

PTT Global Chemical Public Company Limited (“GC”),

GC Branch 18, Phenol Business Unit Profile

1. Organization Profile

1.1 Background

PTT Global Chemical Public Company Limited, or “GC” is the world number one in chemical sector in Dow Jones Sustainability Indices (DJSI), Thailand’s largest integrated petrochemical and refining business capacity of approximately 12.79 million tons per year and crude oil and condensate distillation capacity of 280,000 barrels per day. and a leading corporation in Asia-Pacific region, both in size and wide range of products – from petrochemical to biochemical with the world’s number one bioplastics producer. Combining environmentally friendly innovations with advanced technologies to develop products that improve people’s lives.

As a leader in chemical business, GC aligns ourselves with the Paris Agreement. We will be at the forefront of collective global solutions to mitigate Climate Change in order to reach the ultimate goal of “Net Zero” by reducing our net emissions of Greenhouse Gases to zero by the year 2050.

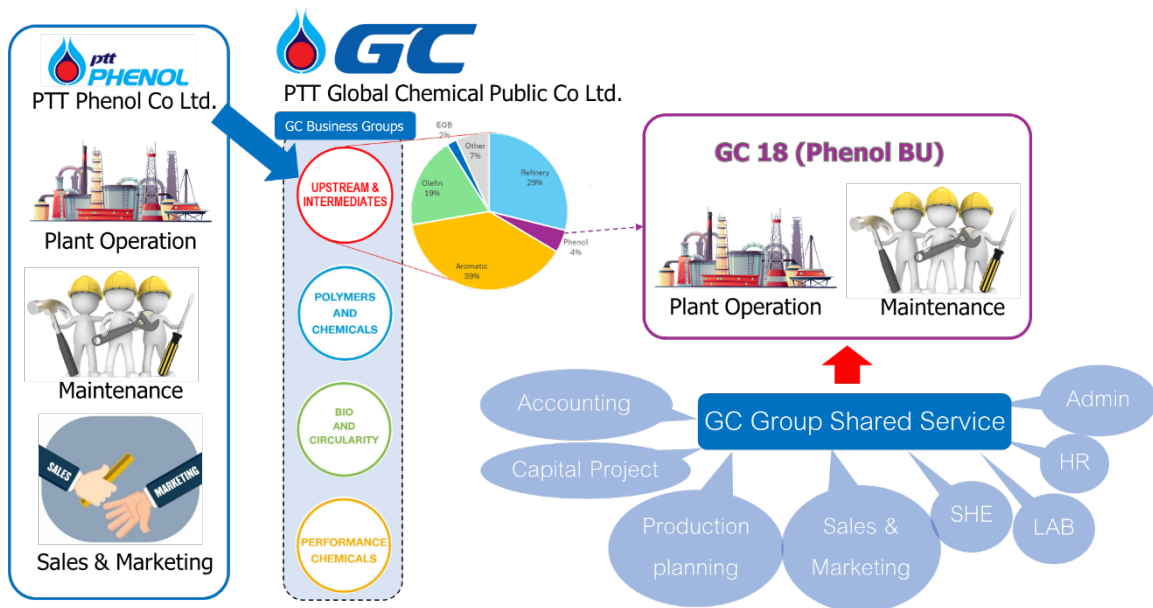


Figure 1-1 : GC18 (Phenol BU) Profiles

PTT Phenol Company Limited or “PPCL” is a subsidiary of GC. It has transferred the entire business to GC since February 2023. Then, PPCL is a part of GC as phenol business unit or “Phenol BU” and called “GC Branch18”. It is consisting of 2 factories of Phenol production and 1 factory of Bis-Phenol A production. It is still the first and only manufacturer of Phenol substance in Thailand.

