INEEJI EMPOWERING EXPERTISE

www.ineeji.com
www.ineeji.jp

Company & Service Introduction Material

V13.2 2023. 05. 18.

KOREA HQ

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+82 31 8022 7534

KOREA HQ

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+82 31 8022 7534

JAPAN OFFICE

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+81 3 5501 2847

Written by

Marketing Team

Date of Issue

18. MAY. 2023.

The World's Accurate AI Prediction Service Providing Company

INEEJI Provides
The World's Most Accurate
AI Prediction Service
www.ineeji.com
www.ineeji.jp

INEEJI EMPOWERING EXPERTISE

The Smart Choice for Cost Saving

The company providing Process Optimization AI prediction solution, INEEJI

CEO	Jaesik Choi	**Address**	KOREA HQ	14F, 8, Seongnam-daero 331beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do
			BUSAN OFFICE	55F, 40, Munheyon-geumyung-ro, Nam-gu, Busan
			JAPAN OFFICE	Kasumigaseki Building, 5階, 3-chōme-2-5 Kasumigaseki, Chiyoda City, Tokyo 100-6001, Japan
Employees	41 employees (R&D 29 employees, 1Q/2023)	**Contact**	KOREA HQ	+82-31-8022-7534
			JAPAN OFFICE	+81-3-5501-2847
Services	AI process optimization, Quality prediction, Diagnosis and maintenance	**Website**	www.Ineeji.com www.Ineeji.jp	
Partners	POSCO, Samsung, SK Picglobal, SK energy, GS chem, HYUNDAI Steel, Hankook Steel & Mill, SeAH Besteel, DIG airgas, GS EPS, SK chem, Dongwon systems, SUNGSHIN cement, SK gas, LG Energy Solution LG chem, Korea East-West Power Co., KG Steel, Dongguk Steel, Korea South Power Co., Dongwon, Ssangyong, Bucheon-si, etc.	**E-mail**	ineeji@ineeji.com sales@ineeji.com marketing@ineeji.com recruit@ineeji.com	

2019 - 2020 — **INEEJI Established**, **A venture Certified AI research Center Established**

2021.03. — **Completed field application (SK)**

2021.08. — **INFINITE OPTIMAL SERIES™ Launched**

2022.03. — **Pre-Series A Completed (5.5 B)**

2022.04. — **KODIT Selected as First Penguin (2 B)**

2022.10. — **KOREA AI STARTUP 100**

2022.11. — **Grand Prize** by **Ministry of SMEs and Startups**

2022.12. — Selected as Industry Convergence Leading Company **(Ministry of Industry)**

2023.01. — Selected as **2023 Emerging AI+X TOP 100**

2023.05. — **1st Award** by **Ministry of Science and ICT (AI Technology Award)**

CEO

Over 20 Yrs Global leader in explainable AI researcher / World-Class XAI Expert

INEEJI Co., Ltd	**CEO** (2019-Present)
KAIST	**Associate Professor, AI**
UNIST	**Associate Professor, Computer** (2013-2019)
U.S Lawrence Berkeley National Laboratory	**Adjunct Professor** (2013-2019)
U.S University of Illinois at Urbana-Champaign	**MS-PhD, Computer Science** (2012)
Seoul National University	**BS, Computer Engineering** (2004)
Ministry of Trade, Industry and Energy	**Committee, Industrial Digital Transformation** (2023)
Korean Institute of Information Scientists and Engineers	**Vice President of International Relations** (2023)
Presidential 4th Industrial Revolution Committee	**Subcommittee, AI department** (2020-2021)
SAMSUNG Electronic Future Technology	**Advisor** (2019-Present)
Korean Ministry of Science and ICT	**Director, Explainable AI Center** (2017-Present)
2022 Korea AI Startup	**Named in '2022 Korea AI Startup 100' List** (2022)
Korea East-West Power	**Grand Prize, AI Competition** (2020)
Prime Minister's Commendation	**Award** (2019)
Smart Blast Furnace	**Selection** (2019)
POSCO	**Smart Innovation Award** (2018)
UNIST [5% of UNIST faculty members]	**Special Professor** (2018)
International Digital Curling Tournament	**Winner** (2017/2018)

World Class eXplainable AI(XAI) Prediction Technology

Leading the XAI field expert, CEO & CTO

KDD2020 Tutorial on

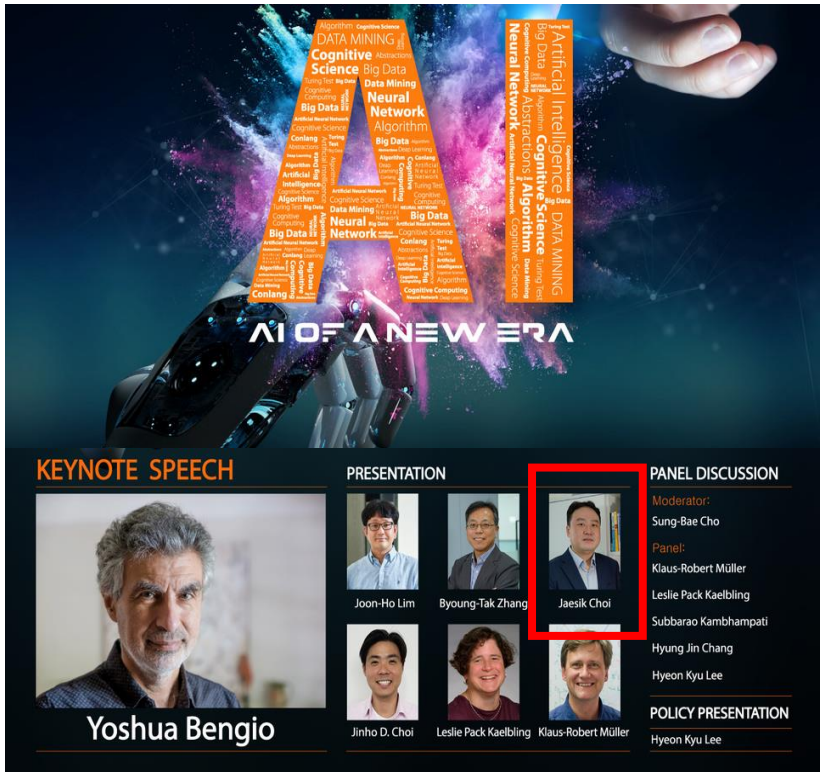
Interpreting and Explaining Deep Neural Networks: A Perspective on Time Series Data

