



Award for TPM Excellence, Category B

1. Company and Plant Profile

1.1 About Owens Corning



Headquarters in Toledo, Ohio, USA

Owens Corning is a global building and construction materials leader committed to building a sustainable future through material innovation. Our three integrated businesses - Composites, Insulation, and Roofing - provide durable, sustainable, energy-efficient solutions that leverage our unique material science, manufacturing, and market knowledge to help our customers win and grow. We are global in scope, human in scale with approximately 19,000 employees in 31 countries dedicated to generating value for our

customers and shareholders and making a difference in the communities where we work and live. Founded in 1938 and based in Toledo, Ohio, USA, Owens Corning posted 2021 sales of \$8.5 billion. Now, OC has become a Broad-Based Company Recognition, we aspire to build market-leading businesses; global in scope - human in scale.

1.2 Sustainability in OC-TPM

In Owens Corning, TPM is the way we drive our operation to 'Zero' - zero accidents, zero defects, zero losses. This is what we call operation excellence. We introduce TPM since Y2012 in Asian Pacific & Europe, and in Y2017, made huge strides in launching and implementing TPM throughout 3 business. We aim to reach TPM excellence level for all plant in Y2022.

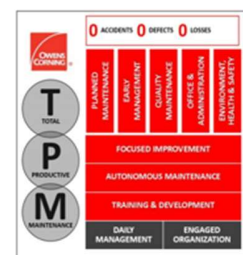
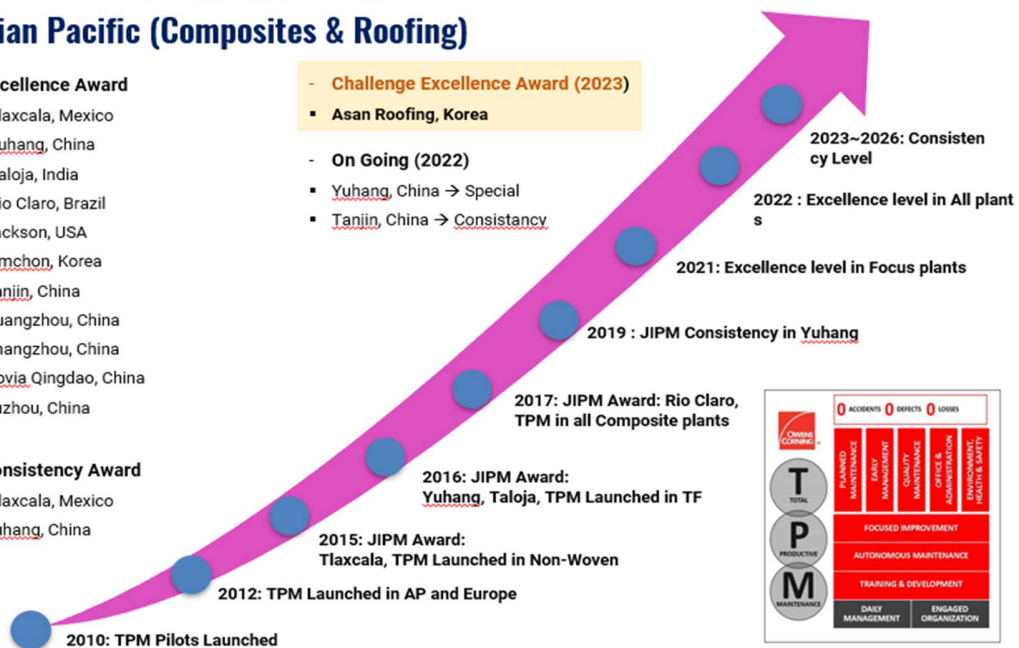
TPM in Asian Pacific (Composites & Roofing)

- **JIPM Excellence Award**
 - Y2015 Tlaxcala, Mexico
 - Y2016 Yuhang, China
 - Y2016 Taloja, India
 - Y2017 Rio Claro, Brazil
 - Y2018 Jackson, USA
 - Y2019 Kimchon, Korea
 - Y2019 Tanjin, China
 - Y2020 Guangzhou, China
 - Y2021 Changzhou, China
 - Y2021 Novia Qingdao, China
 - Y2021 Suzhou, China

- **JIPM Consistency Award**
 - Y2018 Tlaxcala, Mexico
 - Y2019 Yuhang, China

- **Challenge Excellence Award (2023)**

- **Asan Roofing, Korea**
- **On Going (2022)**
 - Yuhang, China → Special
 - Tanjin, China → Consistency





1.3 About Asan Plant

Owens Corning Asan plant located in Asan-si, Chungcheongnam-do, South Korea. Asan Plant is OC's sole roofing plant in the world other than US 14 roofing plants. It was established Jan. 2005 and groundbreaking on Apr.2005. It delivers products to Korea, Japan, China and South East Asia.



