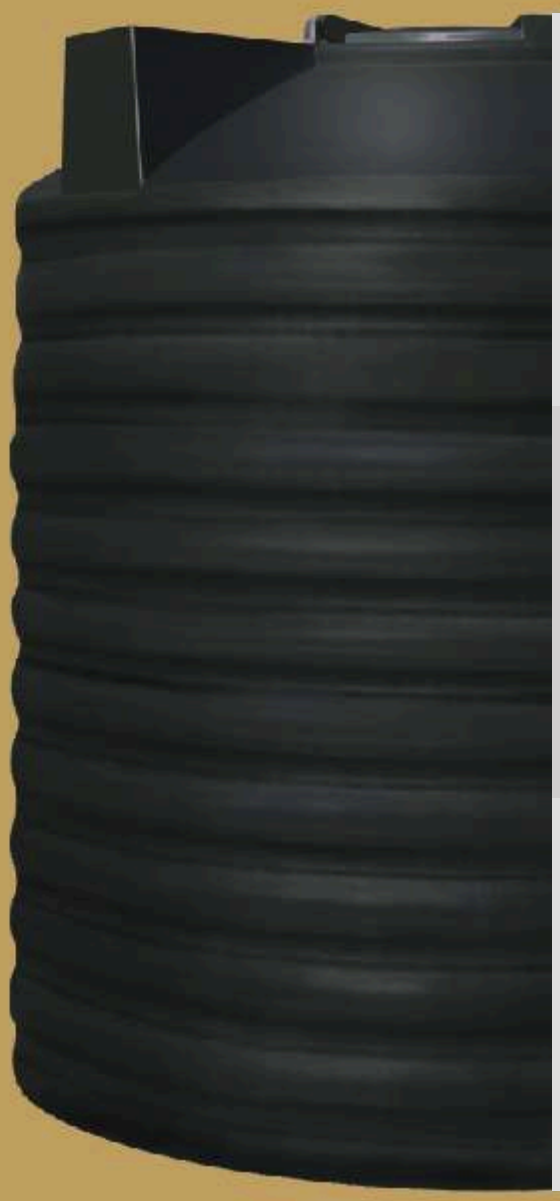
REPOL
POLYPROPYLENE
A Reliance Polymers product

RELENE
POLYETHYLENE
A Reliance Polymers product

REON
POLYVINYL CHLORIDE
A Reliance Polymers product

Reliance
POLYMERS

HERE'S THE FULL PICTURE



Reliance
POLYMERS

ROTOMOULDING FOR WATER TANKS IS ONLY HALF THE STORY

Reliance Industries Limited

Reliance Industries Limited is India's largest private sector company and the only private sector company from India to feature in the 2005 Fortune Global 500 list. The Group's activities span exploration and production of oil and gas, petroleum refining and marketing, petrochemicals (polymers, polyester, fibre intermediates and chemicals), retailing and textiles.

Reliance Polymers

Reliance Polymers is one of the world's largest producers with a current capacity of 3.5 MMT per annum and massive expansion plans underway. It operates world-scale plants for Polypropylene (PP), Polyethylene (PE) and Polyvinyl chloride (PVC) using state-of-the-art technology, setting global benchmarks in product quality and services.

A wide range of grades in each of the categories provide diverse applications across packaging, agriculture, automotive, housing, healthcare, water and gas transportation and consumer durables. Superior technological strengths, a strong focus on R&D, latest IT-enabled services to support supply chain management, and end-to-end solutions offered across the value chain, bear testimony to its commitment to customer satisfaction.

Polypropylene

REPOL
POLYPROPYLENE
A Reliance Polymers product

Being the 7th largest manufacturer of Polypropylene (PP) in the world and with a capacity of over 1.8 MMT per annum, Reliance Polymers offers a wide range of Homopolymer, Random and Impact Copolymer grades.

Homopolymer grades from Reliance Polymers are available in a wide range of melt flows and molecular weight distribution. They are used extensively in applications such as commodity and industrial packaging (TQPP, woven fabric, BOPP and cast film). Special grades are available for fibre and filament, extruded sheet and thermoformed applications.

Reliance Polymers has customised Impact Copolymers that are available in a diversified range of Impact and MFI to suit the needs of injection moulding, thermoforming, blow moulding, extrusion coating and compounding. Random Copolymers with improved strength and excellent contact clarity are available for plumbing pipes, sheets and blow moulding applications.

