2022

Best practice for sustainable growth
Innovation Partnership Project

여수광양항만공사
YEOSU GWANGYANG PORT AUTHORITY

Table of Content

Project overview

[YGPA Innovation Partnership Project]

Background	● Given that the growth of Gwangyang Port hinges on the growth of SMEs and consequent cargo handling volume in the Gwangyang bay, it is important to realize the value of mutual growth under the spirit of “port community”. ● Undertake the government’s policy initiative, “innovative growth led by the private sector”, by supporting the innovation of SMEs, rather than simply providing material support. → Achieve mutual growth with SMEs and secure sustainable growth engines for the Yeosu and Gwangyang Ports by providing business innovation consulting and facilities to enhance productivity.		
Period	Jun.~Dec. 2022 (7 months)	Support type	Consulting, facilities
Activity	After on-site inspections, provide consulting for business innovation and facilities to improve productivity		
Participant	Wonhee, Gwangyang Tech, Jeil Logis, Argo Marine Total, Harmony SL, Yeosu Tank Terminal, Bonggang Environmental Farming Association		
Progress	’22. 5: Collected applications and selected participants. ’22. 5 : Held a briefing session on the project for 7 participant companies. ’22. 6. 30: Signed agreements (to kick off the project). ’22. 11. 23: Held a reporting session on the project result.		

Support for innovation

Summary of Tasks and Results

No.	Company	Task (consulting and facilities support)	KPI	Result		
				As-is	To-be	Improvement
1	Won-Hee	Improve complex desulfurizer quality to reduce claims	Number of claims(case/year)	34	10	71%
		Adopt an automatic lubricant supply system to improve productivity	Facility stoppage (case/month)	10	2	80%
2	Gwangyang Tech	Improve processing processes to enhance productivity	Production quantity (each/year)	2,800	3,080	10%
		Automate waste water treatment to reduce pollution	Pollution level (BOD, mg/l)	144	72	50%
3	Jeil Logistics	Build a risk assessment system for major tasks and safety & health management systems	Safety & health management (K-ESG score)	25	75	200%
		Acquire ISO45001 certification to build an occupational disaster prevention system	No. of certificates	0	1	-
4	Argo Marine Total	Set up/operate a safety & health organization to build safety & health management systems	Occupational safety (K-ESG score)	12.5	62.5	400%
		Acquire ISO45001 certification to build an occupational disaster prevention system	No. of certificates	0	1	-
5	Harmony SL	Research palm leaf mat markets and establish marketing strategies	Market research, business strategies	0	1	-
		Promote brand PR utilizing on/offline marketing tools	Finding new buyers	0	2	-
6	YEOSU TANK TERMINAL CORP.	Establish smart factory road map to enhance corporate competitiveness	Level of smart factory	0.5	1.0	100%
		Adopt UPS for communication servers to stabilize plant operation	Line stoppage hour	3	0	100%
7	Bonggang Environmental Farming Association	Develop an algorithm to optimize raw materials mixing ratios to reduce product defect	Product defect rate (%)	5	4	20%
		Improve the performance of packaging facility to shorten packaging cycle	Packaging cycle time (minute)	10	7	30%

Innovation Activities : Wonhee

Reason for participation

- Improve productivity by providing consulting for overall manufacturing processes and innovation
- Enhance quality by improving the inspection process of complex desulfurizer (sulfur-removing agent) and raw materials
- **Prevent facility troubles caused unstable grease supply to driving facilities, so as to improve productivity (introduction of an automatic grease supply system)**

History

- Oct. 2021: Conducted a test on shell quicklime-based desulfurizer (positive result)
  - Started the production of desulfurizer using shell quicklime (contribution to promoting ESG management)
- Oct. 2020: Constructed a manufacturing plant for CaO complex desulfurizer (supply to SNNC)
  - production capacity: 600 tons/day, 160,000 tons/year, specialized in desulfurizer production
- Mar. 2020: Founded Wonhee Co., Ltd.
- 2019: Conducted R&D and commercialized CaO-based complex desulfurizer
  - Development of CaO-based desulfurizer for steelmaking and 5 operational tests → development of the final product, desulfurizer cost reduction for customers