The plant main information listed in below sheet.

Main information	Asan Plant (Owens Corning BM Korea, Ltd.)	
	Shingle production line	Underlayment production line
Occupied area	35,100 m ²	
Initial plant investment	\$ 6.5 million	
Startup time	Production Stated in Mar. 2006	Production Started in Apr. 2011
Total headcount	43 (13 salary, 30 hourly)	
Annual output Capacity	650,000 SQ/Year	500,000 Roll/Year (1Roll = 10m ²)
Market distribution	Korea (Domain), Japan, China and South East Asia	Korea (Domain)
Product application	Building Material (Roofing)	Building Material (Waterproof for Roofing, wall & Floor)
Range of Product	<ul style="list-style-type: none"> ✓ Classic (3-tab Shingle) ✓ Amortab (5-tab Shingle) ✓ Oak Euro W/Plus (6-side Shingle) ✓ Oakridge Super (Laminated Shingle) ✓ Classic AR & Oakridge AR (Algae Resistance) ✓ Hip & Ridge Shingle <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;"> <p>OAKRIDGE SUPER</p>  </div> <div style="text-align: center;"> <p>6SIDE W & PLUS</p>  </div> <div style="text-align: center;"> <p>CLASSIC</p>  </div> <div style="text-align: center;"> <p>ARMORTAB</p>  </div> </div>	<ul style="list-style-type: none"> ✓ Under Guard for Roofing (3type) ✓ Weather Guard for Wall & Floor (5type) <div style="display: grid; grid-template-columns: repeat(2, 1fr); gap: 5px; margin-top: 10px;">     </div>
Major equipment	Glass Mat unwinder, Slate, Coater, Cooling, Shinlge Machine, Wrapping & Palletizing and etc.	PET Mat unwinder, Coater, Cooling, Cutting & Rewinder, Wrapping & Palletizing and etc.
Major achievements and recognitions	ISO 9001/14001 certification, OHSAS 18001 certification, KS 4917 certification for underlayment (2020) \$10million export prize (2012)	



2. Milestone on the Journey of Manufacturing Excellence

2.1 Why We Do TPM

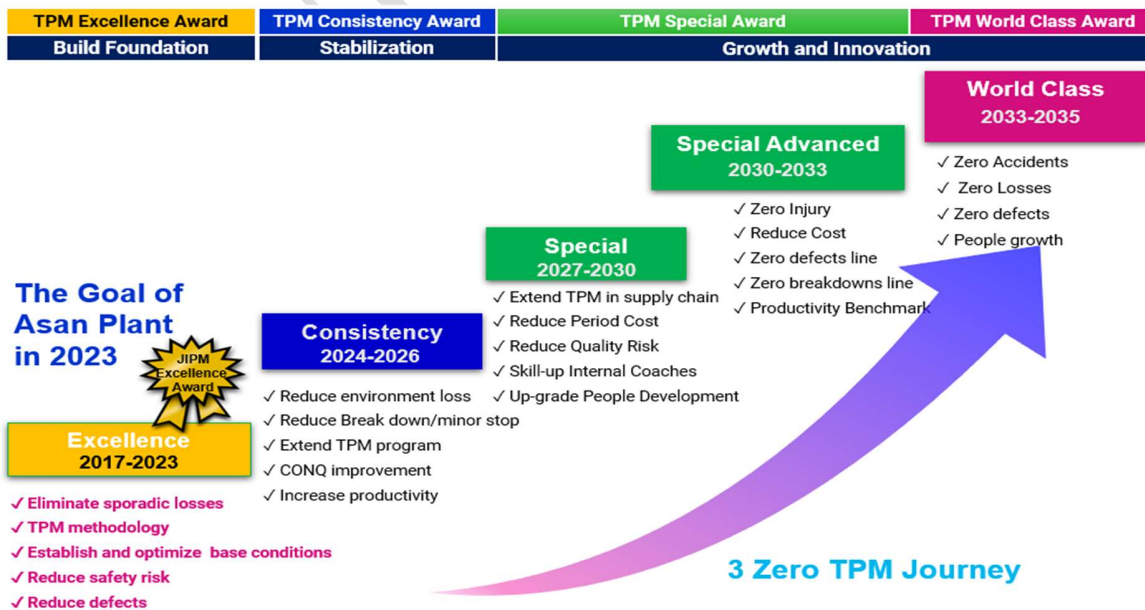
Owens Corning has been working with different continuous improvement methodologies which have been inconsistently used within all its manufacturing centers. This led to weak manufacturing standards which started to cause forced deterioration at early stages of the equipment's lifetime. Forced deterioration started to get visible to the business when escalations started to happen at all Owens Corning facilities.