Phenol I complex is committed to produce high-quality Phenol and Acetone substances. Since March 2009, Phenol I complex commercially launched its business. With Phenol complex is located in Map Ta Phut Industrial Estate in Rayong. Later in time, a second complex, Bis-Phenol A, was established in order to increase the product value. By creating a reaction between the existing Phenol and Acetone products

In 2014, started the project expansion for Phenol production with a Phenol II complex. Then complex was commissioning in April 2016 to increase phenol production capacity from 242,000 tons per year to 492,000 tons per year. The Phenol II complex project was successful with high capabilities knowledge from Early Management Pillar, Autonomous Maintenance Pillar, Planned Maintenance Pillar and Safety Health Environment Pillar supported by all MP Information from Phenol I complex.

1.2 Phenol BU Plant Location

Currently, Plant is located in Hemaraj Eastern Industrial Estate, Map Ta Phut, Rayong Province, Thailand. The approximate total area operates is 192.6 Rai (76.15 Acres). The area can be divided into four section which are administration, Phenol I complex, Phenol II complex and BPA complex. All area are TPM implemented.

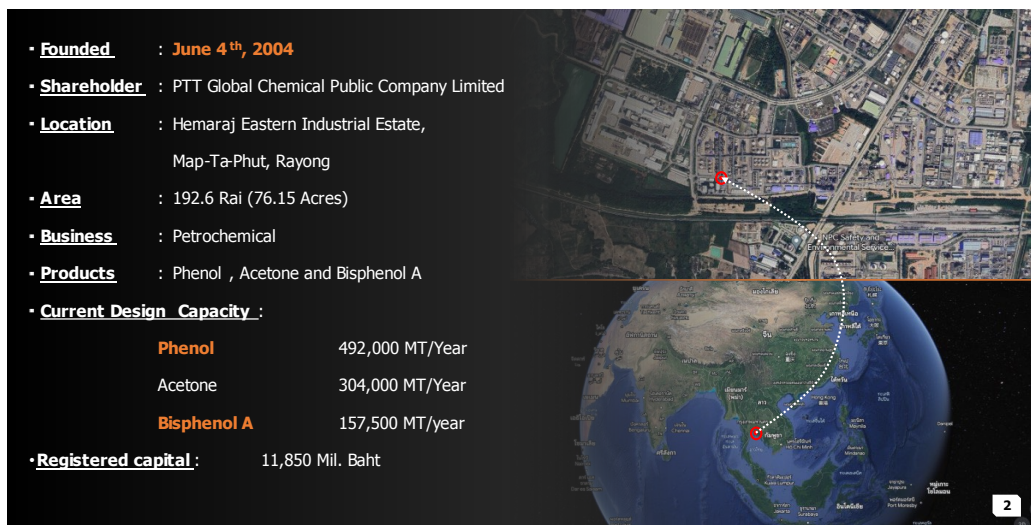


Figure 1-2: Phenol BU total areas implementing TPM.

1.3 Phenol BU Product

Phenol: Currently nameplate product capacity is 492,000 MT/year. Phenol is an intermediate stream petrochemical product, which is produced from Benzene and Propylene as feedstocks. It is used as an important substrate in production of Bisphenol A (BPA), Agriculture industry, pharmaceutical manufacturing industry, Dyeing color industry.

Acetone: Currently nameplate product capacity is 304,000 MT/year. Acetone is manufactured through the production of Phenol. It is widely used as a solvent in various industries such as chemicals, cosmetics, and medical industries. Furthermore, it can be used as a substrate in the production of BPA and Methyl Methacrylate, which are used in plastics, fiber, drugs, and other chemicals.

Bisphenol A: Currently nameplate product capacity is 157,500 MT/year. Bisphenol A (BPA) is an intermediate stream petrochemicals product that is used as a feedstock for downstream applications such as Polycarbonate (PC), Epoxy resin and Flame Retardant.