* Due to COVID-19, the tutorials will be delivered virtually this year.

Tutorial outline

Time	Tutor	Detail
50 min	Jaesik Choi (KAIST)	Overview of InterpretingDeep Neural Networks
50 min		Interpreting Inside of Deep Neural Networks
50 min		Explaining TimeSeries Data

"Global Artificial Intelligence Forum"
Under the theme of "AI of a New Era", AI Future Development Direction and Insight Sharing



World Class eXplainable AI(XAI) Prediction Technology

World's leading AI expert, CEO & CTO

INEEJI, Korea's representative AI startup recognized by **KOFST(The Korean Federation of Science and Technology Societies)**

World Class eXplainable AI(XAI) Prediction Technology

eXplainable AI(XAI) & Prediction Pa rs published in Global Academic Conference

Technology to Correct errors Inside Learning

CVPR 2021

*KAIST Breakthroughs pick (Autumn, 2021) Naver IT/Science Headline News

World's Leading Multivariate Time Series Prediction Model

ICML 2021

*The World's Highest Ranking Of the multivariable traffic Prediction Dataset Standard **PeMSD7 2nd, PEMS-BAY 5th**

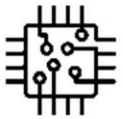
World's Best Diagnostic Artificial Intelligence

IEEE TNNLS 2021

IF 10.45

The World's First Technology to Visualize Decisions in Time Series Deep Learning

KDD 2021



Artificial Intelligence Explains the Causes of Chemical Toxicity

Chemical Science 2021

Method of Explanation Of the Reason for World-Class Accuracy Image Deep Learning

AAAI 2021

Distilled Gradient Aggregation: Purify Features for Input Attribution in the Deep Neural Network

NeurIPS 2022

World Class eXplainable AI(XAI) Prediction Technology

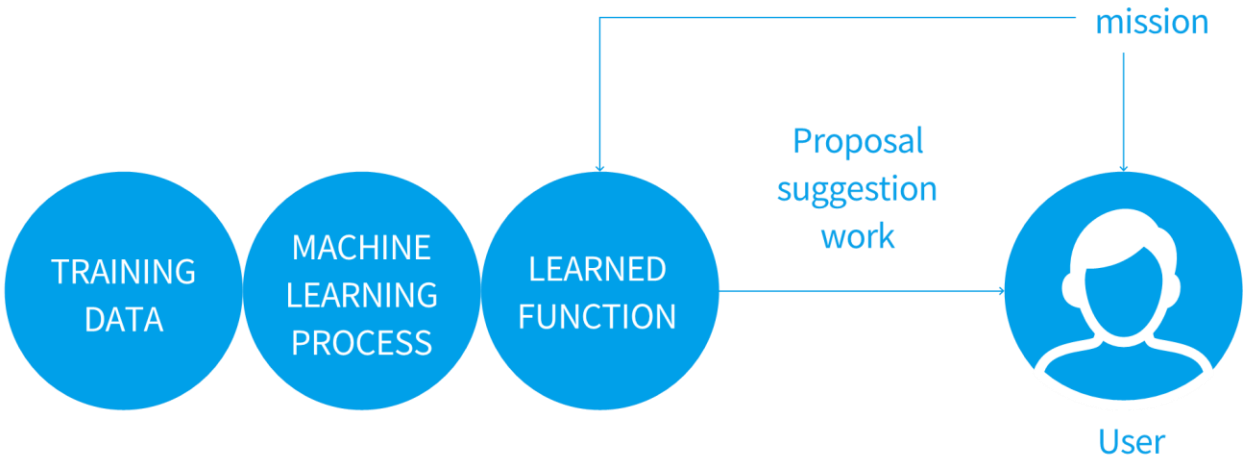
Building the world's highest level AI technology collaboration system