At this stage, 70% of escalations happening at Owens Corning were related to equipment breakdowns. Uncertainty of when an escalation may occur and its subsequent effect in Safety and Quality conditions, led OC to choose TPM as the way in which Owens Corning will work to eliminate forced deterioration and search for the Manufacturing Excellence. Based on these, Asan plant aligned to move forward with TPM methodology as plant operation management tool.

2.2 Asan Plant TPM Journey

Owens Corning BM Korea have made business agreement with Korean Standards Association (KSA) to get support by consultant to assist with the understanding of TPM and to coach the plant in the progression of the Pillar steps to start the journey with coaching, a Master Plan was developed to guide us through the TPM implementation. And Owens Corning BM Korea has organized 3 small group on the shop floor and leadership team for TPM deployment that introduced to firstly 5S activity implementing in 2017. Owens Corning BM Korea began implementing TPM focused on 5 core pillars to drive stability in our manufacturing processes since 2018

In December 2022, OC Global TPM directors assessed our TPM progress, they approved us to apply JIPM assessment in Y2023. Asan plant want to be the 1st plant to win JIPM level 1 award in Roofing business. From Top leader to shop-floor employees, we are all do our best to get this challenge. Here is the plant TPM master plan since 2017





3. Benefits Achieved

3.1 Tangible Results

As to workplace, through the deployment of AM step 0 to step 4 activities, the work environment from pilot area to whole plant are all changed, the leaks are eliminated, easier for cleaning inspection and lubrication, Preventive maintenance system works effectively, tagging and de-tagging activities are becoming a daily common process on 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 in shingle production area supported by PM. OEE(%) has steadily improved in both of production line.

In case of shingle line, we achieve more than 10% the OEE improvement 87,7%(YTD) in 2020 compared to OEE 77.5%(YTD) in 2017.

Last 2 years, we had to develop 2nd source of supplier for glass mat which is one of major raw materials, because we have been notified of the discontinuation of supply from 100% mat supplier in US. For the unstable quality issues of China mat, we had a hard time and recession in OEE(%). The quality problem of mat in China is currently stabilizing thank to the effort each other, so we expect the situation to improve from next year.

3.2 Intangible Results

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

4. Key of our Manufacturing Excellence

4.1 TPM Integration into Daily Management

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 2017, we accomplished our vision, mission and object according to OC global strategy, defined KPI/KAI and masterplan of 5 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.

Owens Corning Building Materials Company Limited.



OC vision and mission	We aspire to build market leading businesses; global in scope - human in scale			
	<ol style="list-style-type: none"> 1. Winning in Safety, 2. Winning with our Customers, 3. To expand our impact through sustainability, 4. To transform knowledge into value, 5. To fight to be the best- every day 			
Asan plant vision and mission	To build a leading company that secures the highest productivity and quality priority, and takes pride as a member of the organization, and continues to grow together with customers			
	<ol style="list-style-type: none"> 1. Strong commitment and engagement of all employees on shop floor. 2. Systematic training & development program to elevate the TPM skills. 3. Effective execution for TPM methodology and result driven management. 4. Achieve LRP(Long Range Plan) target of company 			
Plant objectives	Create a safety environment	Deliver high-quality products	Enhance operational performance	Reduce production cost
	Zero accident	Zero defect	Zero breakdown	Zero losses
KPI/KAI	<ul style="list-style-type: none"> ✓ Recordable ✓ First aid ✓ Near-miss ✓ Hazard 	<ul style="list-style-type: none"> ✓ Customer Complaint ✓ Customer Satisfaction Rate ✓ DPMO ✓ CONQ 	<ul style="list-style-type: none"> ✓ OEE(%) ✓ Down Time(hr) ✓ MTBF ✓ MTTR 	<ul style="list-style-type: none"> ✓ Unit cost ✓ Productivity Saving ✓ Kaizen ✓ Scrap
Pillar approach and activities	AM Pillar	PM pillar	FI pillar	T&D Pillar
	Deep cleaning SOC & HAA CILT Tagging/de-tagging AM Skill-up	Zero breakdown TBM/CBM Reliability Spare part	Loss tree Cost deployment Analysis tool FI project (Cases)	Skill matrix OPL Talent deployment Training Center
	QM Pillar	EHS Pillar	EM Pillar	OA Pillar
	/	Zero accident Fist Aid Near-miss report OPL for safety DSR MOC LPA	/	/