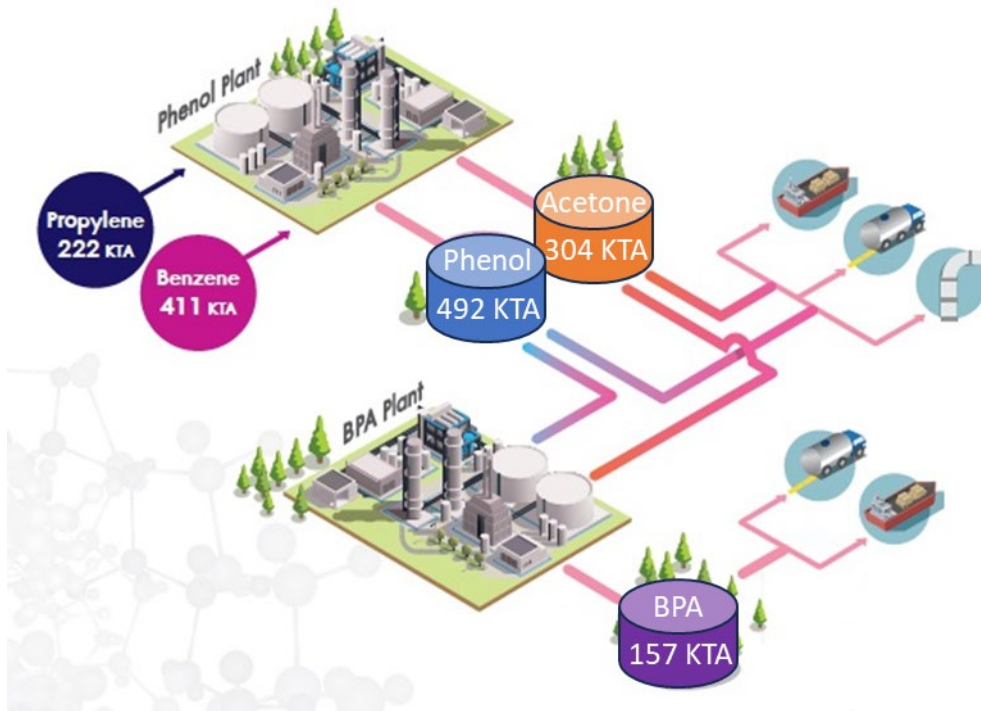


Figure 1-3: Product and capacity

1.4 Product Technology

- 1.4.1 Phenol I, II complex Licensor : Universal Oil Products National Hydrocarbon Company (UOP)
Commercial Operation : March 2009, July 2016
- 1.4.2 BPA complex Licensor : Mitsubishi Chemical Corporation
Commercial Operation : April 2011

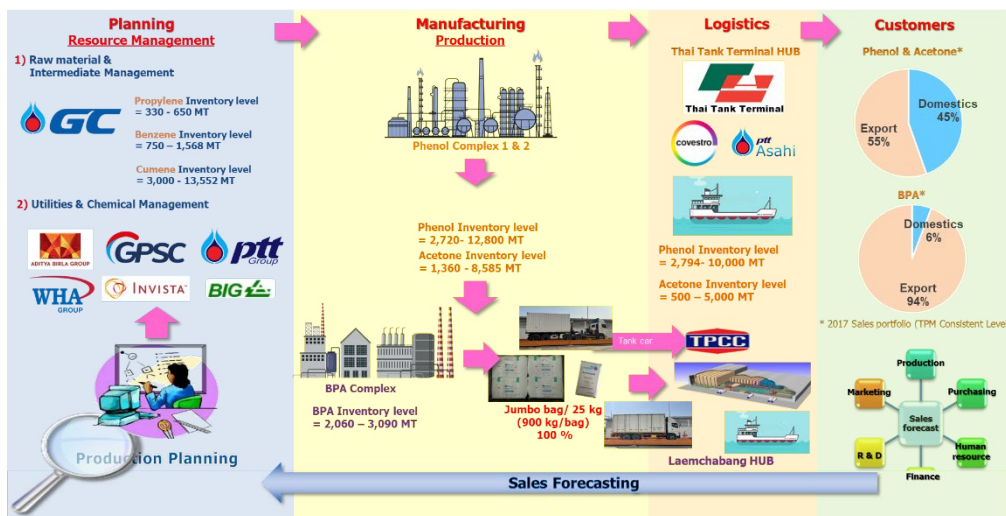


Figure 1-4: Production management

1.5 Phenol BU organization

GC had operated Phenol BU through its subsidiary, PPCL from sourcing raw material to delivering product to customers. Because of GC organization restructuring policy, PPCL has transferred the entire business to GC since February 2023. Therefore, Phenol BU work scope has been changed to be phenol production unit. Sales & Marketing department is rotated to another function. Phenol BU organization consists of Three Departments and Twelve Divisions. There are 215 manpower which is including to management and staff which are daytime and shifts.

