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www.gcmgrp-techinfo.com



Caps and Closures Solutions

Updated as of June 2021



Company Introduction



PTT Global Chemical Public Company Limited

PTT Global Chemical Public Company Limited, or GC, Thailand's largest integrated petrochemical and refining business and a leading corporation in the Asia-Pacific region, both in size and product variety. GC has a combined olefins and aromatics capacity of 11.28 million tons/year. We committed to creating chemical innovations for a better future. We strongly support technological advances that meet today's lifestyles through products that span several sectors including automobiles, construction, medical products, electric and electronic equipment, agricultural products, environmentally friendly, and safe consumer products that benefit society and improve consumer satisfaction.

www.pttgcgroup.com



HMC Polymers Company Limited

HMC Polymers Company Limited, or HMC, a subsidiary of PTT Global Chemical Company Limited (GC). The first polypropylene manufacturer in Thailand with the production facilities output over 810,000 metric tons per year and comprise two Spheripol lines and a latest technology Spherizone line from LyondellBasel. We produces a wide range of Moplen polypropylene grades including homopolymer, heterophasic and random copolymer resins, as well as specialty polypropylene resins.

www.hmcpolymers.com



GC Marketing Solutions Company Limited

GC Marketing Solutions Company Limited, or GCM, a subsidiary of PTT Global Chemical Company Limited (GC). GCM is a major polymer sales and marketing company in Thailand. We offer variety of high-quality polymers such as high density polyethylene (HDPE), low density polyethylene (LDPE), linear low density polyethylene (LLDPE), polypropylene (PP), polystyrene (PS) and polyethylene terephthalate (PET). Our products are distributed throughout Thailand as well as being exported to more than 100 countries around the world with the product and services qualities are well accepted by our customers internationally.

www.gcmgrp.com



GC Logistics Solutions Company Limited

GC Logistics Solutions Company Limited, or GCL, a subsidiary of PTT Global Chemical Public Company Limited (GC). GCL is full logistics service for chemical business and other products. The services is including silo, bagging & packing, warehouse management, transportation, freight forwarding, and customs clearance etc. We are committed to strengthen our client's competitive advantage though high quality services, advanced technology and competitive cost.

www.gc-logistic.com



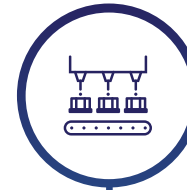


Product Introduction

Business Trends

Growth in the beverage industry, particularly in plastic bottled water, will rapidly drive increasing of HDPE screw caps and closures demand. Moreover, the trend in beverage packaging is to down-gauge, lightweight and standard short neck closures. The use of lightweight closures is spreading through the beverage industry which is the aim to use a less polymer substrate but still retain all the performance of caps and closures. Consequently, this application typically requires a balance of toughness and stiffness, combined with easy processability, and excellent in organoleptic properties, in particular for beverage applications include, still water, pasteurized water and carbonated soft drinks (CSD).

Value Chain



Converter

Benefit to Converter (Production Perspective) :

Our caps and closures resin are well controlled in quality to provide an advantage of processability, product stability and product consistency which essential for high speed & fast cycle time production.



Brand

Benefit to Branding (Marketing Perspective) :

Our caps and closures resin deliver quality advantages of stiffness and superior Environmental Stress Crack Resistance (ESCR) properties which secure and strengthen the brand equity.



Consumer

Benefit to Consumer (User Experience Perspective) :

Our caps and closures resin is a health and safety conscious product which serve a benefit of safety, purity and organoleptic for our valuable customer.

Solutions

Product Quality

Because the quality and safety are major required for beverage packaging, we are strongly committed to producing InnoPlus and Moplen caps and closures resin a safe, functional and legal product by obtaining globally recognized certification.