World Class eXplainable AI(XAI) Prediction Technology

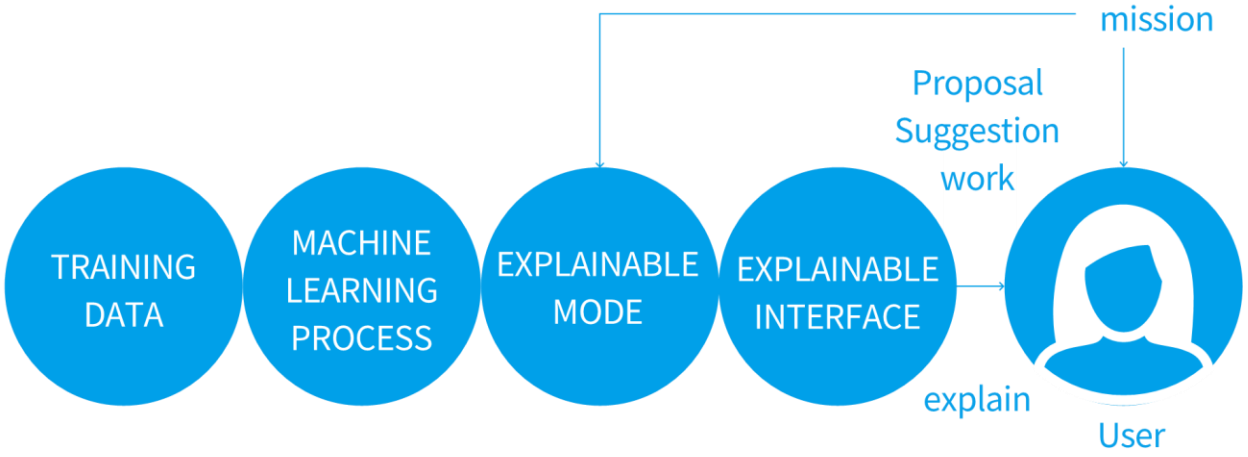
Technology Patent Application

Intellectual Property Name	Applicant for intellectual property rights	Applicant country	Application/ Registration Number	Application/Registration	Remarks
Extraction methods and devices of Deep learning internal data	UNIST/INEEJI	PCT	KR2019011184	Application	EU
Data prediction methods and devices	UNIST/INEEJI	KOR	10-2020-0110650	Application	
Context information extraction method and device	UNIST/INEEJI	KOR	10-2019-0153388	Application	
Methods and Apparatus for Extracting Data in Deep Neural Networks	UNIST/INEEJI	USA	16/642,579	Application	EU patent pending
Artificial intelligence device for predicting and controlling time series data based on automatic learning	INEEJI	KOR	10-2020-0046317	Application	
Artificial intelligence device for predicting and controlling time series data based on automatic learning	INEEJI	PCT	KR2021020067	Application	USA, JAP, EU
Deep learning-based thermal power plant re-heater tube leakage detection method and device	IST/East-West Power (INEEJI /Patent License)	KOR	10-2241650	Registration	
Method and apparatus for explaining artificial neural networks based on time series data	KAIST(License by Agreement)	KOR	10-2020-0161577	Application	Technology transfer contract in progress
A method for controlling an intersection signal and an apparatus for performing the same	INEEJI	KOR	10-2023-0011554	Application	
Electronic device for realizing a polymer quality prediction and control system and control method thereof	INEEJI	KOR	10-2023-0012294	Application	
INFINITE OPTIMAL SERIES™ trademark application	INEEJI	JAP	6672783/6670020	Registration	Class 9, Class 42
INFINITE OPTIMAL SERIES™ trademark application	INEEJI	JAP	40-2022-0144170-0144176	Application	Class 9, Class 42 *under registration review

About “eXplainable AI(XAI)”



- Why did it comes to this conclusion?
- How did it succeed?
- How did it failed?
- Can I trust the conclusion?
- How are you going to modify it?



- You can see why we came to that conclusion.
- You can see how it succeed.
- You can see why it failed.
- It is reliable in these case.
- We can figure out why it happened.

About “eXplainable AI(XAI)”

High accuracy

Increase precision of model
by checking the process of
deriving results and
finding errors of learning.

Accurate guidance

Provide accurate and detailed
guidance
through the process of
deriving results.

High reliability

You can check intuitively
with the results
based on high reliability.

www.ineeji.com / www.ineeji.jp

Think Smart,

INFINITE OPTIMAL SERIES™

INFINITE OPTIMAL SERIES™ is
Prediction solution for ENERGY SAVING through process optimization of industrial processes (Oil/Chemical/Ferrous metal/Cement/Glass/Power generation/Semiconductor), which enables companies to realize ESG/SDGs management through energy reduction, productivity improvement, and quality improvement.

CHALLENGE

Optimization of industrial processes in the factory is challenging!

High heat, pressure, corrosion, etc.
make it difficult to measure
the internal reaction.

Lack of experienced site managers
and high cost of data analysis experts

Various variables for detailed process monitoring make it impossible to handle problems accurately 24/7 in person.

Original method of designed operation does not always guarantee an optimal operation.

Need a different operation approach depending on changes in raw materials and production costs.

The Smart Choice for Energy Saving in industrial process

INEEJI INFINITE OPTIMAL SERIES™

AI Prediction Base

PREDICT

Prediction technology
to optimize production

AI predicts and optimizes process production

Time series prediction AI-based
process optimization solution
World Class Technology

AI Automatic control

EXPLAIN

World's first explainable AI
to provide explanation of guidance

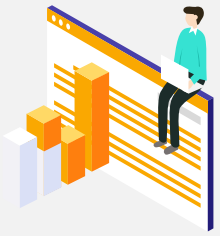
AI explains the reason for its guidance

Explainable AI-based
process explanation solution
World's First tech of visualization of
time-series deep learning's decision

Various product Cost

COSTSAVER

Cost saving technology
to improve spread costs



AI improves the spread of products

AI solution for long & short-term
price prediction for raw material cost
and raw material price changes
Profit Maximization

The Smart Choice for Energy Saving in industrial process

INEEJI INFINITE OPTIMAL SERIES™ Predictive Solution

Optimization solution

INFINITE OPTIMAL SERIES™
Optimization solution

MANUFACTURING INDUSTRIES

CHEMICAL REFINERY

Maintenance solution

INFINITE OPTIMAL SERIES™
Maintenance solution

CLOUD BASED AI SERVICES

High-Temperature response optimization

Efficiency and production prediction by monitoring the internal reaction temperature and amount of The energy required of large thermal reactors at a high temperature of 1,000 degrees or higher.