Main product

Mixture of raw materials

Desulfurizer

Desulfurizer in use

Result

Innovation Activities : Wonhee

Task 1

Company	Won-Hee	Task type	Manufacturing innovation(Q)	Task	Improve complex desulfurizer quality to reduce claims

Objective

CSF	Key performance indicator(KPI)	As-is	To-be	Result	Improvement (%)	Achievement (%)
Claim reduction by quality improvement	Number of claims(case/year)	34	10	10	71	100

Issues

- Defective product specifications caused by unstable quality of raw materials: need to eliminate the cause of quality claims
- Result of product quality analysis is available only 15 days after commissioning to an outsourced agency: cannot check quality in real-time
- Poor mixing of raw materials due to facility trouble (e.g. clogging of the silo discharger, failure of the mixer/dust collector/hammer)
- Need to enhance customer satisfaction by real-time analysis of raw materials mixing and production of stable, high-quality products: reduce claims

Activities

1. Put in a sample

2. Enter XRF analysis data

3. Put in a sample and additives

XRF quality analysis

4. XRF quality analysis

5. Secure quality data

6. Send to the MES server

7. Real-time monitoring

Result

Innovation Activities : Wonhee

Task 2

Company	Won-Hee	Task type	P(Production)	Task	Adopt an automatic lubricant supply system to improve productivity

Objective	CSF	Key performance indicator(KPI)	As-is	To-be	Result	Improvement(%)	Achievement (%)
	Productivity improvement	Facility stoppage (case/month)	10	2	2	80	100

Issues

- Poor grease supply: facility failures (bearing damages in rotating machine)
- Need to enable operators to put in grease manually during the continued operation of facilities.
- No grease supply standards set for each facility
- Grease injection by certain intervals: increased workload

Activity

■ Installation of a centralized grease supply system

- Automated grease supply and improvement of major greasing points

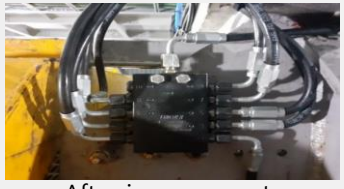
Preparation (1)

Preparation (2)

Installation of automatic greasing system

Installation completed

Before improvement (manual mixer)



After improvement (automatic mixer)

Before improvement (screw feeder)

After improvement (screw feeder)

Innovation Activities : Gwangyang Tech

Reason for participation

- Inefficient, aged facilities for waste water treatment: increased treatment cost
  → Need to prevent environmental pollution by automating waste water treatment, including the improvement of the aged facilities and the adoption of high-efficiency facilities
- Need to find and solve issues with processing parts for construction equipment maintenance: productivity improvement and cost saving

History

- Sep. 2021: Certified as maintenance plant designated by Hyundai Construction Equipment
- Apr. 2016:Constructed a parts processing plant for heavy equipment
- Apr. 2015: Certified as maintenance plant designated by Doosan Infracore
- May 2014: Designated as inspection center for construction equipment in Jeollanam-do
- Jan. 2009: Changed company name to Gwangyang Tech Co., Ltd.

Main product

Maintenance of construction equipment

Excavator grapple cylinder

Other parts

Result

Innovation Activities : Gwangyang Tech Task1

Company	Gwangyang Tech	Task type	Production(P)	Task	Improve processing processes to enhance productivity

Objective

CSF	Key performance indicator(KPI)	As-is	To-be	Result	Improvement (%)	Achievement (%)
Process innovation	Production quantity (each/year)	2,800	3,080	3,080	10	100

Issues

- Mainly process parts for construction equipment maintenance (e.g., lathe, milling, hole, tap), which involves much of manual work: need to improve methods to move and store raw materials and parts (currently, raw materials and parts are mixed).
- Need to move scraps generated during part processing to a separate space in the plant.