InnoPlus

InnoPlus PE for caps and closures is manufactured under International ISO 9001 / ISO 14001 / OHSAS 18001 standard and strictly control for Good Manufacturing Practices (GMP) and Hazard Analysis and Critical Control Point (HACCP) standard. They also meet with international standard regulations in contact with food application such as U.S FDA 21 CFR 177.1520 and EC1935/2004, EU10/2011 and its amendments. In particular country, Additionally, they comply with HALAL for Muslim country, JCII for Japan, GB 9685-16 for China and TIS 816-2556 for Thailand

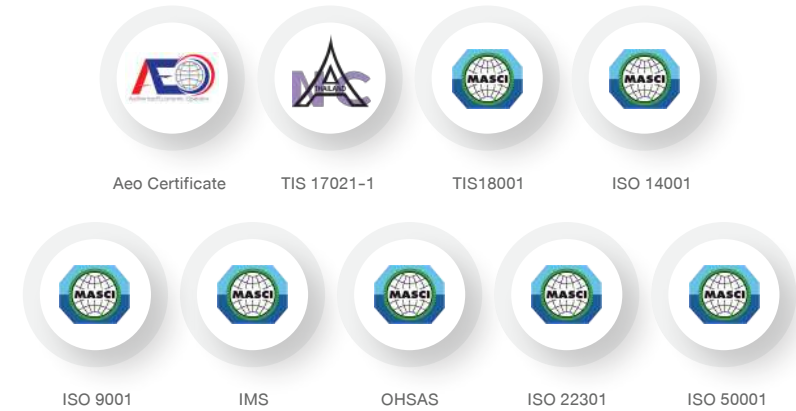
Moplen

Moplen PP for caps and closures is manufactured under International ISO 9001 and ISO 14001 standards. Moplen PP for caps and closures also meet with international standard regulations such as U.S. FDA and European Union regulations include another country's equivalent regulatory classification.

Service Quality

We are also strongly committed to handle and deliver caps and closures resin. We storage the resin in International Distribution Center (IDC) is one of the largest in the Southeast Asian region. It is over 140,000 sq.m. in size and has a capacity to handle the production and delivery of over 1 million tons of polymer per year with most advanced technology under top quality management.

We provide fully logistics with highly effective integrated Transportation Management System (TMS) spanning across transportation network design, routes selection, vehicle scheduling and freight management to ensure the best results.



How to Handling and Storage

Handling

- Use good housekeeping for safe handling of the product.
- No smoking, open flames or source of ignition drinking or eating in handling and store area.
- Avoid spilling the product, as this might cause falls.
- Potential toxic/irritating fumes may be evolved from heated material. Provide appropriate ventilation for such processing conditions.
- Take precautionary measures against explosion risks, as all types of polymers may develop dust during transporting or grinding of granules.

Storage

- Store away from heat, ultraviolet and direct sunlight in a dry, cool and well-ventilated area.
- Take precautionary measures to prevent the formation of static electricity.
- Do not store together with oxidizing and self-igniting products.

Cap and Closure Grade by Product Segments

Grade	Beverage CSD	Beverage NON - CSD	Food and Dairy Products	Personal Care and Beauty	Home Care	Industrial
HD1600JP		●				●
HD2200JP		●				●
HD2220C		●				●
HD2401C		●				●
HD3000C/ HD3001C	●	●				●
HD3200C	●	●				●
HD3500C/ HD3502C	●	●				●
HD1010J		●				●
LD2426K		●	●			●
LD2420K			●			
LD2026K			●			●
LL5420A		●	●			
HP400M		●		●	●	●
HP648N		●	●	●	●	●
HP500N		●		●	●	●
RP348N		●		●	●	●
EP545L		●	●		●	●
EP546T		●	●	●	●	●
HP400H		●		●	●	●
EP540N				●	●	