Participation	Steering Committee (NLT & Pillar Leaders)	Executive committee (Engineers/shift leaders)	3 activity groups (All operators)
Governance	TPM Steering Committee Gemba walk weekly	Pillar weekly meeting Daily huddle meeting	Group bi-weekly meeting
Management	Standardization, Visualization, 5S, SQDCPM, leadership and membership morale activity		

4.2 Reflection on TPM excellence

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 Asan Plant, all employees are actively engaging in TPM activities. We use cost deployment, OEE analysis, loss tree establishment, training and sharing to deploy the plant projects to improve. The other pillars also made significant progress through the methodology of TPM system

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	Owens Corning BM Korea, Ltd., & Asan Roofing Plant
TPM Slogan/Objectives	We are the One in TPM

Category	Index	Unit	TPM Started 2017	Actual Status 2023(YTD)	Target 2023
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	5	0	0
P	Productivity for main products (Based on shingle Square/hour)	SQ/hour	129.4	130.0	137.2

Owens Corning Building Materials Company Limited.



P	OOE (or Overall Plant Efficiency)	%	78.1	84.9	87.7
P	Availability (Mat JE)	%	97.2	99.1	97.7
P	Performance Rate (OE)	%	84.0	91.5	98.5
P	Quality Products Rate	%	97.2	99.1	97.7
P	Number of breakdowns (only for equipment)	Breakdowns/ year	149	67	49
P	MTBF	Hour	30.9	60.6	80.8
P	MTTR	Hour	1.3	1.7	1.0
Q	Number of customer complaints	Number/year	19	1	6
Q	In-line defect rate (scrap/based on Shingle)	%	1.17	1.0	0.84
Q	In-line defect rate (rework)	%	N/A	N/A	N/A
C	Cost index (Based on Shingle cost/square)	Cost/Unit (Cost/SQ)	\$36.43	\$44.0	\$43.42
D	Production Lead time (Based on MTO)	Days (max.)	20	20	20
D	Delivery performance	%	>95	>95	>95
S	Frequency rate	Number of occupational accidents with leave for 1 000 000 worked hours	0	0	0
M	Number of Employee Suggestions (Kaizen + Safety + Hazard id.)	Number/year	302	758	700



<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, such as:</p> <ul style="list-style-type: none"> ✓ Daily AM activities (Cleaning, creating OPL, tagging, de-tagging) ✓ Eliminating Losses by participating in Kaizen activities ✓ Training & sharing with others on shop floor by OPL ✓ Daily huddle meeting in each group ✓ NLT Gemba walk with operators (2times/week) <p>2. Do you have a program allowing employees to be recognized their achievements?</p> <ul style="list-style-type: none"> ✓ We have a recognize bonuses for all employees for their OPL, Kaizen, sketch ✓ Also, we have a recognize monthly TPM champion employee. <p>3. Are top management involved in the audit/verification of completion of TPM pillar steps?</p> <p>Yes, OC have an audit system and assessment standards</p> <ul style="list-style-type: none"> ✓ OC internal TPM assessment team audit plant TPM progress once a year with OC TPM assessment standard. ✓ Pillar step audit by TPM steering committee and OC consultant once a month. ✓ Pillars self-assessment once a month and reported OC with monthly report <p>4. Are all pillar activity boards displayed and reviewed by top management?</p> <p>Yes, Asan plant activity boards are displayed on shop floor, reviewed by NLT and pillar members during Gemba walk.</p>
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