Polyethylene

RELENE
POLYETHYLENE
A Reliance Polymers product

Reliance offers the entire basket of Polyethylenes (PEs) viz. LDPE, HDPE and LLDPE with a capacity of 1.1 MMTA. Reliance Polyethylenes are available in wide ranging density and melt flow to match the demanding needs of the end applications. Low Density Polyethylene (LDPE) is used in extrusion coating, flexible packaging and moulding applications. High Density Polyethyene (HDPE) finds applications in high-pressure pipes, heavy-duty packaging, blow moulding, telecom ducting, pipe coating, woven sacks and monofilaments.

Linear Low Density Polyethylene (LLDPE) is used extensively in extrusion coating, milk & edible oil packaging, lamination films, specialty films and rotational moulding. Our Octene and Butene LLDPE grades are used in specialty films, various flexible packaging and rotomoulding applications. Reliance is one of the six producers of Octene grades in the world. Our LLDPE rotomoulding grades find extensive applications in automotive components, insulated containers, material handling products, tanks etc.

Polyvinyl Chloride

REON
POLYVINYL CHLORIDE
A Reliance Polymers product

Reliance Polymers is India's largest manufacturer of suspension grade Polyvinyl Chloride (PVC), with a capacity of 625 KT per annum and a wide range of viscosities. State-of-the-art manufacturing technology ensures consistency in the resin quality. Typical applications for Reliance PVC include rigid pipes and fittings, flexible tubes, hoses, doors, windows, partitions, floor/wall coverings, wires, cables, electrical conduits and fittings, blood bags, tubing, heart catheters, IV fluid bags, toys, sports goods, shower curtains and footwear.

Rotational Moulding

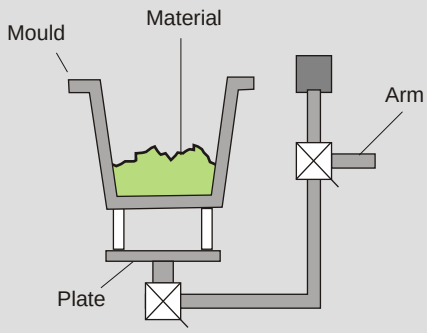
Rotational Moulding or Rotomoulding is a highly versatile process that allows unlimited design possibilities with the added benefit of lower production costs. The range of products being moulded is matched only by the innovative manner in which moulders tackle new product lines and markets. The product portfolio ranges from micro moulding of PVC earpieces to large polyethylene tanks.

Process

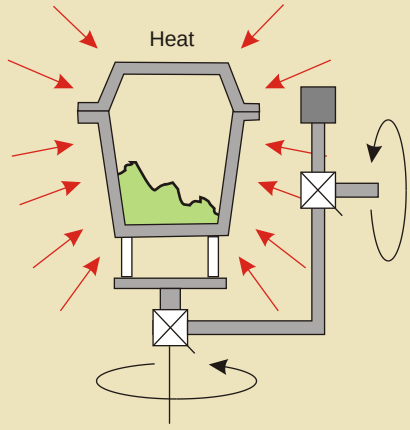
The rotomoulding process is simple in concept and consists of loading a known amount of plastic material in powder, micropellets, or liquid form into a hollow, shell-like mould. The mould is then heated and simultaneously rotated about its two principal axes so that the material enclosed in the mould fuses and uniformly adheres against the surface. The mould is then cooled to solidify while rotating to retain the desired shape. The part is then de-moulded.

Four Principal Stages of Rotomoulding

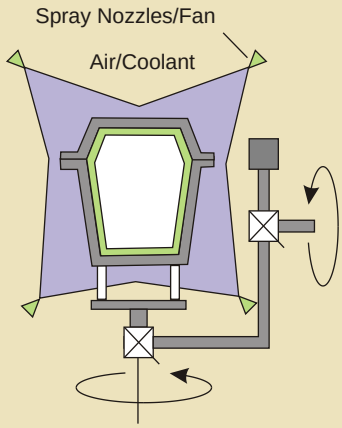
1 Charging the Mould



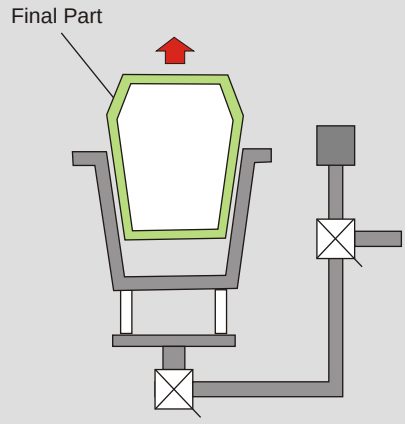
2 Heating the Mould



3 Cooling



4 Demoulding



Materials and Moulds

Rotational Moulders currently use a variety of polymers. The most widely used are Polyethylenes that include Linear Low-Density Polyethylene (LLDPE), High-Density Polyethylene (HDPE), Low-Density Polyethylene (LDPE), Cross-likable Polyethylene (XLPE) and PVC Plastisols. Other materials which are rotomoulded in a limited way include Polypropylene (PP), Nylons (PA), Fluoropolymers, Polycarbonates (PC), Cellulose Acetate Butyrate (CAB), Elastomers, Inomers, EVA and specially formulated compounds.