However, operation excellence is still the key strategy to enhance our competitiveness. PHN BU manage and monitor any action plan through TPM Pillars. There are 9 Pillars which consist of Autonomous Maintenance, Focused Improvement, Planned Maintenance, Early

Management, Quality Maintenance, Office Improvement, Skill Development, Safety, Health and Environment Management Supply Chain Management

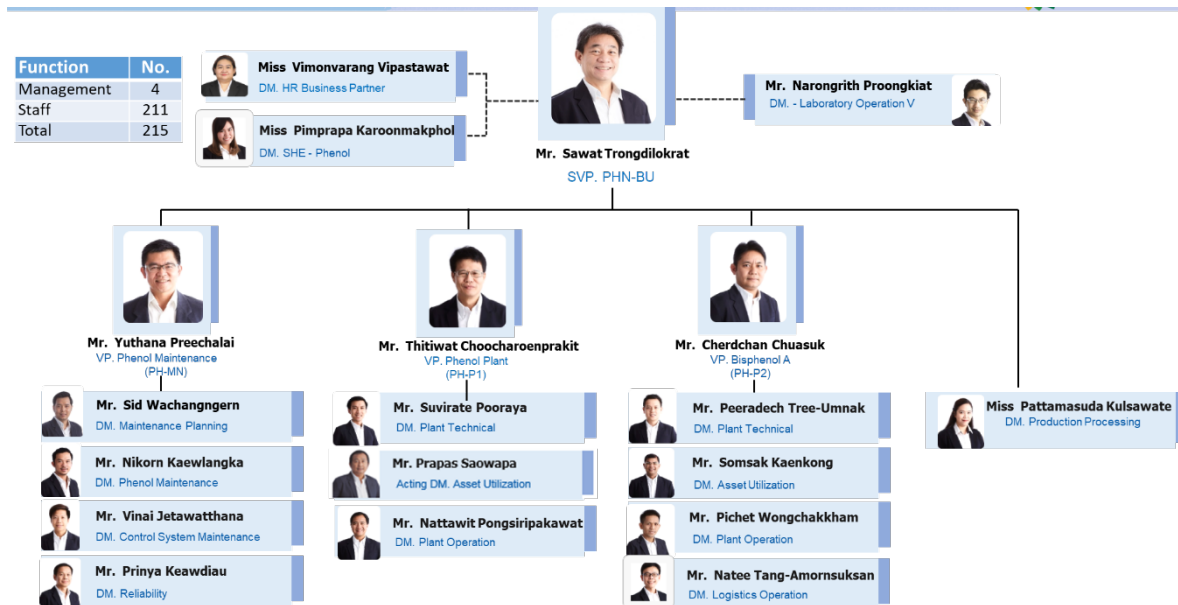


Figure 1-5: Phenol BU organization

2. Milestone on the journey to Manufacturing Excellence

Phenol BU has implemented TPM by focusing on cleaning, tightening, and basic equipment maintenance. Throughout those years, TPM activity had been practiced with the lack of building TPM culture. Furthermore, TPM was conducted on a misunderstanding concept of the system. Employees did not know the importance of activities; the details of machines were not studied thoroughly as people did not know their relevant to the activities. Employees saw TPM as only activities regarding cleaning, lubricating, tightening and basic maintenance equipment setting- up and hence, cultural of ownership was not implanted. Employees felt that TPM was just another one of the company's tedious campaigns. Therefore, the result of the activity was slightly off intention. In 2010, PPCL announced a TPM policy and introduced JIPM's style to improve for higher Operational efficiency, Cost reduction and moving toward zero losses.

