

Productivity Improvement Forum 2018

Pilot Project Working Group: Our 3-Years Journey and Path Forward

Presented by:

Mr Smith Ang

(Pilot Project WG Leader)

Jointly Organised by

SCIC
SINGAPORE CHEMICAL
INDUSTRY COUNCIL

ASPRI
Connect · Engage · Grow

Supported by

EDB
singapore

Utezi
Better Jobs For Life
Employment and Employability Institute

Contents

Work Group objective and task

Activity Analysis (AA)

- Quick Introduction on AA
- Benefits of AA
- Journey on AA
- AA Results over the 3 years span

Best Productivity Practices Implementation Index (BPPII)

- Quick Introduction on BPPII
- Benefits of BPPII
- Journey on BPPII
- BPPII Results during Pilot Phase

Work Face Planning (WFP)

- Quick Introduction on WFP

Work Group objective and task

Objective

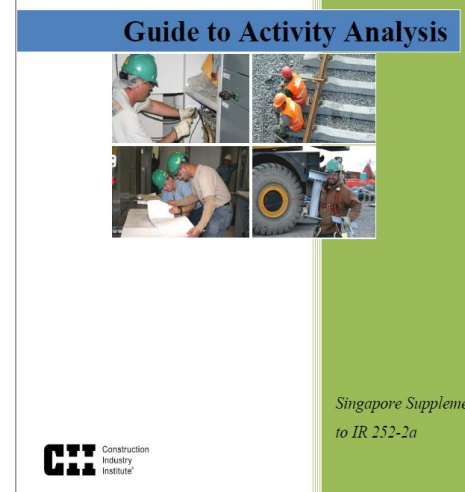
- Adopt / pilot CII established work processes to identify opportunities for productivity improvement on behalf of the industry
- Dovetail the work processes for contractor certification

Members

- Plant owners: Chevron Oronite, ExxonMobil, PCS, Shell, SRC
- Contractors: HSL, Mun Siong, PEC, Rotary
- EDB, ASPRI, SCIC

Approach

- Members worked with CII / NUS to deploy the work processes
- Customize tools; localizing it to Singapore's context
- Identify areas of opportunities for productivity improvement



Adopted Processes



Quick Introduction on AA

A 5-Step continuous improvement process.

1. Plan Study

Define study objectives, scope and details on the work.

2. Sample

Take samples on work activity out in the field with the specific categories.

3. Analyze

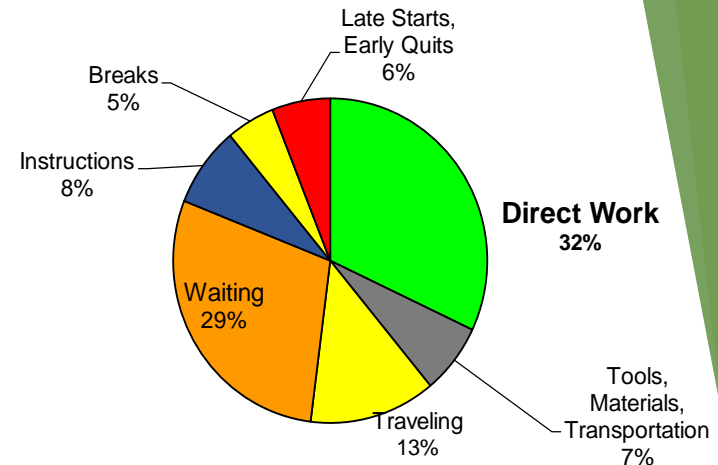
Tabulate activity percentages and analyse the root cause for activities which are beyond the acceptable range.

4. Plan Improvements

Plan potential solutions to improve productivity.

5. Implement Improvements

Implement the selected improvement(s) to increase direct work rate.



A typical general breakdown of worker's time



The 5 Step Process of AA

Benefits of AA

- Able to quantify productivity.
- Identifies specific areas for improvement.
- Cost-effective.
- Knowledge development for the companies.
- Continuous process of improvement.