POWER PLANT

STEEL PLANT

FURNACE

CEMENT KILN FURNACE

GLASS MELTING FURNACE

Low-Temperature response optimization

Optimization of production and quality of production for medium/large chemical reactions at room temperature, including chemical, distillation, batch, and precision chemistry.

REFINERY

CHEMICAL

SEMICONDUCTOR

Cloud-based AI (including diagnostics)

prediction and inference of multivariate time series to the online cloud is primarily applicable for monitoring and diagnosing when data is publicly and externally accessible.

TRAFFIC CONGESTIONS PREDICTION

PLANT PIPELINE

PREDICTIVE MAINTENANCE

ROBOTICS MANUFACTURING

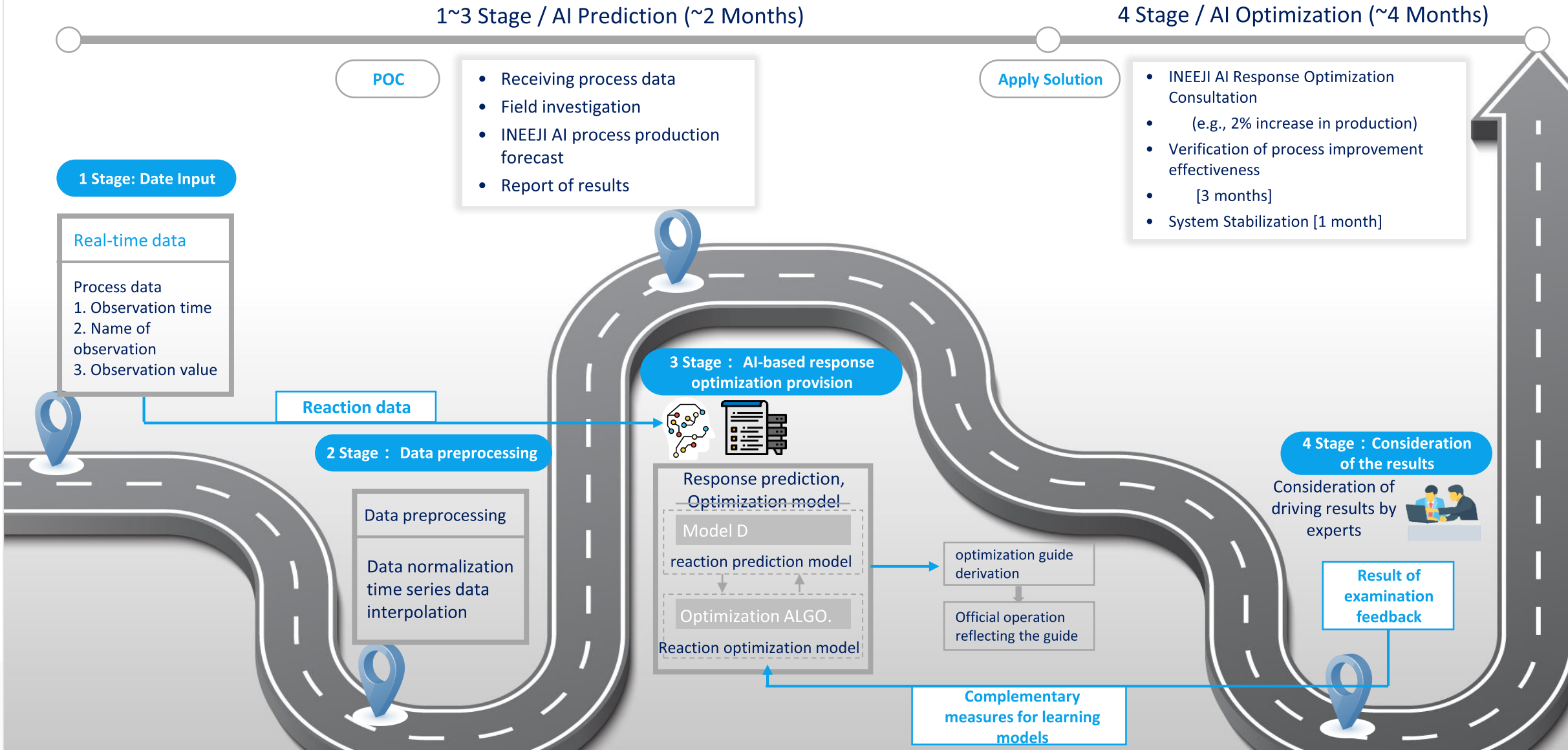
SOLAR PANEL

WIND TURBINE

Facility process optimization POC process

Procedure for applying the INEEJI AI solution

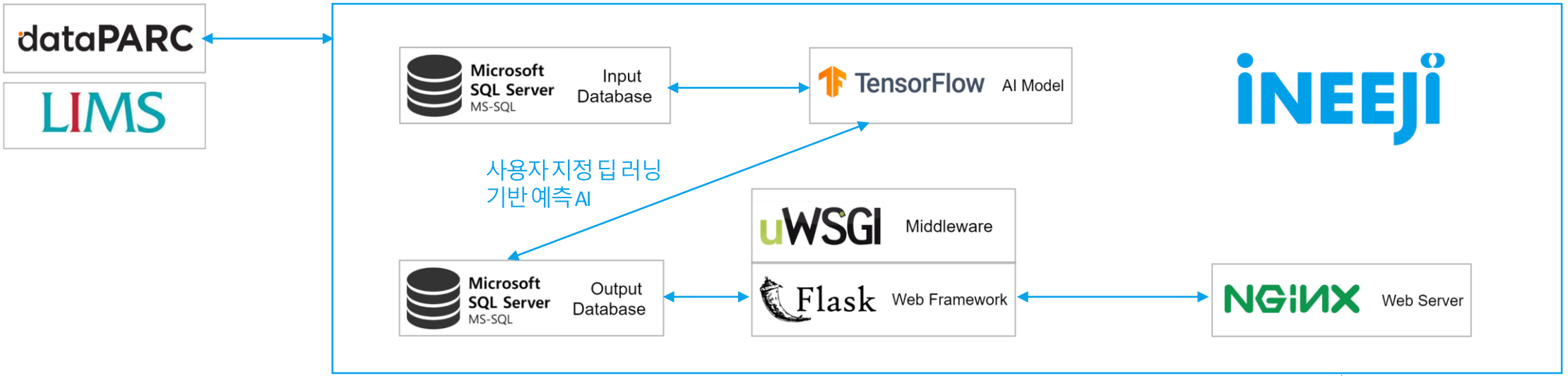
POC (Proof of Concept)



Facility process optimization POC process

INEEJI AI Solution Configuration Diagram

Process operating data



Operator screen

AI Server SPEC

OS: ubuntu v16
CPU: i7-12
GPU: G-FORCE RTX 3050
RAM: SAMSUNG DDR4-3200 16G X 2
SSD: M.2 NVMe 1TB
HDD: 4TB

Business Road map

Milestone & Sales Plan of INEEJI