The steps of implementation are as follows:

1. The Managing Director announced the company's policy for implementing TPM system on November 2010.
2. In 2010, achieved Integrated Management System. (ISO 9001, ISO 14001, TIS/OHSAS 18001)

3. On January 2011, TPM targets were set up to be operator KPIs. The activity was first started with Autonomous Maintenance (AM). In this stage, the management team and employees learned TPM by using a manager model.
4. Master Plan was also set in January 2011 to assure target achievements.
5. On 26th July 2011, TPM kicked off ceremony was launched.
6. Reorganized operation system to steer highest efficiency by:
 - Reduce all losses by Focus Improvement (FI).
 - Step by step Autonomous Maintenance (AM).
 - Planned Maintenance (PM) by maintenance division.
 - Quality Maintenance (QM).
 - Early Management (EM).
 - Training for skill development of operations and maintenance staff (SD).
 - Office Improvement (OI).
 - Safety, Health and Environmental Management (SHE).
7. On 28th January 2015 Phenol BU announced TPM Excellence Award, Category A of year 2014.
8. In 2015, Managing Director committed to continue improvement operational excellence by TPM.
 - Establish Supply Chain Management Pillar (SCM) to continue reduce losses from supply chain.
9. The Managing Director had deployed the policy that Phenol BU was awarded for Excellence in Consistent TPM commitment.
10. In 2016, TPM journey drives toward continuously enhancing cost reduction, improvement process, increasing productivity, reliability and safety improvement. All KPI achieved with highly operational excellent such as BPA complex achieved target zero unplanned shutdown (break down).
11. In 2017, TPM journey is broadened to apply to phenol production unit no.2 which has commercial run since 2016. Zero unplanned downtime is achieved except to phenol production no.2. Corrective & Preventive plans are set and implemented.
12. On 31st January 2018 Phenol BU announced Award for Excellence in Consistent TPM Commitment of year 2017.
13. Since 2018 Phenol BU continuously driving business with TPM concept follow as the milestone. Phenol production unit no.1 and no.2 have achieved zero

unplanned downtime from internal factor, since 2020. also unplanned downtime in 2021 which come from external factor, Then both Phenol production unit no.1 & no.2 have achieved zero unplanned downtime through year 2022 until now.

