



GAIL (India) Limited

POLYMERS FOR LIFE

HDPE, LLDPE & PP



**BRAHMAPUTRA CRACKER
AND POLYMER LIMITED**

[A Joint Venture Company of GAIL (India) Ltd.,
OIL, NRL & Govt. of Assam]



BRAHMAPUTRA CRACKER
AND POLYMER LIMITED

Introduction

Brahmaputra Cracker and Polymer Limited (BCPL), the first ever petrochemical plant of north-east India, is all geared up to promote plastic industry in the region. Promoted by GAIL (India) Limited as a Joint Venture Company, BCPL looks forward to create a sustainable development for the people residing in these regions.

BCPL is envisioning for a constructive presence in the north-eastern region of India in the form of '*Polymers for life*' approach. The mega plant will help in developing a lot of ancillary industries which in turn will provide direct and indirect employment to the local people. This will help in increased per capita income and better quality of life.

The BCPL project will provide all the eight north-eastern states of India with the most fitting opportunity to orchestrate their growth in a comprehensive manner. The project will be hugely beneficial for suppliers and buyers alike and will be commissioned by 2012-13.

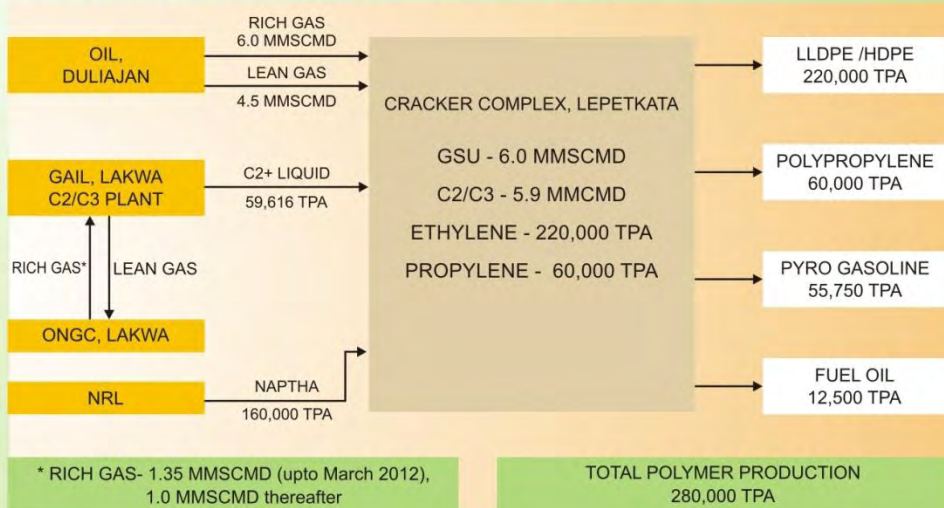




Polymers for life

BCPL Project Configuration

The project configuration includes the separation of C2+ liquid from the available gas at GAIL's LPG Plant at Lakwa, which will then be transferred via pipeline to Gas Cracker unit at Lepetkata. The rich gas from OIL shall be transferred by pipeline to Gas Cracker plant where C2+ liquids shall be recovered and used as a feed for the Gas Cracker. The combined C2+ liquid and naptha will be fed to the Gas Cracker to obtain ethylene and propylene for production of LLDPE, HDPE and Polypropylene.



LLDPE/HDPE - Description & Application

The resin grades to be manufactured in the LLDPE/HDPE plant will be based on the gas phase process technology and will primarily cater to the Film, Injection Moulding, Rotational Moulding, Raffia-Monofilament & Blow Moulding sectors. The MI value will be in the range of 0.05 to 21 g/10min and Density value in the range 0.920 to 0.960 g/cc.

Film

LLDPE grade (MFI- 0.9): This grade is recommended for general purpose application. It is suitable for blending with conventional LDPE. Film made from this grade has better sealing, higher puncture resistance, greater drawdown capability and higher tensile strength over conventional LDPE.

It is suitable for manufacturing heavy duty sacks, agriculture films, liners, stretch film etc.



Packaging Films

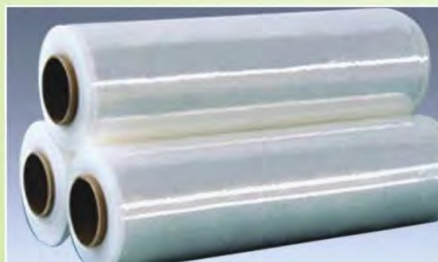


Liners

LLDPE grade (MFI- 2.0): This grade is suitable for the production of blown film for light duty applications and for the production of cast stretch film.