GRADE Selection : HDPE

Properties	HD1600JP	HD2200JP	HD2220C	HD2401C	HD3000C	HD3001C	HD3200C	HD3500C	HD3502C
MFR at 190 OC, 2.16 kg (g/10min)	12	3.5	4	7	2	2	2.3	1	1
Density (g/cm3)	0.958	0.961	0.960	0.964	0.954	0.954	0.967	0.956	0.956
Flexural Modulus (kg/cm3)	13500	14500	12600	16000	11300	11300	17000	11500	11500
Notched Izod Impact at 23 OC (kg.cm/cm)	3 (C)*	5 (C)*	7 (H)*	3 (C)*	5 (P)*	5 (P)*	2.5 (C)*	6 (NB)*	6 (NB)*
Vicat Softening Point	120	126	127	124	122	122	123	120	120
ESCR : 10% Igepal, F50 (hr)	3	4	6	4	24	24	15	460	460
Slip Agent	NO	NO	NO	NO	YES	NO	NO	YES	NO
Structure	Unimodal	Unimodal	Unimodal	Unimodal	Unimodal	Unimodal	Bimodal	Bimodal	Bimodal
Specific Features	ORGANOLEPTIC	ORGANOLEPTIC	Superior ORGANOLEPTIC property	Superior ORGANOLEPTIC property	ORGANOLEPTIC	ORGANOLEPTIC	ORGANOLEPTIC	Superior (ESCR) Performance	Superior (ESCR) Performance
Business Segment	Beverage Non-CSD	Beverage Non-CSD	Beverage Non-CSD	Beverage Non-CSD	Beverage Non-CSD and CSD	Beverage Non-CSD and CSD	Beverage Non-CSD and CSD	Beverage CSD	Beverage CSD

Remark *C = Complete break *P = Partial Break *NB = Non Break

For more information : www.gcmgrp-techinfo.com

GRADE Selection : LLDPE / LDPE

	Test Method (ASTM)	LL5420A	LD2426K	LD2420K	LD2026K
MFR at 190 OC, 2.16 kg (g/10min)	D1238	20	4	4	4
Density (g/cm3)	D792	0.924	0.924	0.924	0.920
Flexural Modulus (kg/cm3)	D790	(Under testing process)	-	-	-
Notched Izod Impact at 23 OC (kg.cm/cm)	D256	(Under testing process)	-	-	-
Vicat Softening Point	D1525	94 (refer to LL8420A, the test is under processing)	93	93	86
ESCR : 10% Igepal, F50 (hr)	D1693	(Under testing process)	-	-	-
Slip Agent		Yes	Yes	No	Yes
Structure		-	-	-	-
Specific Features		- Organoleptic test passed - High melt flow	Organoleptic test passed	Organoleptic test passed	Organoleptic test passed
Business Segment		- Beverage NON - CSD - Food and Dairy Products	- Beverage NON - CSD - Food and Dairy Products	- Food and Dairy Products	- Food and Dairy Products

For more information : www.gcmgrp-techinfo.com

GRADE Selection : PP

	Test Method (ASTM)	HP400M	HP648N	HP500N	HP400H	HP553R	RP348N	EP545L	EP546T	EP540N
MFR at 190 OC, 2.16 kg (g/10min)	D1238	7.5	12	12	2.1	22	11	6.0	60	12
Density (g/cm3)	D792B	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900
Flexural Modulus (kg/cm3)	D790A	1450	1870	1480	1450	1500	1050	1480	1550	1540
Notched Izod Impact at 23 OC (kg.cm/cm)	D256A	27	32	25	40	20	70	77	40	80
Deflection temperature, at 455 kPa, °C	D648	96	122	97	95	98	86	115	115	110
ESCR : 10% Igepal, F50 (hr)		-	-	-	-	-	-	-	-	-
Slip Agent		No	No	No	No	No	No	Yes	No	No
Structure		-	-	-	-	-	-	-	-	-
Specific Features		-	-	-	-	-	-	-	-	-
Business Segment		-Beverage NON -CSD -Personal care and Beauty -Home Care	-Beverage NON -CSD -Food and Dairy Products -Personal care and Beauty -Home Care	-Beverage NON -CSD -Personal care and Beauty -Home Care	-Personal care and Beauty -Home Care	-Personal care and Beauty	-Beverage NON -CSD -Personal care and Beauty -Home Care	-Beverage NON -CSD - Food and Dairy Products -Home Care	-Beverage NON -CSD -Food and Dairy Products -Personal care and Beauty -Home Care	-Personal care and Beauty -Home Care