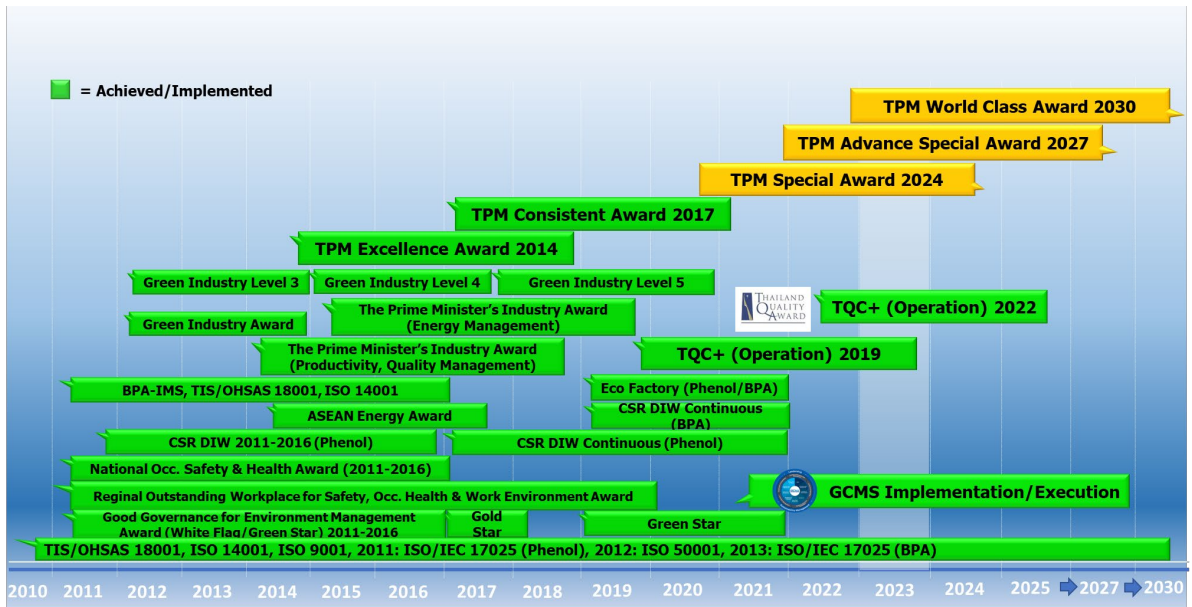


Figure 2-1: Milestone to World Class Manufacturing

3. Benefits Achieved.

3.1 Tangible Results.

Through TPM implementation, Phenol BU's KMI's continuous improvements, Specific energy consumption (SEC) PH1 & PH2 complex had been reach 1st quartile benchmarking. Domestic sales are increasing every year. Since KMI's are good, KSI's are also good as follow;

KSI	Unit	Consistent	TPM Special														Advance Special			World Class			
			2017		2018		2019		2020		2021		2022		2023		2024		2025	2026	2027	2028	2029
			A	T	A	T	A	T	A	T	A	T	A	T	A	T	A	T	T	T	T	T	T
Ranked in 1st quartile in reliability (Zero Unplanned DT)	PH1	%	0	0	0.5	0	0.6	0	0	0	1.33	0	0	0	0	0	0	0	0	0	0	0	0
	PH2	%	0.2	0	0.2	0	0.4	0	0	0	0.26	0	0	0	0	0	0	0	0	0	0	0	0
	BPA	%	0	0	0.7	0	2.8	0	0.17	0	0.65	0	0.85	0	0.47	0	0	0	0	0	0	0	0
8.4% Energy reduction from 2018	PH1	%				0.7	1.1	1.8	3.2	2.5	1.6	2.8	3.8	3.6	2.4	3.3	-0.2	3.8	6.0	6.0	6.4	10.8	
	PH2	%				0.6	0.8	2.1	9.3	6.6	8.1	7.2	6.4	7.9	-4.0	1.4	8.3	9.9	9.7	12.4	12.4	11.8	
	BPA	%				3.7	-0.3	3.8	8.4	4.8	8.8	7.1	5.5	8.3	7.2	8.9	9.9	10.4	10.4	21.2	21.2	21.2	
	Avg.	%				1.2	0.4	2.3	6.7	4.7	6.0	5.6	5.3	6.4	1.2	4.0	5.9	8.0	8.6	12.5	12.7	13.8	
10% GHG emission reduction from 2020 (Accm.)	PH1	%								0.6	1.6	1.8	3.7	4.0	4.8	5.1	5.3	9.0	9.0	9.0	13.8	13.8	
	PH2	%								0.5	0.9	1.1	2.9	3.6	5.1	6.4	7.8	7.4	9.8	9.8	9.8	13.0	
	BPA	%								0.2	0.4	1.5	3.3	3.9	4.1	7.0	7.4	7.5	7.5	14.8	14.8	14.8	
	Total	%								0.4	1.0	1.5	3.3	3.8	4.7	6.1	6.8	8.2	8.9	10.9	12.6	13.8	
75% Domestic market share	Phenol	%	70.4	71.9	82.6	81.4	87.6	81.8	81.8	80.1	85.4	80.7	96.9	80.0	78.2	81.2	80.2	81.7	82.6	84.0	84.9	85.3	
	Acetone	%	65.7	68.3	70.2	69.5	66.0	68.7	65.8	68.7	66.6	70.1	73.6	77.5	75.7	74.8	75.1	74.8	74.8	74.8	74.8	74.8	
	BPA	%	5.1	9.8	11.5	15.7	28.6	23.5	26.4	24.5	41.0	29.1	43.6	49.5	49.6	53.2	52.2	59.9	59.9	60.0	60.0	60.0	
	Total	%	48.8	50.0	56.7	55.5	65.4	58.0	61.5	60.4	67.2	60.0	76.3	69.0	68.7	71.2	70.5	73.4	73.7	74.4	74.8	75.0	

