

Award for TPM Excellence, Category B

1. Company and Plant Profile

1.1 About Owens Corning

Owens Corning is a publicly traded company on the New York Stock Exchange (NYSE: OC), the headquarter based in Toledo, Ohio, posted 2021 sales of \$8.8 billion and current employs about 19,000 people in 33 countries around world, founded in 1938, an industry leader through three major business units include Insulation Solutions Business (ISB), Roofing and Asphalt (R&A), Composites Solutions Business (CSB) to serve the market, has been on Fortune 500® list for 67 consecutive years.




Our products range from Glass Fiber to Foamglas, Mineral Wool and other high-performance products and systems dominated in transportation, electronics, marine, infrastructure, wind energy, LNG etc. specific markets for residential, commercial and industrial applications. Now, OC has become a Broad-Based Company Recognition, we aspire to build market-leading businesses; global in scope - human in scale.



1.2 About Yantai Plant

Pittsburgh Corning Yantai plant is located in No 26, Kaifeng Road, Yantai Economic Technological Development Area (YEDA), Shandong Province, China. Plant Phase I project on commercial from March 2015 with primary focus on Foamglas materials production (the FLAT workshop). Phase II project on stream from Dec 2016 with primary focus on Foamglas materials post fabrication (the FAB workshop). The plant main information listed in below table.

Main information	Plant	
	FLAT workshop	FAB workshop
Occupied area	100,000 m ²	
Initial plant investment	\$65 million	
Startup time	March 2015	December 2016
Total headcount	94 (Salary employee 22, Primary labor 72)	
Annual output capacity	100,000 m ³	22,000 m ³ (Industry 2,000m ³ + Building 20,000m ³)
Market distribution	Asia Pacific, USA, Middle East and Europe	
Product application	Industry and Building	

Product advantage		<ul style="list-style-type: none"> ✓ Constant insulating efficiency and lifelong ✓ Non-combustible ✓ High compressive strength ✓ Non-absorbent ✓ Corrosion/chemical resistant ✓ Impermeable to water and vapor ✓ Easy to work with ✓ Vermin resistant ✓ Long term dimensional stability
Core technology	<p>The FLAT manufacturing process of FOAMGLAS® comprises 4 stages:</p> <ul style="list-style-type: none"> ✓ Produce Glass Frit from melter (Yantai import the Glass Frit from Europe plants) ✓ Glass Frit grinding to powder after mixing with foaming agents ✓ Furnace foaming and annealing process ✓ Cut and trim to product at FINISH process 	<p>The product could be tailor-made as user's requirement, with the purpose of helping customer saving time and cost during installation.</p>
Major equipment	<p>Ball mill, Furnace, Annealing Oven , Main Saw, Packing line</p>	<p>CNC, Fitting equipment</p>
Major achievements and recognitions	<p>ISO45001, ISO14001, ISO9001 certification</p> <p>ASTM C552 Grade 6,8,10,12 certification</p> <p>ASTM 1639</p>	

2. Milestone on the Journey of Manufacturing Excellence

2.1 Why We Do TPM

In 2012, OC Asia Pacific leadership team committed on TPM as one of the sustainable development objective, there are several OC plants in this region already successfully achieved TPM Award of Excellence and the Award of Excellence in Consistent which bring the great product competitiveness and people capability for OC business developing in the market.

Based on the influence of Customers, Competitors, Company, Politics, Economy, Society and Technology on the development of our Company, and the plant annually SWOT analysis results and OC company sustainability strategy, Yantai plant decided to deploy the TPM methodologies to build the preventive maintenance system to maintain the equipment in best condition and reduce the related loss continuously