Activity

▣ **Improvement of process lay out**

- Realign process layout to secure work space and conduct 5S activities to improve the work environment and logistics within the plant.

Result

Innovation Activities : Gwangyang Tech

Task 2

Company	Gwangyang Tech	Task type	S(safety, environment)	Task	Automate waste water treatment to reduce pollution

Objective

CSF	Key performance indicator(KPI)	As-is	To-be	Result	Improvement(%)	Achievement (%)
Process innovation	Pollution level (BOD, mg/l)	144	72	72	50	100

Issues

- Inefficient, aged facility for waste water treatment: increased treatment costs
- Low efficiency in treating waste water discharged from the plant: need to improve the treatment facilities and resolve environmental pollution.
- Discharge of contaminated water by facility inspection workers' mistakes and increased work load
- Difficulty in disposing of waste gravels and activated carbon used for filtration
- Manual use of chemicals: difficulty in calculating the proper amount of chemicals, resulting in the overuse of chemicals

Activities

▣ Improvement of the waste water treatment facility

- Demolition of the aged waste water treatment facility and improvement of process flow (sedimentation, water collection, filtration, sediment removal before discharge, waste water treatment)
- - After the improvement, positive results were confirmed in tests on the waste water treatment process and the waste water discharged after chemical treatment.
- - Commissioned quality analysis of water before discharge, considering the water quality standard was changed from COD/BOD => total organic carbon (TOC).

Aged facility

Demolition

Improvement

Air panel for treatment

Innovation Activities : Jeil Logis

Reason for participation

- Various factors cause safety accidents at business sites, while regulations and punishments for severe industrial disasters are tightening.
- Prevention of safety accidents requires Jeil to prepare and upgrade safety management manuals customized to its business sites.
- Need to prepare a manual to establish ISO45001 and acquire certification: After establishing a safety and health management system, Jeil plans to obtain certification on the system, which is centered on workers and workplaces, thereby preventing major disasters.

History

Dec. 2020 Obtained ISO14001 certification
Dec. 2019 Selected as SME of management innovation
Sep. 2019 Acquired permission to run a solar power plant (Jeil Sora No. 1)
Dec. 2018 Registered as inspection site (#1 center)
Dec. 2015 Constructed a warehouse for Jeil Logis
Nov. 2015 Registered as foreign-invested forwarding business
Aug. 2015 Signed a lease contract with YGPA
Jun. 2015 Established Jeil Logis

Main products

Feed additives

Hay

Nonferrous metal

Result

Innovation Activities : Jeil Logis

Company	Jeil Logis	Task type	S(safety, environment)	Task	Build a risk assessment system for major tasks and safety & health management systems

Objective	CSF	Key performance indicator(KPI)	As-is	To-be	Result	Improvement(%)	Achievement (%)
	Building safety & health management systems	Safety & health management (K-ESG score)	25	75	75	200	100
	ISO 45001 certification	No. of certificates	0	1	1	100	100

Issues

- Absence of safety and health management systems: need to prevent safety accidents.
- Jeil Logis handles heavy materials, which requires safety rules for loading and unloading.
- Need to establish safety and health management systems and upgrade the systems by acquiring ISO45001.
- Need to set a foundation for ESG management by establishing safety and health systems.