Expansion of the domestic market	Expansion to Japan/East Asia Market	Expansion to USA / EU Market Domestic Petrochemical market share 30%	Biochemical / Pharmaceutical optimization solution	H/W integrated AI solution World Petrochemical Market share 5%	Online Prediction service	World industrial process market share 10%	World industrial process market share 40%	

PARTNERS

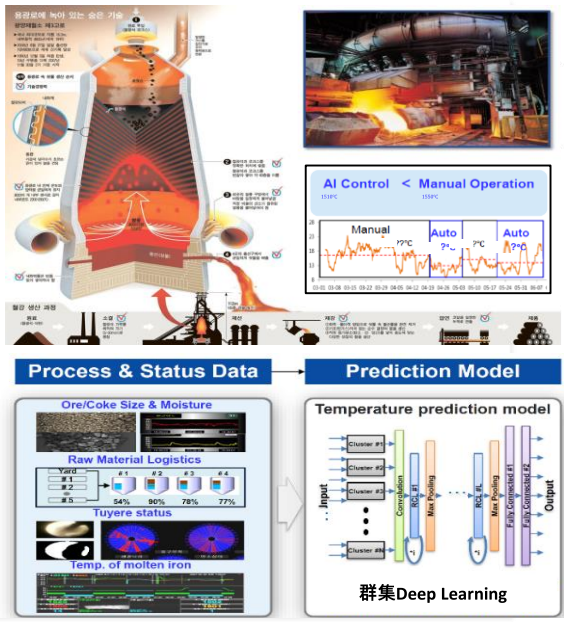
Customers with INEEJI INFINITE OPTIMAL SERIES™ Predictive Solutions

Beyond the clients' expectation

INFINITE OPTIMAL SERIES™ verified at manufacturing site

[National Core Technology, World Economic Forum Lighthouse Factory]

POSCO Smart Blast Furnace



Annual fuel cost saved by $50m

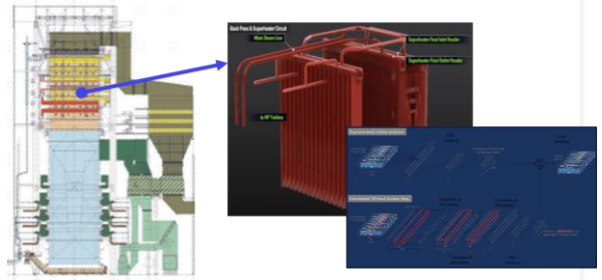
(Total amount $250m)

25% reduction

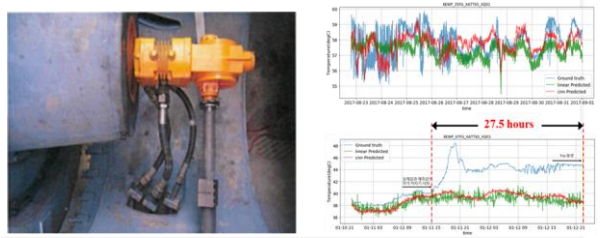
in furnace glaze temperature prediction error

Korea East-West Power Boiler diagnosis

62h earlier detection than existing method



27.5h earlier detection for ventilation system stop



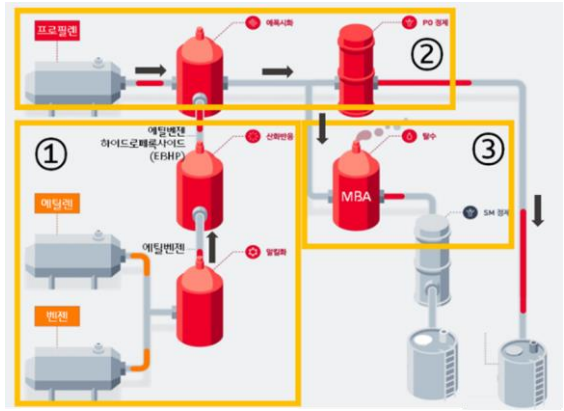
Dangjin Thermal Power HQ

No-failure Operation since Solution Introduction

(2021.03)