Globally, the rotomoulding industry uses fabricated sheet metal moulds for simple designs or for very large products like tanks. For complex designs and for specific surface finishes/textures, rotomoulders prefer cast aluminum moulds or CNC machined aluminum moulds, which offer a very high degree of design flexibility and consistency. Even though the cost of these moulds are comparatively higher than sheet metal moulds, they offer a very high value-addition to end products in terms of quality and finish.

Applications

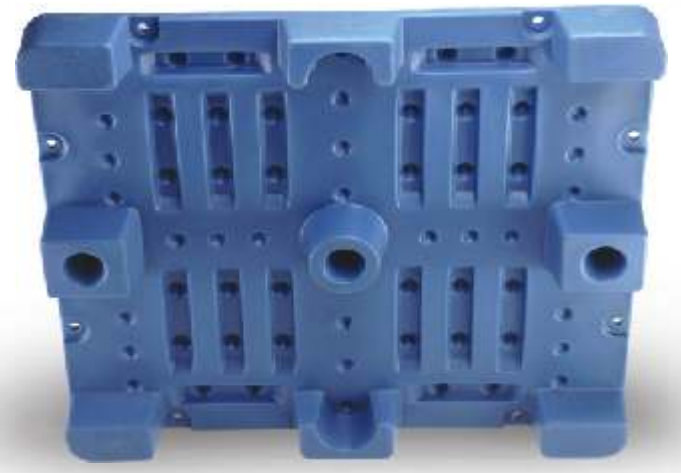
The recent technological developments in terms of materials, machines, moulds and process control, have opened up new application avenues. However, the versatility of the process is still largely unknown to the potential end users and to the design community. With increased awareness in the design community, more areas will open up for rotational moulding, which have not yet been considered or explored. This catalogue showcases typical application areas and new products that can be rotomoulded, to the Indian Rotomoulding Industry and to potential end users.