Activities

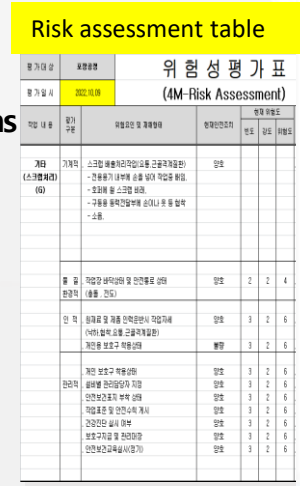
■ Building safety & health management systems (including risk assessment)

▣ Activities

1. Establish manuals and processes for EHS management systems
   1) Prepare a manual for the environment, safety, and health
   2) Prepare a risk assessment procedure
   3) Prepare safety and health management procedures (13)
      (Refer to the task examples)

2. Safety and health risk assessment
3. ISO 45001 certification (Dec. 3, 2022)

Risk assessment table


위 험 성 평 가 표
(4M-Risk Assessment)

Management system certificate


경영시스템인증서
주식회사 제일로지스
KSA
한국표준협회장

Innovation Activities : Argo Marine Total

Reason for participation

- Growing emphasis on corporate responsibility for health and safety: need to reinforce legal compliance and effective management of health and safety
- Need to respond to laws and regulations for safety and health (domestic/overseas)
- Need to integrate work processes with safety and health management systems

History

- 2022 Confirmed as a venture company of the innovative growth type
- 2021 Won the Best Business Leader Award from Gwangyang municipal government, opened the R&D Center
- 2020 Developed the automation and modeling system for steel product stowage planning
- 2020 Received the provincial governor's award for contribution to the development of the steel industry
- 2020 Selected as a promising SME in Jeollanam-do
- 2017 Developed electric P&C equipment to improve work efficiency at ports
- 2013 Developed a video inspection system for offshore import and export cargo
- 2012 Constructed and started up the condensation prevention center (manufacturing facility) for steel products
- 2000 BV ISO 9001 2000/KSA 9001 2000 quality management certification
- 1998 Inspected raw materials and products for POSCO and started integrated inspection service
- 1997 Established Argo Marine Total

Main businesses

Cargo inspection /appraisal

Anti-condensation heater

S/W

Result

Innovation Activities : Argo Marine Total

Company	Argo Marine Total	Task type	S(safety, environment)	Task	Acquire ISO45001 certification to build an occupational disaster prevention system

Objective	CSF	Key performance indicator(KPI)	As-is	To-be	Result	Improvement(%)	Achievement (%)
	Building safety & health management systems	Occupational safety (K-ESG score)	12.5	62.5	62.5	400	100
	ISO 45001 certification	No. of certificates	0	1	1	100	100

Issues

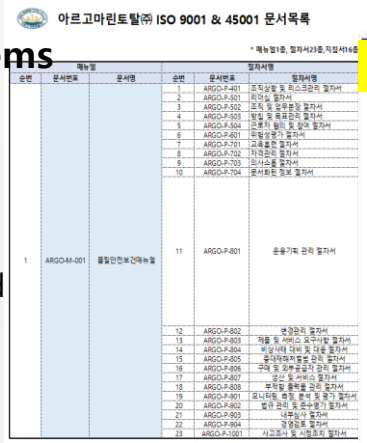
- Need to enable employees to recognize safety issues and enhance their safety awareness by providing education.
- Need to comply with the Act on Punishment for Severe Accidents and foster a safe work environment by establishing safety and health management systems and deploying safety experts.
- Need to systematically discover and mitigate risk factors at work.

Activities

■ Building safety & health management systems

▣ Review of PDCA cycle

- ✓ Documented regulations on the quality/safety/ health management systems and processes
- ✓ Safety and health management systems integrated with the existing quality management system
- ✓ manual (1), procedure (23), instruction (16)



Management system certificate

Innovation Activities : Harmony SL

Reason for participation

- Harmony SL is engaged in transportation and shipping brokerage at Yeosu and Gwangyang Ports. To deal with reduced trade volume due to the pandemic and secure long-term self-reliance, it seeks to diversify its business portfolio by importing eco-friendly products and construction/gardening materials from Southeast Asia, including Vietnam.