Journey on AA

First Year (2016)

- Conducted the 2 rounds of pilot studies in 5 facilities across 10 pilot projects in Construction, Maintenance and Shutdown/Turnaround Activities with CII
- Aggregated report was generated.

Second Year (2017)

- Companies conducted AA on their own; Secured tablet
- Deployed beyond Oil and gas industry
- “Low Hanging Fruits” were identified and the Productivity Practices Work Group was formed.

Third Year (2018)

- Individual companies conducted the 3rd round of AA independently.
 - Total: 17 projects (2 Construction, 11 Maintenance and 4 Shutdown/Turnaround projects).
- Dovetail AA as part of certification requirement

Journey on AA

Activity Analysis App

Activity Analysis

Minimum Number of Observations: 34 / 189

Company: company 2

Work Type: Concrete

Short Service Employee: Yes No

Direct Work	Waiting	Support
Installation 4	Permits 5	Preparatory Work 3
Demolition 2	Instruction 6	Material Handling 3
Other	Material 2	Tools and Equipment 1
Personal 3	Equipment 1	Travel 2
	QA/QC 1	
	Unknown 1	

Start Recording Stop Recording Clear Project/Observation Setup ?

*Convenient way of inputting the work observations

AA Results over the 3 years span

► Aggregate results for All Projects

Project	Work Category	Percentage		
		Avg. 1st Round (10 projects)	Avg. 2nd Round (8 projects)	Avg. 3rd Round (17 projects)
All projects	Direct Work	29.50%	35.60%	34.00%
	Waiting	12.01%	8.50%	10.75%
	Preparatory Work	12.96%	21.30%	22.40%
	Material Handling	15.69%	17.20%	8.80%
	Tools and Equipment	0.74%	1.00%	1.95%
	Travel	23.81%	13.20%	17.50%
	Personal	5.24%	3.20%	4.50%

Conducted by CII/NUS in 2016

Conducted by
Companies in 2018

Quartiles	Maintenance Environment	Construction Environment
First	≥ 42%	≥ 50%
Second	32-42%	38-50%
Third	20-32%	27-38%
Fourth	20-32%	≤ 27%

AA Results over the 3 years span

Suggestions for improvement

- Implement the Standard Procedures (5-step process) based on the definitions.
- Identify and retain the right people to be AA surveyors. (e.g. supervisor or foremen who understands the work nature)
- Conduct more comprehensive and intensive training for AA surveyors
- Active engagement between Plant Owners, Main Contractors and Sub-contractors to validate the data collected.

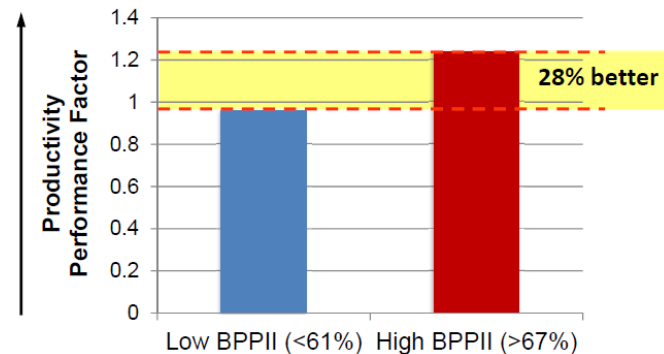
Quick Introduction on BPPII

- An assessment tool designed to assist companies in assessing their capabilities to perform best productivity practices.
- Joint Assessment between Plant Owners and Contractors.

- Focuses on 6 Main Categories

1. Materials Management
2. Equipment Logistics
3. Craft Information Systems
4. Human Resource Management
5. Construction Methods
6. Environment, Safety, and Health

Higher Industrial BPPII Scores Led to Better Productivity
Statistical Validation (greater than 95%)



$$\text{Productivity Performance Factor} = \frac{(\text{estimated hours/output})}{(\text{actual hours/output})}$$

Quick Introduction on BPPII

- 66 elements under 6 main categories:

I – MATERIALS MANAGEMENT						
Section	Planning and Implementation Level					
Element	0	1	2	3	4	5
A. Materials Management Systems						
1.A.1. Project Team Material Status Database						
1.A.2. Onsite Material Tracking Technology						
1.A.3. Material Delivery Schedule						
1.A.4. Procurement Plan for Materials and Equipment						
1.A.5. Pre-Fabricated Material Tracking						
1.A.6. Material Issuing Procedure & Material Usage Tracking						
B. Receipt and Inspection of Materials						
1.B.1. Material Inspection Process						
1.B.2. Material Inspection Team						
1.B.3. Post-receipt Preservation and Maintenance						
1.B.4. Centralized Onsite Warehouse; Fabricated Materials Storage						
1.B.5. GA/QC Inspection & Assessment; NDT Testing & Tracking Plan						
II – EQUIPMENT LOGISTICS						
Section	Planning and Implementation Level					
Element	0	1	2	3	4	5
A. Site Tool Management						
2.A.1. Site Tool And Consumables Management Strategy						
2.A.2. Tool Tracking Systems						
2.A.3. Onsite Tool Maintenance						
2.A.4. Control System for Tool Delays						
B. Machinery Availability						
2.B.1. Construction Machinery Productivity Analysis						
2.B.2. Equipment Maintenance plan for On-Site and Off-Site						
2.B.3. Construction Machinery Tracking						
2.B.4. Fuel Top up Schedule for Equipment and Machinery						
2.B.5. OnSite Construction Equipment Laydowns Area						
III – CRAFT INFORMATION SYSTEMS						
Section	Planning and Implementation Level					
Element	0	1	2	3	4	5
A. Short Interval Planning						
3.A.1. Short Interval Planning						
3.A.2. Centralized Planning, Work Prioritization, and Process Control						
B. Workface Planning						
3.B.1. Well Defined Scope of Work						
3.B.2. Utilization of Software to Assist in Generating Work Packages						
3.B.3. Project Model Requirements						
3.B.4. Dedicated Planner						
3.B.5. Identify Required Permitting						
3.B.6. Engineering Work Packages (EWP)						
3.B.7. Construction Work Packages (CWP)						
3.B.8. Installation Work Packages (IWP)						
3.B.9. Quality Control Systems						
C. Constructability Review						
3.C.1. Design Readiness for Construction						
3.C.2. PPMOF Evaluation						
3.C.3. Work Interface Review						

IV – HUMAN RESOURCE MANAGEMENT						
Section	Planning and Implementation Level					
Element	0	1	2	3	4	5
A. Training and Development						
4.A.1. Employee/Trades Technical Training						
4.A.2. Career Development						
4.A.3. Supervisors and Foreman Skills Development and Training						
B. Behavior						
4.B.1. Non-financial Incentive Programs						
4.B.2. Financial Incentive Programs						
4.B.3. Team Building and Social Activities						
C. Organizational Structure						
4.C.1. Maintain Stability of Organization Structure						
4.C.2. Clear Delegation of Responsibility including span of control						
D. Employment						
4.D.1. Retention Plan for Experienced Personnel						
4.D.2. Exit Interviews						
V – CONSTRUCTION METHODS						
Section	Planning and Implementation Level					
Element	0	1	2	3	4	5
A. Sequence and Scheduling of Work						
5.A.1. Integrated Schedule						
5.A.2. Work Schedule Strategies						
5.A.3. Schedule Execution and Management						
B. Start-Up, Commissioning, and Turnover Plan						
5.B.1. Planning for Start-up						
5.B.2. Testing Procedures						
5.B.3. System Turnover Procedure						
5.B.4. Process-Interface (Process technician standby)						
5.B.5. Planning for Shut Down (Plan for transient s/o operation)						
C. New Technology Investigation						
5.C.1. New Equipment Investigation						
5.C.2. New Information System Investigation						
5.C.3. New Materials Technologies Investigation						
D. Site Layout Plan						
5.D.1. Dynamic Site Layout Plan						
5.D.2. Site Security Plan						
5.D.3. Equipment Positioning Strategy						
VI – ENVIRONMENT, SAFETY, AND HEALTH						
Section	Planning and Implementation Level					
Element	0	1	2	3	4	5
A. Job Safety						
6.A.1. Zero Accidents Techniques						
6.A.2. Task Safety Analysis						
6.A.3. Identification of Potential Hazards						
6.A.4. Housekeeping						
6.A.5. Systems Hazard Analysis						
B. Substance Abuse Programs						
6.B.1. Substance Abuse Programs						
C. Safety Training and Orientation						
6.C.1. OSHA Compliance Training						
6.C.2. Toolbox Safety Meetings						
BPPII OVERALL SCORE		50.1%				