Applied to Korea East-West Power's Dangjin thermal power plant No. 5-8

Chemical products Production Optimization



2.1t/d Production Increase

Under 200+ operating conditions

Less than 2% M/D/T polymer production forecast error

Annual sales increase

Estimation by $2M

AI-based chemical material production optimization

INFINITE OPTIMAL SERIES™

USE CASE

INEEJI

Main Partners

INEEJI Provides
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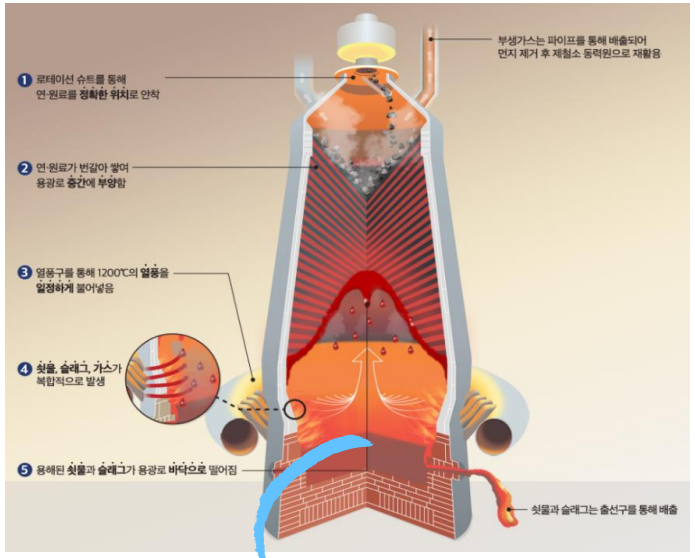
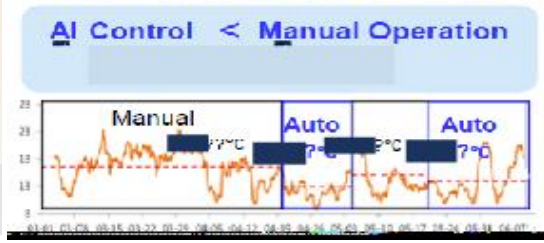
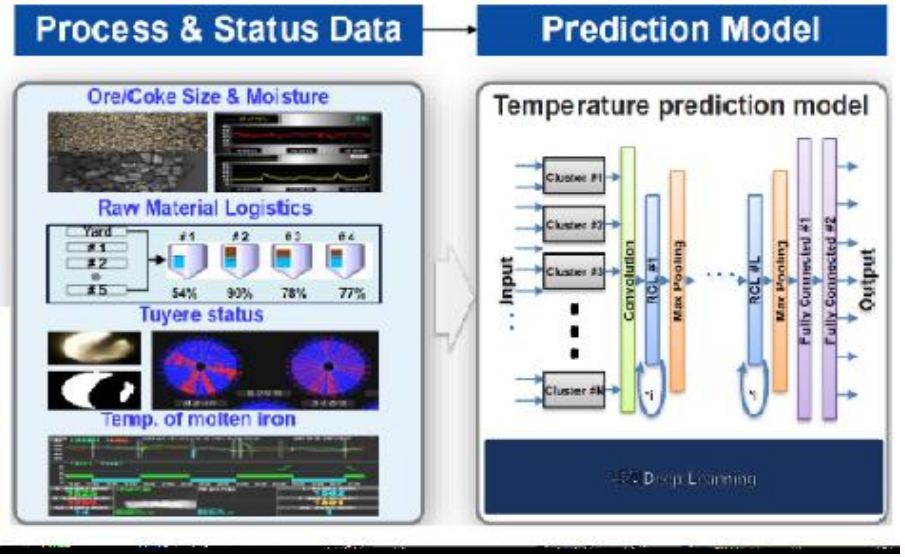
High-temperature response optimization / Blast Furnace

Efficiency/Production Prediction of Blast Furnace at High Temperature Above 1000°C