2.2 Yantai Plant TPM Journey

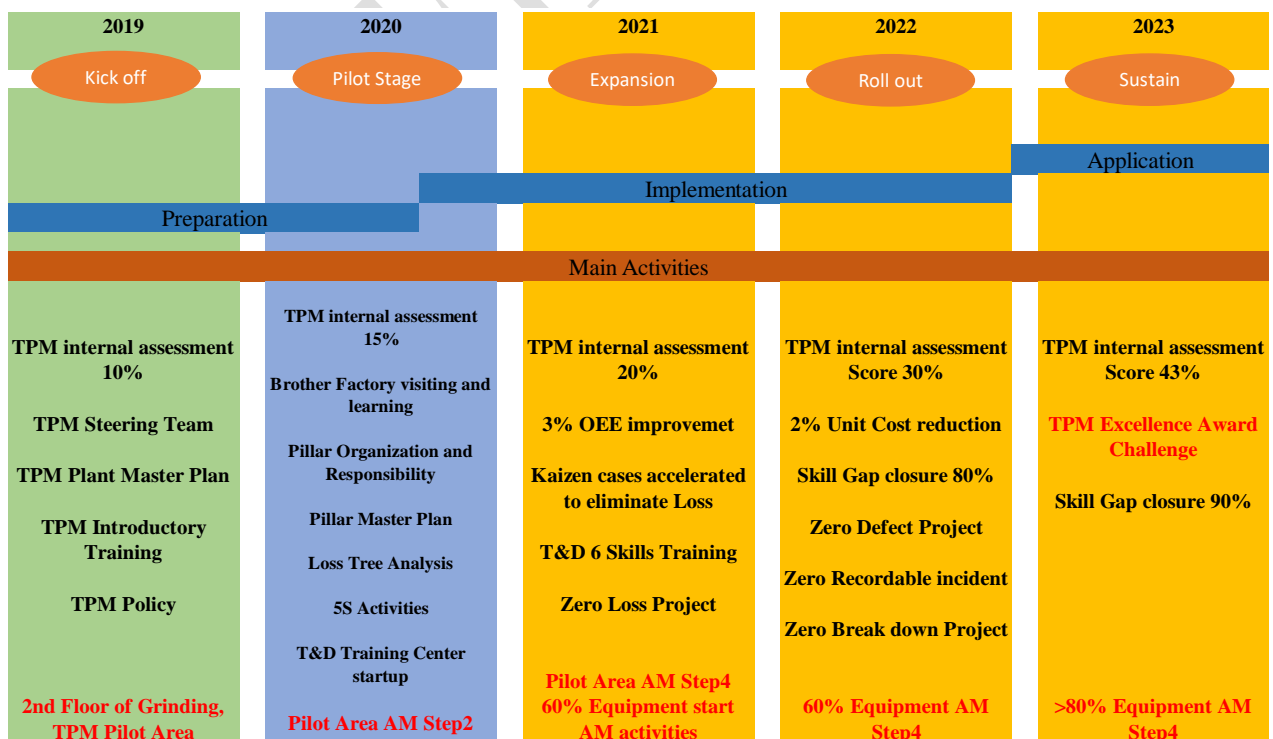
Yantai Plant introduced TPM to the organization in Dec,2019, We are determined to maintain optimal manufacturing condition and avoid potential deterioration. The main goal for Yantai Plant is to restore the initial condition of our equipment and achieve zero breakdowns, zero accident and zero defects. With the support from the internal and external consultancy, we follow JIPM approach to implement TPM within the whole plant, started from our pilot area- Raw material mixing area.

Raw material mixing area suffered high breakdown/ Minor Stop rate and serious carbon pollution initially. Selecting that area as the TPM pilot area, we aim to accomplish zero breakdown /minor stop and make it dust free in this area. Include 3 years consistency on TPM activities, we already achieved 1 million workhours recordable injury free, 74% breakdown and 10% CONQ reduction, which convince all the employees believe that TPM is the way we need to insist; After 1year TPM running in pilot area, we extended TPM activity to the entire grinding and furnace area, then roll out to entire plant. Up to now, every employee actively engages in TPM activities; all equipment list in critical A&B column are restored to basic condition.

When we are moving on our TPM journey, we expanded our efforts according the plan and focus on these six Pillars execution - FI, AM, PM, TD, QM, and EHS.

In November of 2022, OC Global TPM director and his team assessed our TPM progress, he recommended us to pursue the official JIPM Award of Excellence assessment in year of 2023. Meanwhile, plant not only considers it should be a good opportunity in our TPM journey but also from site leaders to field employee are all willing to take this challenge.

Here is the plant TPM master plan since Y2019:



3. Benefits Achieved

3.1 Tangible Results

When kick off the TPM, we seen the 2019 performance data on SQDCPM as a baseline start. After 3 years these consecutive results proved adoption of TPM is the right choice. TPM activities overall elevated our plant performance through improving equipment reliability and enhancing employee operations skill.

As in workshop, through the deployment of AM step 1 to step 4 activities, the work environment from pilot area to entire plant are all changed, easier for cleaning, inspection and lubrication, Preventive Maintenance system works more effectively, tag and de-tag activities are becoming a daily common process on the shop floor, the equipment operates more stably. With the loss tree analysis and the application of structured FI problem solving approach, we achieved zero breakdown case over 1 year in pilot area.

3.2 Intangible Results

Employee ownership and engagement were turned around. The operators experienced a total mindset change. Now they truly own their machines but not only operate them. People are eager to know the equipment function and raise ideas to improve processes and equipment reliability. A win-win situation was expected buildup while employees enhanced their skills with better work results and the plant also benefited from people growth

4. Key of our Manufacturing Excellence

TPM is our way to manage operations to achieve ‘zero accidents, zero breakdowns and zero losses’. Our commitment and engagement to practice TPM for achieving Operational Excellence is unwavering. We firmly believe that the adoption of TPM methodology and tools will enable us to become a world-class manufacturing facility eventually.

Since the introduction of TPM to the plant in 2019, we accomplished our vision, mission and objectives according to OC global strategy, defined KPI/KAI and masterplan of 6 pillars. Through total participation, governance meeting and management activities achieved the mindset change and strong engagement of our people. Most importantly, as the deployment of these pillars across the plant, enhanced ownership and engagement were achieved.