History

- Jan. 2021: Signed a washing facility (phase2-1) lease contract with YGPA
- Apr. 2020: Inaugurated new CEO (Choi Won-young), construction equipment rental business
- Nov. 2017: Registered as a port transportation business (container repair business)
- May 2017: Signed a washing facility lease contract with SM Gwangyang terminal
- May 2017: Registered as container washing and repair contractor for SM Shipping Co., Ltd.
- Feb. 2011: Established Harmony SL

Main facilities

Coconut mats warehouse (& 5 containers)

Equipment

Truck

Result

Innovation Activities : Harmony SL

Task 1

Company	Harmony SL	Task type	M(management, awareness)	Task	Research palm leaf mat markets and establish marketing strategies

Objective

CSF	Key performance indicator(KPI)	As-is	To-be	Result	Improvement(%)	Achievement (%)
Market research and marketing strategies	Market research, business strategies	0	1	1	-	100

Issues

- Need domestic/overseas market analyses for palm leaf mats distribution
- Need SWOT analyses based on its existing infrastructure
- Need marketing strategies for palm leaf mat markets based on the analysis of domestic and overseas markets

Activities

■ Discovering competitiveness in palm leaf mats distribution

▣ Setting up strategies for domestic distribution (B2B) capitalizing on Harmony SL's strengths

- Harmony SL has container yards at Yeosu and Gwangyang Ports, which helps to expedite import and export customs clearance and maximize work efficiency.
- Over $300 can be saved per container in the import business, which increases the price competitiveness of imported products
- The free storage period at the warehouse for customs clearance has shortened from 21 to 10 days and faster work handling means less import cost. In this context, Harmony SL has high competitiveness, which is expected to facilitate its business expansion.

Harmony SL has a container yard and a warehouse at Yeosu Gwangyang Ports and hence can process quarantine, customs clearance, storage, and delivery under a centralized system (the biggest competitive edge)

Result

Innovation Activities : Harmony SL

Task 2

Company	Harmony SL	Task type	M(management, awareness)	Task	Promote brand PR utilizing on/offline marketing tools

Objective	CSF	Key performance indicator(KPI)	As-is	To-be	Result	Improvement(%)	Achievement (%)
	Market research and marketing strategies	Finding new buyers	0	2	2	-	100

Issues

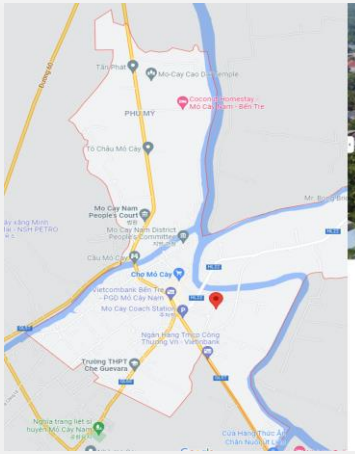
- Conduct online PR through the homepage to expand its presence in the palm leaf mat market (major portal sites, such as Naver).
- Discover new buyers by employing marketing strategies based on the analysis of domestic and overseas palm leaf mat markets.

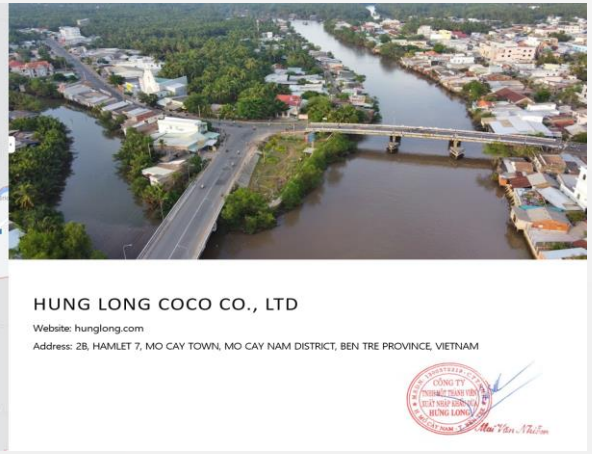
Activities

■ **Building infrastructure for distributing palm leaf mats**

▣ **Signing a contract with a Vietnamese manufacturer for distribution in Korea**

- Secure reliability in sourcing palm leaf mats by signing a domestic distribution contract with a Vietnamese company producing over 60% of palm leaf mats sold in Korea.