KMI	Unit	Consistent	TPM Special														Advance Special			World Class			
			2017		2018		2019		2020		2021		2022		2023		2024		2025	2026	2027	2028	2029
			A	T	A	T	A	T	A	T	A	T	A	T	A	T	A	T	T	T	T	T	T
Zero Unplanned Downtime	PH1	Hr.	0	0	43.8	0	52.6	0	0	0	116.5	0	0	0	0	0	0	0	0	0	0	0	
	PH2	Hr.	32	0	17.5	0	35.0	0	0	0	22.8	0	0	0	0	0	0	0	0	0	0	0	
	BPA	Hr.	0	0	61.3	0	245.3	0	149.3	0	56.9	0	74.5	0	41.2	0	0	0	0	0	0	0	
SEC reduction (Accumulate)	PH1	MJ/MT				46	70	118	216	166	104	188	250	243	157	219	-13	253	403	403	428	719	
	PH2	MJ/MT				43	55	138	618	438	537	478	429	528	-265	91	551	661	648	827	827	783	
	BPA	MJ/MT				284	-21	293	645	367	675	545	423	642	552	687	760	801	801	1,634	1,634	1,634	
	Total	MJ/MT				373	104	549	1,479	971	1,316	1,211	1,102	1,413	444	997	1,299	1,715	1,852	2,864	2,889	3,136	
GHG emission Reduction from 2020 (Accumulate)	PH1	T-CO2e								1,000	2,575	2,920	5,871	6,373	7,692	8,150	8,150	14,241	14,241	14,241	21,907	21,907	
	PH2	T-CO2e								800	1,578	1,870	4,834	6,044	8,155	10,830	12,657	13,376	16,662	16,662	16,662	22,042	
	BPA	T-CO2e								200	565	2,023	4,387	5,212	5,477	9,282	9,327	9,960	9,960	19,528	19,528	19,528	
	Total	T-CO2e								2,000	4,718	6,813	15,092	17,629	21,484	28,262	30,134	37,577	40,863	50,431	58,097	63,477	
Domestic sale increasing	Phenol	KTA	173	169	194	187	202	179	179	197	209	185	222	171	169	179	177	180	182	185	187	188	
	Acetone	KTA	97	97	100	97	92	88	88	96	93	94	98	100	99	99	99	99	99	99	99	99	
	BPA	KTA	9	17	20	22	40	33	38	41	68	38	58	74	77	80	78	90	90	90	90	90	
	Total	KTA	279	284	314	307	334	305	305	334	371	317	378	346	345	358	354	369	371	374	376	377	

3.2 Intangible Results.

- 3.2.1 Teamwork creation and Increase confidence with “Can-Do” attitude.
- 3.2.2 Enhance job satisfaction and Work life integration.
- 3.2.3 Approaching interdependent stage.
 - Operators have ownership of their equipment.
 - Each small group helps and support each other.
- 3.2.4 Manufacturer and Customer Partnership.
- 3.2.5 Shift in Paradigm.

4. Key of our manufacturing excellence

In order to succeed in TPM Excellent implementation; management level, 9 pillars leaders and TPM coordination team were set up as a committee to support TPM activities. The roles of the committee are:

- To manage TPM activities to increase efficiency and effectiveness as well as achieving the highest benefit.
- To endorse and supervise the written TPM Activity Report.
- To promote and advise TPM activities.
- To manage the administration of TPM promotion activities, training courses in order to promote the continual improvement of TPM activities.
- To suggest plans, strategies, objectives and targets of the TPM activities.
- To provide staff supports and encouragements.
- To serve as a coordinator for all TPM activities.
- To set up budgets, support training materials & courses, evaluate results and overall support for TPM-related activities issues.

Future Plan

- Challenging to “TPM Special Award” in 2024.
- Heading to phenol chain solution provider in Asia through innovation and sustainability.
- Increase domestic market share to 75% in 2027.
- Energy reduction 8.4% from 2018 within 2025.
- Extend value chain of Phenol & BPA derivatives.
- Smart factory with Digitalization.