Stretch Film



Stretch Film Roll

LLDPE grade (MFI- 4.0): This grade is suitable for the production of high quality cast packaging films, such as display packaging and bubble film. It has high output rates, excellent drawdownability, good combination of strength & stiffness and high glow & clarity.



Bubble Film Roll



Bubble Film Packaging

HMHDPE (MFI- I_{21} - 10): This grade is suitable for the production of very thin film with high tensile strength and stiffness. It has excellent drawdownability, good extrudability, high tensile strength and high stiffness. The grade is used for making strong thin film, shopping/carrier bag, grocery sacks, trash bags etc.



Trash Bag



Carrier Bags

MDPE Rotational Moulding

MDPE (MFI- 3.0): This grade is a high rigidity UV stabilized virgin medium density polyethylene copolymer grade exhibiting good impact strength and improved stiffness.

It is used for manufacturing rotational moulded items with improved stiffness, draining parts, domestic fuel tanks etc.



Fuel Tank



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MDPE (MFI- 4.0): This grade is a UV stabilized virgin medium density polyethylene copolymer grade exhibiting excellent processability, good impact strength, high stiffness, excellent internal and external surface finish.

It is used for manufacturing rotational moulded items like tanks, containers, waste bins, road dividers etc.



Road Dividers



Water Storage Tanks

HDPE Injection Moulding

HDPE (MFI- 4.5): This grade is a UV stabilized high density polyethylene copolymer grade with a narrow molecular weight distribution, specially developed for injection moulding of heavy duty articles. It has high rigidity, high impact strength and good ESCR.

It is used for manufacturing large dustbins, pallet boxes, fish crates and technical mouldings.



Fish Crates



Dustbins

HDPE (MFI- 8.4): This grade is a UV stabilized high density polyethylene grade characterized by easy processing, high rigidity, good impact strength and high warpage resistance.

It is used for manufacturing crates, boxes, pallets, closures, helmets etc.



Crates



Crates

HDPE (MFI- 21): This grade is an easy flow high density polyethylene copolymer grade suitable for thin wall injection moulding applications. It has good flow, high warpage resistance and suitable for fast cycling applications.

It is used for manufacturing housewares, thin walled food containers, caps & closures.



Buckets & Baskets

Raffia-Monofilament

HDPE (MFI- 1.0): This grade is high density polyethylene copolymer grade suitable for tape and monofilament applications. It is characterized by excellent processability and exceptional tenacity.

It is used for manufacturing woven sacks (raffia bags) for fertilizer, foodgrain, sugar packaging, sacks for vegetables, woven covers, tarpaulins, woven shopping bags, knitted nets for crop protection and ropes.



Fishing Nets



Raffia Bags

HDPE Blow Moulding

HDPE (MFI- 0.2): This grade offers an optimum balance of properties for use in a wide range of blow moulding applications. It has easy processing, good rigidity, high ESCR and good impact strength.

It is used for manufacturing blow moulded containers upto 5 litres for packaging chemicals, household products, oil and other foodstuff.



Oil Containers



Lube Oil Containers

HDPE (MFI- I₂₁ - 10): This grade is suitable for medium and large blow moulding applications where a combination of high environmental stress cracking resistance and good rigidity is required. It is characterized by very high ESCR, good rigidity, high melt strength and high impact strength.

It is used for manufacturing high performance blow moulded containers of typically 1 to 60 litres capacity for packaging aggressive products and robust industrial and for technical mouldings.



Large Containers



Large Containers

POLYPROPYLENE - Description & Application

The resin grades to be manufactured in Polypropylene plant will be based on Novolen Gas phase technology. The product range of PP plant will cover various grades of homopolymer & random co-polymer.

TQ Film (MFI- 12): TQPP (un-oriented or tubular quenched polypropylene) films manufactured from this grade have excellent stiffness and clarity. The applications are primarily transparent film for packaging, textile overwraps, garment bags, snack food packaging.



Garment Packaging Film



Film Roll

Raffia (MFI- 3.4): This is a propylene homopolymer for extrusion and thermoforming applications. The extremely low water carry-over is of special advantage in the production of tapes. Woven sacks (raffia bags) manufactured from this grade are used for the packaging of cement, fertilizer etc.



Raffia Bags



Leno Bags

Injection Moulding (MFI- 12):

This is a propylene homopolymer for general purpose injection moulding applications, rigid packaging, furniture, house-wares, closures etc.