■ **Vitalizing brand PR online by opening a homepage and conducting PR by keywords**

Profile

Innovation Activities : Yeosu Tank Terminal

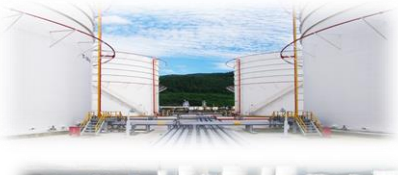
Reason for participation

- Yeosu Tank Terminal is a global company with a vast fleet of tanks engaged in the storage, release, and blending of liquid cargo (e.g., light liquid, alcohol, and chemicals). It needs to establish a smart factory strategy to keep pace with the 4th Industrial Revolution and address pending issues.
  - Establish a smart factory roadmap to strengthen business competitiveness.
  - Introduce an uninterruptible power supply (UPS) to prevent the shutdown of communication equipment and servers during a power outage, to stabilize factory operation.

History

- Apr. 2022: Acquired ISO-9001(quality), 14001(environment), 45001(safety) certification
- 2017: Obtained ecovadis (environment/labor/safety) certification
- Jul. 2011: Acquired OHSAS 18001 certification (safety and health management manual)
- Aug. 2007: Acquired CDI-Terminal certification (international terminal certification)
- Nov. 2005: Operated a Yeosu tank terminal of the Federation of Fisheries Cooperatives
- Jun. 2005: Expanded Methanex tanks in Wolnae (108,000kl)
- 2002: Acquired a license to use licensed bonded warehouses
- 1999-2000: Signed a contract with the Methanex logistics complex(50,000kl)
- 1999: Acquired a loading license for dangerous materials, acquired ISO 9001 certification
- 1990-1994: Leased tanks to SHELL, S-OIL, BASF, DOW, etc.
- Jul. 1988: Established Yeosu Tank Terminal

Main business



Storage of liquid cargo

Offshore/onshore cargo (un)loading

Innovation Activities : Yeosu Tank Terminal

Task 1

Company	Yeosu Tank Terminal	Task type	P(production)	Task	Establish smart factory road map to enhance corporate competitiveness

Objective

CSF	Key performance indicator(KPI)	As-is	To-be	Result	Improvement(%)	Achievement (%)
Business strategy	Level of smart factory	0.5	1	1	100	100

Issues

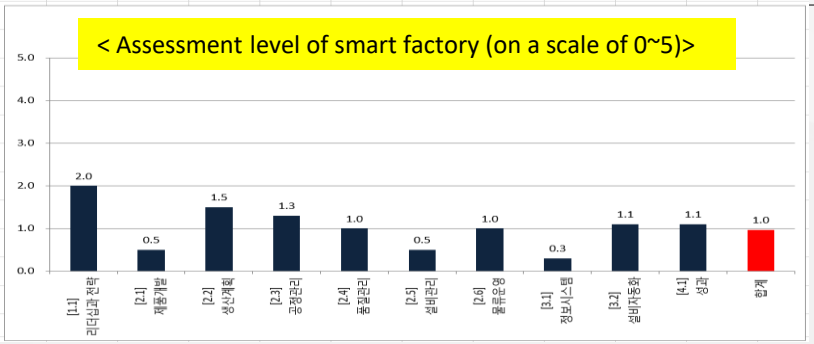
- Manual management of production processes (e.g., issuance of work instruction) undermines information sharing and emergency response, deteriorating work efficiency.
- Tank inventories are measured and recorded manually, and human errors decrease data reliability.
- Manual blending costs more time and manpower.
- Inefficiency in overall work processes in storage, release, and blending of liquid cargo (e.g., light liquid, chemicals): need to introduce a smart system