1. Select the appropriate level of implementation for each of the elements.

2. A X% output rating would be generated.

Benefits of BPPII

- Systematic list of essential practices that need to be planned and implemented on a project.
- Works as a checklist which determines the level of planning and implementation index.
- Gives a clear description on how to achieve the next level of higher implementation.

8. Journey on BPPII

Second Year (2017)

- CII, together with WG, developed an original Singapore BPPII tool, modified from the version used in North America.
 - Survey conducted to validate the relevance of each elements
- Pilot of the Pilot was conducted in 3 sites.
- 10 Pilot Projects were conducted.
- Based on the results, the first roundtable discussion was organized to discuss with SIMTech on improvement opportunities especially in the area of Materials Management and Equipment Logistics.

Third Year (2018)

- Second Roundtable discussion was conducted to introduce companies on SIMTech solutions.
- BPPII tool was modified to be contractor-centric for certification purposes

BPPII Result during Pilot Phase

- Aggregate results for All Projects

CATEGORIES	ACQUIRED SCORE	MAXIMUM SCORE	AVERAGE BPPII SCORE	QUARTILE
I - MATERIALS MANAGEMENT	178	323	54.62%	THIRD
II - EQUIPMENT LOGISTICS	142	287	48.91%	THIRD
III - CRAFT INFORMATION SYSTEMS	189	290	64.94%	SECOND
IV - HUMAN RESOURCES MANAGEMENT	210	322	65.03%	SECOND
V - CONSTRUCTION METHODS	207	284	71.53%	SECOND
VI - ENVIRONMENT, SAFETY, AND HEALTH	366	372	98.28%	FIRST
SINGAPORE BPPII SCORE	1292	1879	68.42% (median= 68%)	SECOND

QUARTILES	OVERALL SCORE	I – MATERIALS MANAGEMENT	II – EQUIPMENT LOGISTICS	III – CRAFT INFORMATION SYSTEMS	IV – HUMAN RESOURCES MANAGEMENT	V – CONSTRUCTION METHODS	V – HEALTH, SAFETY, AND ENVIRONMENT
First	Above 77%	Above 77%	Above 70%	Above 74%	Above 68%	Above 82%	Above 98%
Second	68% to 77%	65% to 77%	56% to 70%	62% to 74%	58% to 68%	70% to 82%	94% to 98%
Third	60% to 68%	50% to 65%	43% to 56%	52% to 62%	48% to 58%	60% to 70%	90% to 94%
Fourth	Below 60%	Below 50%	Below 43%	Below 52%	Below 48%	Below 60%	Below 90%

Legend for the 4 quartiles

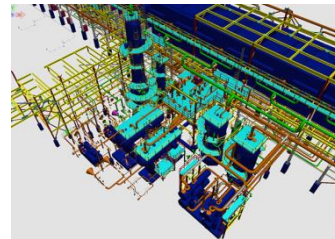
Quick Introduction on WFP

Workface Planning

- The detailed PLAN to ensure that you have the right:



PEOPLE
TOOLS
PLACE
TIME
SCOPE



- The process of organizing and delivering all the elements necessary for an installation work package, before the work is started.
- WG had piloted the processes.
- Results and learnings would be shared in the next session

Work Group path forward

WG would partially “Sunset”

- Objective met; Processes well understood
- Provide support to certification WG
 - Strengthen industry capability to conduct AA effectively; improve quality
 - Share and adopt solutions identified through BPPIL; improve the index
 - Adopt the use of more check list; currently only 3 used
- Promote adoption of all 3 processes across the industry

Industry Story Sharing on AA by Rotary Engineering