Clear vision and objectives of pillars and small groups are essential to achieve a good result. Tag and De-tag activity are very useful tools for us, we set up a systematic activity flow to achieve daily change. Leadership and ownership are the most critical factor. In Yantai Plant, all employees are actively engaging in TPM activities. Regular training center upgrading according to the equipment failure analysis result is important for operator skill improvement continuously.

We have been proactively and deeply analyzing the root causes of all losses on safety, quality and striving for continuous improvement on processes and equipment. We have also been spending great efforts on engaging our people and elevating their skill sets. We firmly believe that we will achieve Zero breakdown, Zero accident and Zero defect across whole organization and reach operational excellence.

5. Achievement Record

Company & plant name	Pittsburgh Corning (Yantai) Insulation Materials Co., Ltd
TPM Slogan/Objectives	NO TPM, NO GROWTH; KNOW TPM, KNOW GROWTH

Category	Index (Calculation Formula)	Unit	Kick off/ TPM Started 2019	Actual Status 2022	Target 2023	JIPM Use
S	Number of work-related accidents requiring days off work	Cases/year	0	0	0	
S	Number of work-related accidents not requiring days off work	Cases/year	0	0	0	
P	OEE (or Overall Plant Efficiency)	%	60.52	63.87	66.64	
P	Availability	%	100.00	99.17	100.00	
P	Performance Rate	%	87.40	89.66	90.91	
P	Quality Products Rate (NE%)	%	69.24	71.83	73.30	
P	Number of breakdowns	Breakdowns/year	210	43	60	
P	MTBF	Hour	42	3323	300	
P	MTTR	Hour	0.51	0.52	0.40	
Q	Number of customer complaints	Number/year	1	0	0	
Q	In-line defect rate (scrap)	%	7.43	6.17	5.00	
C	Cost index	Cost/cum	1554	1468	1417	
D	Production Lead time	Hour	86.42	62.42	44.77	
D	Delivery performance	%	99	99	100	
S	Frequency rate	Number of occupational accidents with leave for 1 000 000 worked hours	0	0	0	
M	Number of Employee Suggestions	Number/year	0	347	360	

<p>Other</p>	<p><Specify achievements not expressible in numerical terms></p> <p>1. Do you have a program where all employees can participate in TPM?</p> <p>Yes. All employees participate daily in the TPM program, through by activities, such as:</p> <ul style="list-style-type: none"> ✓ Daily AM activities (Cleaning, creating OPL, tagging, de-tagging autonomous and general inspection) ✓ Eliminating Losses by participating in Kaizen activities ✓ Training others on shop floor (Some people have been trained and certified as TPM internal trainer) ✓ In our daily performance meetings (Huddle) ✓ TPM small group activity weekly <p>2. Do you have a program allowing employees to be recognized their achievements?</p> <ul style="list-style-type: none"> ✓ We have a monthly and/or yearly bonus structure that allows us to recognize the achievements of all employees. This bonus has defined criteria for Safety, Quality, Delivery, Cost and Talent KPIs. ✓ Also, we have monthly Excellent OPL selection and Quarterly TPM star recommending bonus structure. ✓ TPM skills as a job capacity requirement listed in job position promotion and employee recruitment. <p>3. Are top management involved in the audit/verification of completion of TPM pillar steps?</p> <p>Yes, we have a three-level audit system and assessment standards</p> <ul style="list-style-type: none"> ✓ Small Group Self-Assessment ✓ Pillar Team Assessment ✓ Plant TPM steering committee Assessment. <p>4. Are all pillar activity boards displayed and reviewed by top management?</p> <p>Yantai plant activity boards are displayed on shop floor, maintained by TPM small group daily, reviewed by pillar team member weekly and audited by TPM steering committee team monthly base.</p>	
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2023 TPM Award -Achievement Sheet

Company	Owens Corning
Plant name	Pittsburgh Corning (Yantai) Insulation Materials Co., Ltd
TPM Slogan/Objectives	No TPM No Growth, Know TPM Know Growth.
Year when TPM activity started	2019-12
Year of benchmarking	2019

Category	Index (Calculation Formula)	Unit	Kick off/TPM Started (or last time awarded)	Actual Status 2022
S	Number of work-related accidents requiring days off work	Cases/ year	0	0
S	Number of work-related accidents not requiring days off work	Cases/ year	0	0
P	Productivity for main products	Parts/Operator hours	0.11	0.17
P	OEE (or Overall Plant Efficiency)	%	86.5	93.9
P	Availability	%	98.7	99.5
P	Performance Rate	%	94.3	98.5
P	Quality Products Rate	%	92.9	95.8
P	Number of breakdowns	Breakdowns/ year	210	41
P	MTBF	Hour	42	321
P	MTTR	Hour	0.51	0.26
Q	Number of customer complaints	Number/year	1	0
Q	In-line defect rate, scrap	%	NA	NA
Q	In-line defect rate, scrap and rework	%	5.50%	5.22%
C	Cost index	RMB/M ³	1,611.3	1,471.4
D	Production Lead time	Days	4	3
D	Delivery performance	%	95	99
S	Safety index	Accidents per 1,000,000 operator hours	0	0
M	Number of Employee Suggestions	Number/year	0	372