Activity

■ **Digitalization of analog measuring instruments, automation of batch count, Remote PLC for data collection, cargo inventory management system**

Item	As-is	To-be	Result	Unit	Criteria
Level of smart factory	0.5	1	1	Level	Assessment table

영역	배점	수준	점수(점)
[1.1] 리더십과 전략	100	2.0	70
[2.1] 제품개발	60	0.5	34
[2.2] 생산계획	60	1.5	39
[2.3] 공정관리	70	1.3	45
[2.4] 품질관리	70	1.0	42
[2.5] 설비관리	60	0.5	33
[2.6] 물류운영	60	1.0	36
[3.1] 정보시스템	220	0.3	118
[3.2] 설비자동화	180	1.1	111
[4.1] 성과	120	1.1	74
합계	1,000	1.0	601



Result

Innovation Activities : Yeosu Tank Terminal Task 2

Company	Yeosu Tank Terminal	Task type	P(production)	Task	Adopt UPS for communication servers to stabilize plant operation

Objective

CSF	Key performance indicator(KPI)	As-is	To-be	Result	Improvement (%)	Achievement (%)
Process innovation	Line stoppage hour	3	0	0	100	100

Issues

- Insufficient review of facility reinforcement to cope with major facility failures such as power outages: instability in facility operation
- Insufficient system to stabilize power supply: Power outages might lead to serious accidents.
- Unstable power system of raw materials measuring instruments: inaccurate measurement due to power disruption
- Lack of comprehensive solutions to cover major facilities in the event of a power outage: instability in facility operation

Activities

■ **Introduction of UPS for communication servers**

▣ **UPS installation and inspection**

New UPS (front side)

Battery assembly

Innovation Activities : Bonggang Environmental Farming Association

Reasons for participation

- The Association has established a mid-to-long-term road map for a smart factory under the strong initiative of the CEO and is pursuing process innovation in phases. The most urgent area to improve is the optimization and performance enhancement of key facilities.

- Reduce product defect rate by developing an algorithm to optimize raw materials mixing ratios, a key quality determinant.
- Shorten the packaging cycle by improving the performance of the packaging facility, a key production facility

History

- 2019: Registered as mail-order business, added 'wholesale and retail business' 2012: registered organic materials
- 2011: Registered TOVITA trademark
- 2009: Selected as fertilizer supplier by the National Agricultural Cooperative Federation
- Nov. 2008: Developed organic fertilizer, constructed and registered a plant

Product

fertilizer

Result

Innovation Activities : Bonggang Environmental Farming Association

Task 1

Company	Bonggang Environmental Farming Association	Task type	Q(quality)	Task	Develop an algorithm to optimize raw materials mixing ratios to reduce product defect

Objective

CSF	Key performance indicator(KPI)	As-is	To-be	Result	Improvement(%)	Achievement (%)
Manufacturing innovation	Product defect rate (%)	5	4	3.8	24	120

Issues

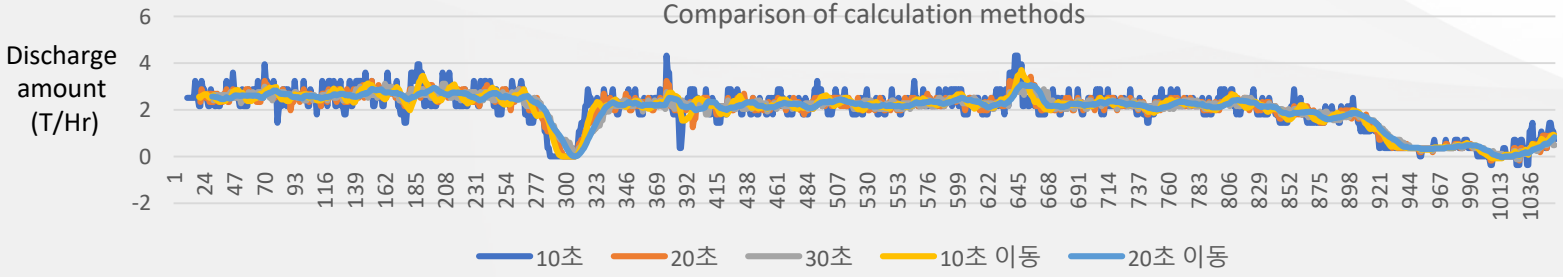
- Blending ratio of raw materials is set by the speed of the dispensing motor, not the weight of dispensed materials: need to optimize the blending ratio.
- Even at the same motor speed, the discharged amount differs due to different amounts of raw materials loaded in the hopper.
- Even at the same motor speed, the discharged amount is affected by the separation of the dispensing screw conveyor.