5. Achievement Record

TPM Award Assessment Achievement Sheet

Company & plant name	PTT Global Chemical (Public) Company Limited/ PTTGC Branch 18 / Phenol 1 & 2 Complex and BPA Complex
TPM Slogan/Objectives	To be a leading phenol chain solution provider in Asia through innovation and sustainability

Company KPIs			Unit	Consistent	TPM Special						
				2017	2018	2019	2020	2021	2022	2023	2024
				A	A	A	A	A	A	A	A
P	Yearly Production	Cumene	KTA	640	727	720	720	748	759	661	746
		Phenol	KTA	487	552	539	539	556	565	507	550
		Acetone	KTA	303	335	336	336	345	353	321	344
		BPA	KTA	165	163	170	168	179	160	157	169
	% Overall Equipment Effectiveness	PH 1	%	105.3	109	109	112.3	106	112	108	104
		PH 2	%	97.7	107	105	104	114	107	94	112
	Production per head	Phenol	KT/person	4.5	5	5	5	5	5.6	5.1	6.1
		BPA	KT/person	4.6	4.5	5.3	5.3	5.3	5.4	4.9	5.8
Q	% Prime	Cumene	%	100	100	100	100	100	100	100	100
		Acetone	%	100	100	100	100	100	100	100	100
		Phenol	%	100	100	100	100	100	100	100	100
		BPA	%	100	100	100	100	100	100	100	100
	Customer Complaint	Phenol	Case	0	1	1	0	0	0	0	0
BPA		Case	1	2	3	3	4	7	1	0	
C	SEC (specific energy consumption)	PH 1	MJ/MT	6,937	6,663	6,593	6,447	6,559	6,413	6,506	6,676
		PH 2	MJ/MT	7,018	6,658	6,603	6,040	6,121	6,229	6,923	6,107
		BPA	MJ/MT	7,780	7,704	7,725	7,059	7,029	7,281	7,152	6,924
	Conversion cash cost reduction	PH 1	%index	85	89	96	92	100	118	158	140
		PH 2	%index	100	100	110	94	83	123	180	135
		BPA	%index	60	65	73	61	65	85	137	111
	Production Cost	PH 1	%Index	83	89	75	68	97	104	94	107
		PH 2	%Index	100	105	89	72	110	123	109	117
		BPA	%Index	61	66	59	44	66	75	66	68
	Maintenance Cost	PH 1	%Index	82	74	74	70	92	50	50	28
		PH 2	%Index	55	45	52	50	54	60	57	20
		BPA	%Index	64	63	71	63	60	61	32	25
	Raw material consumption/ MT product	PH 1	MT/MT product	0.819	0.822	0.821	0.820	0.821	0.821	0.819	0.822
PH 2		MT/MT product	0.821	0.821	0.823	0.819	0.822	0.821	0.822	0.822	
BPA		MT/MT product	1.117	1.116	1.117	1.117	1.12	1.121	1.12	1.111	
D	Late Delivery	Phenol	Case	0	0	0	0	0	0	0	0
		BPA	Case	0	0	0	0	0	0	0	0
S	Loss Time Accident	Case person/ 200,000-MH	0	0	0	1	0	0	0	0	
	Zero TRIR	Case person/ 200,000-MH	0	0.11	0.11	0.1	0.1	0.12	0	0	
E	Social Satisfaction	%	87.4	89.8	88.4	83	91.5	89.6	92.1	92.6	
	Environment Complaint	Case	0	0	0	0	0	0	0	0	
M	One Point Lesson (OPL)	No. Accumulate	4,881	6,081	6,734	6,901	7,017	7,140	7,222	8,022	
	Kaizen	No. Accumulate	10,649	12,649	13,322	13,409	13,479	13,671	13,740	14,540	
	T-Level average	Phenol		-	-	-	2.55	2.79	2.98	3.25	3.77
		BPA		-	-	-	2.52	2.75	2.93	3.19	3.69

6. Contact

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