Furniture



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Typical HDPE / LLDPE Property Chart

Film						
Grade	MFI (I ₂ , 190°C) (g/10min)	Density (g/cc)	Tensile Strength @Break (Kg/cm ²) (MD/TD)	Elong. @Break (%) (MD/TD)	Tear Strength (g/25u) (MD/TD)	Application
	ASTM D 1238	ASTM D 1505	ASTM D 882	ASTM D 882	ASTM D 1922	
LLDPE	0.9	0.920	440/400	600/800	140/360	General purpose applications, liners, stretch film etc.
LLDPE	2.0	0.920	350/300	800/750	130/300	Blown film for light duty applications and for the production of cast stretch film.
LLDPE	4.0	0.930	330/250	750/925	40/100	High quality cast packaging films, such as display packaging and bubble film
HM-HDPE	10 (1 ₂₁)	0.953	560/650	450/400	-	Strong thin film, shopping/ carrier bag, grocery sacks, trash bags etc.
Rotational Moulding						
Grade	MFI (I ₂ , 190°C) (g/10min)	Density (g/cc)	Tensile Strength @Yield (Kg/cm ²)	Elong. @Break (%)	Flexural Modulus (Kg/cm ²)	Application
	ASTM D 1238	ASTM D 1505	ASTM D 638	ASTM D 638	ASTM D 790	
MDPE	3	0.943	210	>500	7000	Draining parts, domestic fuel tanks etc.
MDPE	4	0.938	180	600	6500	Rotational moulded items like tanks, containers, waste bins, road dividers etc.
Injection Moulding						
Grade	MFI (I ₂ , 190°C) (g/10min)	Density (g/cc)	Tensile Strength @Yield (Kg/cm ²)	Elong. @Break (%)	Flexural Modulus (Kg/cm ²)	Application
	ASTM D 1238	ASTM D 1505	ASTM D 638	ASTM D 638	ASTM D 790	
HDPE	4.5	0.957	270	>1000	12500	Dustbins, pallet boxes, fish crates and technical mouldings.
HDPE	8.4	0.960	310	>1000	14000	Crates, boxes, pallets, closures, helmets etc.
HDPE	21	0.952	240	>900	10500	Housewares, thin walled food containers, caps & closures.
Raffia						
Grade	MFI (I ₂ , 190°C) (g/10min)	Density (g/cc)	Tensile Strength @Yield (Kg/cm ²)	Elong. @Break (%)	Flexural Modulus (Kg/cm ²)	Application
	ASTM D 1238	ASTM D 1505	ASTM D 638	ASTM D 638	ASTM D 790	
HDPE	1.0	0.954	220	>800	8500	Woven sacks for fertilizer, foodgrain, sugar packaging, tarpaulins etc.

Blow Moulding						
Grade	MFI (I_2 , 190°C) (g/10min)	Density (g/cc)	Tensile Strength @Yield (Kg/cm ²) ASTM D 638	Elong. @Break (%) ASTM D 638	Flexural Modulus (Kg/cm ²) ASTM D 790	Application
HDPE	0.2	0.955	260	1000	10000	Containers upto 5 litres for packaging chemicals, household products, oils and foodstuffs.
HM-HDPE	10 (I_{21})	0.953	260	1000	9000	Containers typically 1 to 60 litres

Typical Polypropylene Property Chart

Raffia						
Grade	MFI (I_2 , 230°C) (g/10min)	Density (g/cc)	Tensile Strength @Yield (Kg/cm ²) (50mm/min) ASTM D 638	Elong@Yield (%) (50mm/min) ASTM D 638	Tensile Modulus (Kg/cm ²) (v=1mm/min) ASTM D 638	Application
PP	3.4	0.91	340	9	15000	Woven sacks for cement, fertilizer etc.

TQ Film						
Grade	MFI (I_2 , 230 °C) (g/10min)	Density (g/cc)	Tensile Strength @Yield (Kg/cm ²) (50mm/min) ASTM D 638	Elong@Yield (%) (50mm/min) ASTM D 638	Tensile Modulus (Kg/cm ²) (v=1mm/min) ASTM D 638	Application
PP	12	0.91	350	8	15500	Transparent film for packaging, textile overwraps, garment bags, snack food packaging.

Injection Moulding						
Grade	MFI (I_2 , 230 °C) (g/10min)	Density (g/cc)	Tensile Strength @Yield (Kg/cm ²) (50mm/min) ASTM D 638	Elong@Yield (%) (50mm/min) ASTM D 638	Tensile Modulus (Kg/cm ²) (v=1mm/min) ASTM D 638	Application
PP	12	0.91	350	8	15500	Rigid packaging, furniture, house-wares, closures etc.



GAIL (India) Limited

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