Activities

■ **Data collection and analysis using MES**

▣ **Comparison of calculation methods for raw material discharge amount in a hopper**

- - According to the comparison between the general calculation method (weight difference/time difference) and the calculation method reflecting the moving average (weight difference/time difference reflecting moving average for 10 seconds),
- Calculating the discharge amount at **a 20-second interval reflecting the moving average of weight for 10 seconds** was the most appropriate method.
- - Need to choose an optimal calculation method after field tests.



Result

Innovation Activities : Bonggang Environmental Farming Association

Task 2

Company	Bonggang Environmental Farming Association	Task type	P(production)	Task	Optimize the control system of discharge amount to increase production volume / hour

Goal

CSF	Key performance indicator(KPI)	As-is	To-be	Result	Improvement(%)	Achievement (%)
Process innovation	Production volume/hour (T/H)	1	1.2	1.3	30	108

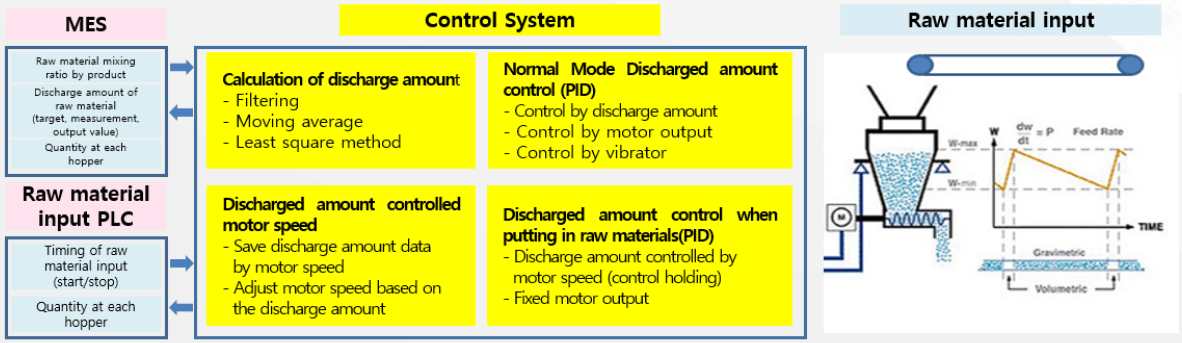
Issues

- Discharge amount at the hopper is controlled by adjusting motor speed without feedback. Improper mixture ratio caused by external factors, such as worn-out screws, decreases production volume.
- Discharge amount set by the motor's speed fluctuates, affected by the amount of raw materials loaded in the hopper, their attachment, and the separation of the screw conveyor. Difficulty in precise control of discharge amount results in poor product quality and suspension of production.

Activity

■ **Design of control function**

- The control system cannot calculate the discharge amount when raw materials are put in. Its control function should is designed to enable real-time control, considering the input of raw materials.



■ The new control system was designed to control discharge amounts in real-time, considering the timing of raw material input.

Attachment: Photos of the Project Result Reporting Session

Thank You.

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YEOSU GWANGYANG PORT AUTHORITY