Industrial

Tote Box

Bin with moulded-in
pallet base for 2-way entry

Pallet



Industrial

Insulated Bulk Container

Tilt Truck

Linen Exchange Truck

Industrial

Bulk Linen Truck

Utility Truck

Super Flare Truck

Industrial

Service Kit

Tool Trainer

Service Kit

Tanks

Spray Tank

Septic Tank

Transportation

Tractor Fuel Tank

Fuel Tank

Road Divider

Furniture

Hand Chair

Stack Chair

Ultra Control Chair

Furniture

Quarter Circle Sofa

Glove Chair

Shoe Fitter

Couch

Medical

Spine Board

End Panel of
Medical Equipment

Medical Bed Rest

Recreation

Sporting Toy Sledge

Boat Seat

Accessory and Golf Case

Special Category

Coffee Dispenser

Newspaper Rack

Baby Diaper Changing Station

Special Category

Housing of Vacuum Cleaner

Mannequin

Special Category

Garbage Can Lid
with Mould-in Graphics

Light Globes

Door Panel with Colour Mould-in Graphics

Special Category

Custom-made Floating Pump Base

Custom-made Roll Box

Decorative

Light Post

Bird Bath

Decorative

Contemporary
Bench

Garden Bench

Poly Rock

Decorative

Planter

Pedestal Planter

Decorative

Round Planter

Half Round Planter

Decorative

Fluted Grooved Planter

Large Urn with Base

Decorative

San Juan Planter

Fluted Grooved Planter

Decorative

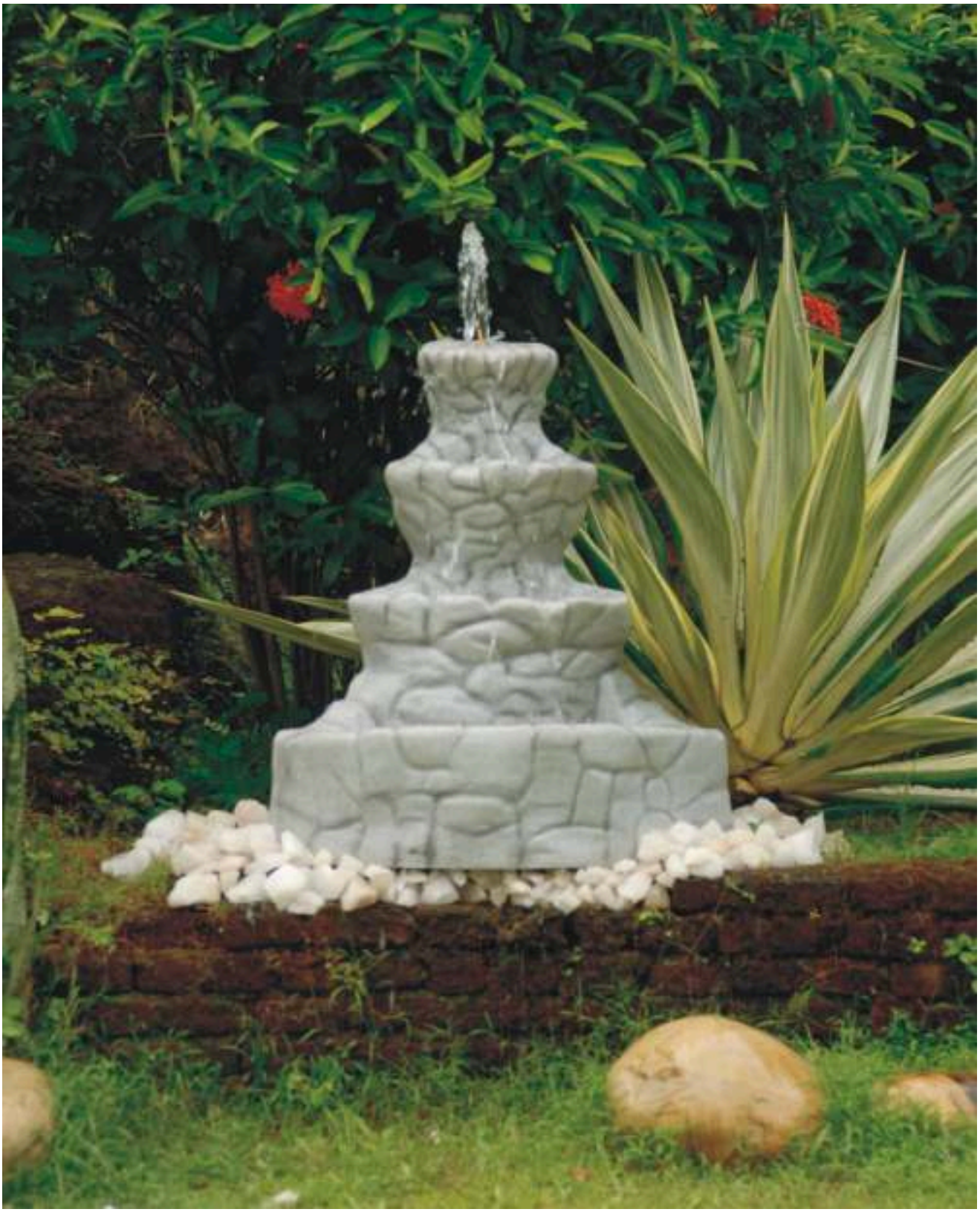
Roman Pillars

Ionic Pillar

Decorative

Polysteel Bollard

Railing



Granite Stone Cascade

Advantages of Rotational Moulding

Rotational Moulding is an economically viable process to manufacturer a limitless range of products in all shapes and sizes, some of which would be difficult to produce by any other moulding process. It is also possible to give special effects like textured grain, leather finish, etc. in the moulds. The benefits of rotomoulding are varied.

Design and Process Benefits

- Flexibility – from small and intricate to large and complex products
- Seamless construction and virtually stress-free products
- Easy to vary thickness with uniform wall distribution – no thinning at corners
- Double-wall products
- Multi-layer or multi-material products
- Products with undercuts and metal inserts
- Foamed products
- Products with mould-on or mould-in graphics
- Product with different surface textures and colours

Mould Fabrication and Cost Economic Benefits

- Short lead-time as moulds are easy to fabricate
- Low tooling cost
- For short production runs and prototypes as well as for volume production

Indian Rotomoulding Industry - An Overview

Indian Rotomoulding Industry started in early 70's with a focus on water tanks and containers. Rotomoulded water tanks became extremely popular due to their light weight, durability, hygienic & easy installation and maintenance, easy availability, and low cost. Since then, the industry has grown by leaps and bounds, both in number of rotomoulders and plastic consumption. Today, there are more than 200 rotomoulders spread across the country consuming around 70 KTA of different grades of polymers. The annual growth rate of the industry is around 20% and this robust growth is likely to continue in the years to come.