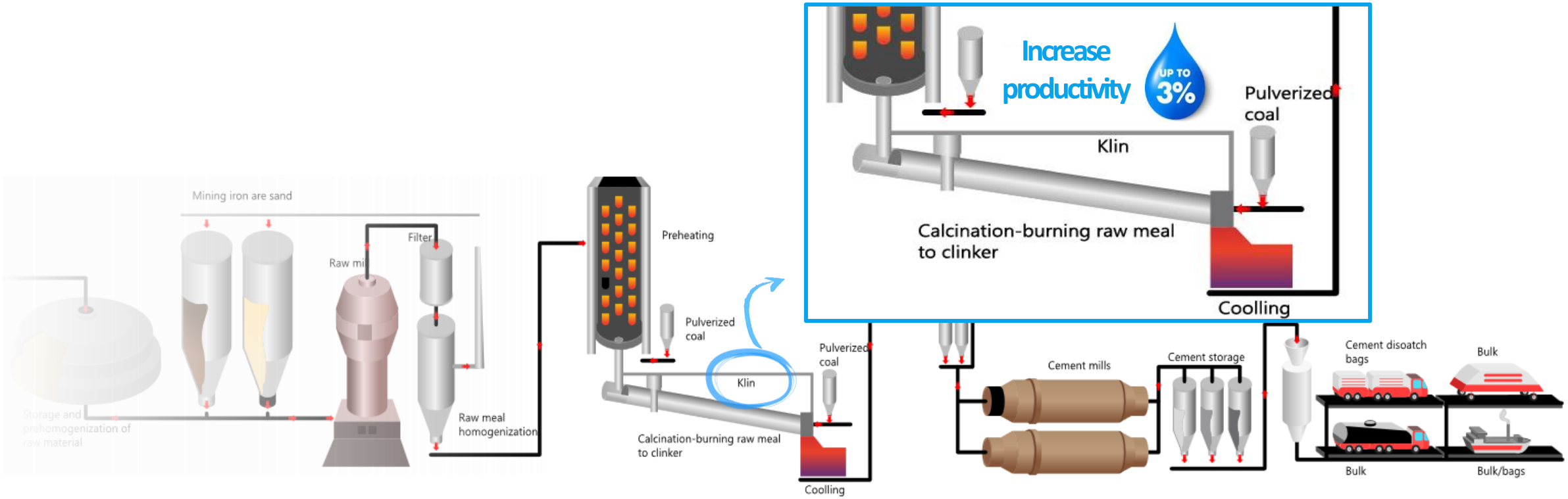


Annual fuel cost saved by **$50M** / year (Total amount $250m)

The INFINITE OPTIMAL SERIES™ applied to the blast furnace in the steel-making process Realized 25% reduction in the molten metal temperature difference inside the blast furnace through accurate deep-learning optimal prediction. (Saving fuel costs by $50 million annually)

High-temperature response optimization / Rotary Kiln Furnace

Energy Cost Reduction Case of Rotary Kiln Furnace Process in Cement Manufacturing

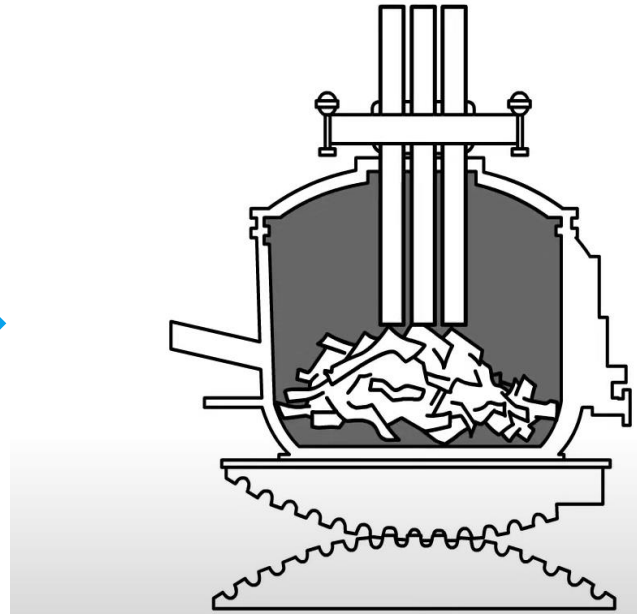


Annual fuel cost saved by **$1nM** / year (with a 10 Kiln factory)

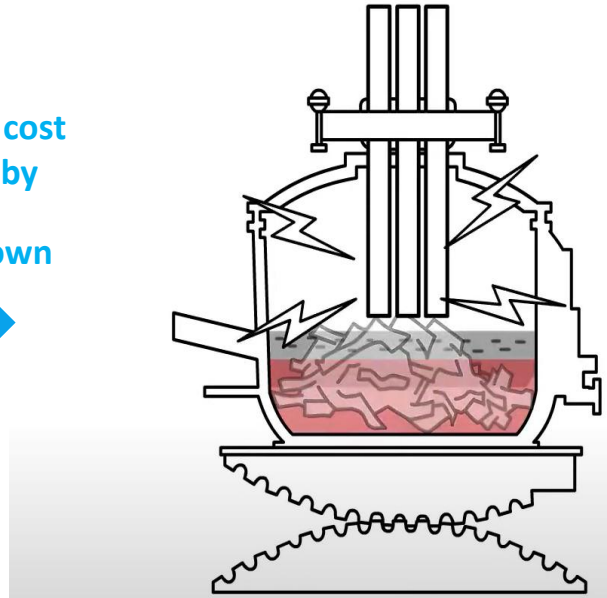
The INFINITE OPTIMAL SERIES™ applied to the cement manufacturing firing process Through accurate and optimal prediction of the temperature inside kiln furnace and input time of the heating material.
3% improvement in productivity and annual fuel cost savings of $ 1n million annually.