Water tanks have traditionally been the main product segment for the Indian Rotomoulding Industry and more than 95% of rotomoulders depend on this segment. Today, water tanks constitute 80% of the market share and would continue to be the major segment due to scarcity of water and increasing building and construction activities in the country. This market segment will continue to have very good growth rate and higher volumes.

With increased awareness and access to the global market, many of the rotomoulders have started venturing into custom made/industrial products like fuel tanks, chemical tanks, material handling products, solid waste management products, etc. These products – though they are at a nascent stage – will register higher growth rates. Awareness within Indian design community about the process and products is fast growing, and this will fuel further growth in the industry, as new and innovative design products are developed.

Presently, the Indian Rotomoulding Industry uses fabricated sheet metal/stainlesssteel moulds since the tanks have been the main product segment. Rotomoulders have extended their knowledge of sheet metal fabrication to newer products. The development of casting technology and usage of cast/CNC machined aluminum moulds is still at the infancy. The industry has to invest in technology for casting/CNC machining. Also mould-in or mould-on graphics in rotomoulded products have neither been used nor developed.

Indian rotomoulding industry is going through structural changes in terms of material development, technological advancement in machines, processes, moulds and new market segments.

Growth Opportunities for the Indian Rotomoulding Industry

Rotomoulding is one of the fastest growing sectors and its developmental activities are highest in emerging markets like Asia, and particularly in India. The Indian economy, which is growing at a fast pace, is opening up new avenues for the Rotomoulding Industry. The growing government emphasis on development of infrastructure, agriculture, health and sanitation, building and construction, etc. apart from growth sectors like automotive, white goods, retail, petrol stations, recreation, marine industry, etc., will generate tremendous growth potential and opportunities for Rotomoulding Industry.

The Indian Rotomoulding Industry is at an exciting stage with the development of a wide range of products including automotive components like bumpers, crash guards, air ducts, engine covers, three-wheeler bodies, seating systems, septic systems, underground tanks, manholes, garbage bins, portable toilets, public utilities, traffic & safety barriers, retail products like point of sale/ point of purchase, kiosks, indoor and outdoor furniture, decorative products, etc.

Easy availability of raw material, technical support from local material manufacturers, access to the global information system will give further impetus to the growth of the Rotomoulding Industry in India.

Reliance - Partnering Growth

Reliance Industries Ltd. is committed to the development of Indian Rotomoulding Industry. The primary emphasis has been on identifying thrust areas, providing assistance to potential rotomoulders, development of required grades/ material, facilitating development of mould manufacturing technology and technology transfer from developed countries, orientation programme to design community – so that world-class rotomoulded products are developed and manufactured in the country.

In its effort to upgrade the product design and technology, Reliance Industries has imported rotomoulded products from different countries, and showcases the same at various forums and customer meets.

Rotomoulding Industry in India is on high growth mode of development and has tremendous growth opportunities. Rest assured, Reliance Industries will partner with the Indian Rotomoulding Industry every step of the way in making international-standard products a reality in India – now and in the future.

This booklet is an attempt to showcase some of the opportunities for rotomoulding, however the sky is the limit.

Acknowledgment

Image Copyright Association of Rotational Moulders (ARM). Reliance Polymers acknowledges the kind permission of ARM in allowing for publication.

Disclaimer

The products made by the rotational moulding process which are pictured or otherwise identified on the pages of this book are representative of the products made by that process. These pictures or other identifications are intended solely to illustrate examples of the types of products made by this process. Reliance Polymers does not make any warranties or representations of any kind whatsoever regarding the plastic product or any subject in the pictures or identifications found on the pages of this book.

Reliance Polymers – 360° Partnership Delivering Value

Enables Growth

- Sector-specific, process-focussed developmental approach from "Molecule to Marketplace"
- Product, application and market development
- Structured Sector Management programmes
- Trends transplantation
- Market extension in conjunction with nodal agencies, machinery manufacturers and leading processors

Supports Development

- Technical support
- Quality Assurance
- Post-trial vendor development
- Advisory services
- An exclusive Entrepreneur Development Program
- Collaborative research with scientific institutions
- Partnerships with government bodies and institutions for developing new standards and specifications
- Capability and capacity development

Enriches Relationships

- Knowledge transfer
- Sharing of intellectual capital and technical resources
- Customer meets
- Manpower training

Ensures Sustainability

- Development of sustainable, cost-effective and environmental friendly solutions
- Easing the pressure on natural resources
- Focus on renewable resources
- Balancing economic growth with improved quality of life

Reliance
Industries Limited
Growth is Life

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