High-temperature response optimization / Electric Arc Furnace

Energy Cost Reduction Case of Electric Arc Furnace Process in Steel Plant



Electricity cost per unit by **2%** down

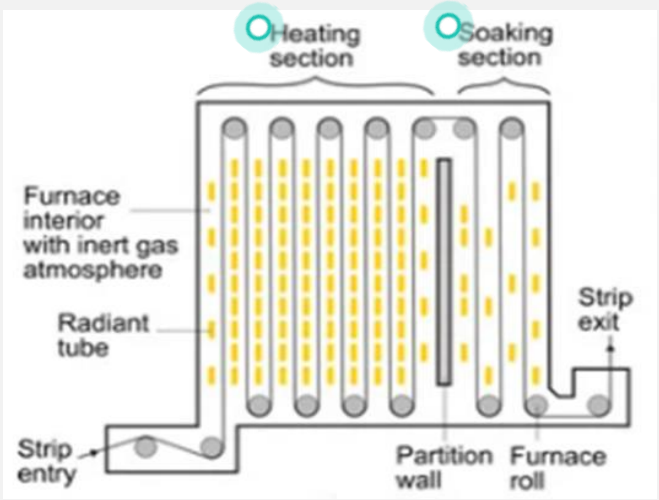


Annual electricity cost saved by **$0.6M** / year

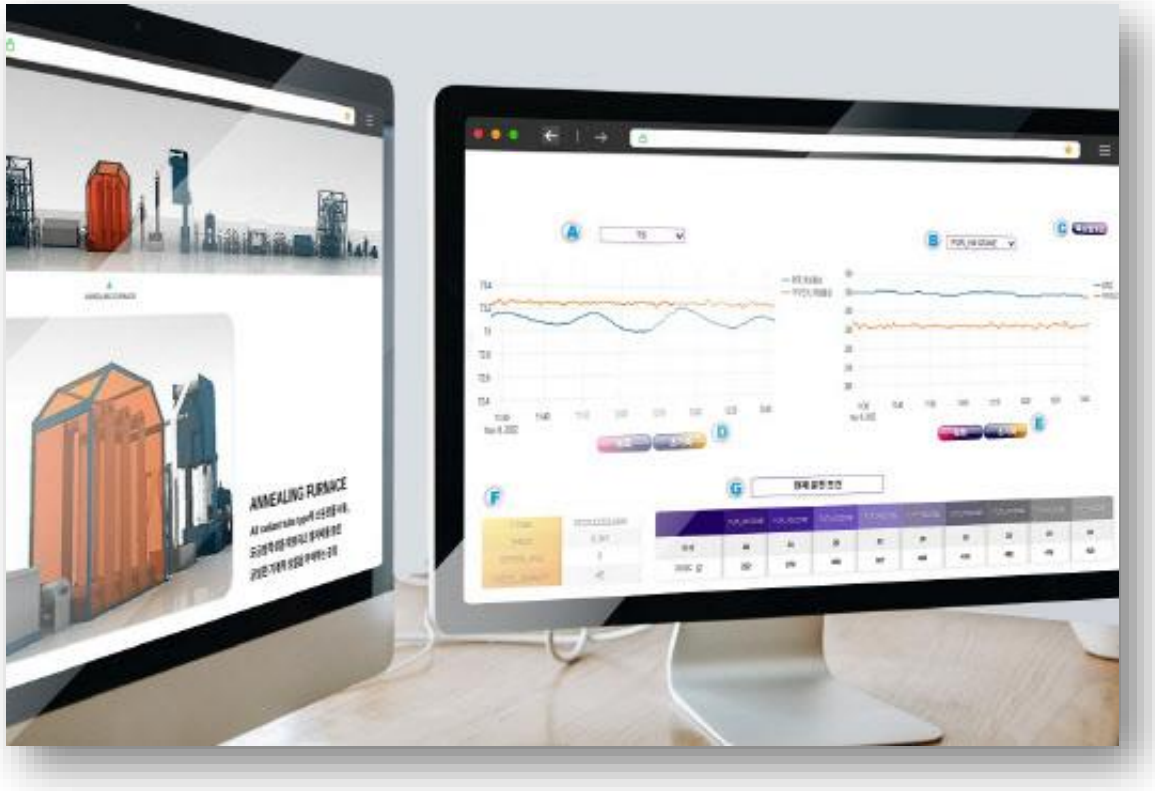
The INFINITE OPTIMAL SERIES™ applied to the electric furnace melting process predicts the optimum time for additional scrap loading accurately even under the condition of a small amount of learning data and provides guidance for the workers.
Reducing electricity cost per unit by 2% and scrap metal bucket loading time by more than 3% compared to the existing process.

High-temperature response optimization / Heating Furnace

Energy Cost Reduction Case of Heating Furnace Process in Continuous Hot Dipped Galvanizing



Optimum temperature Prediction · Control and Guidance



Annual Energy cost saved by **$0.4M / year**

The INFINITE OPTIMAL SERIES™ applied to the Heating furnace enhanced production quality and reduced LNG consumption by predicting and controlling the optimal temperature of all 8 sections of the Heating Furnace in Continuous Hot Dipped Galvanizing(CGL) process. In addition, worker fatigue is reduced by introducing process variable control operation.

High-temperature response optimization / Glass Melting Furnace

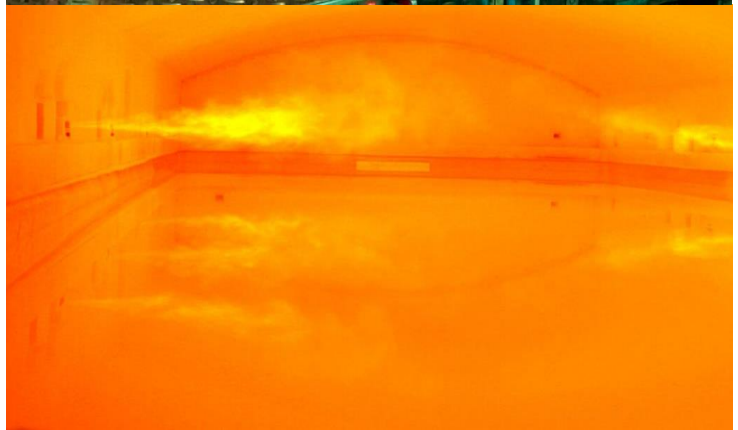
Prediction on Optimal Energy Consumption of Glass Melting Furnace

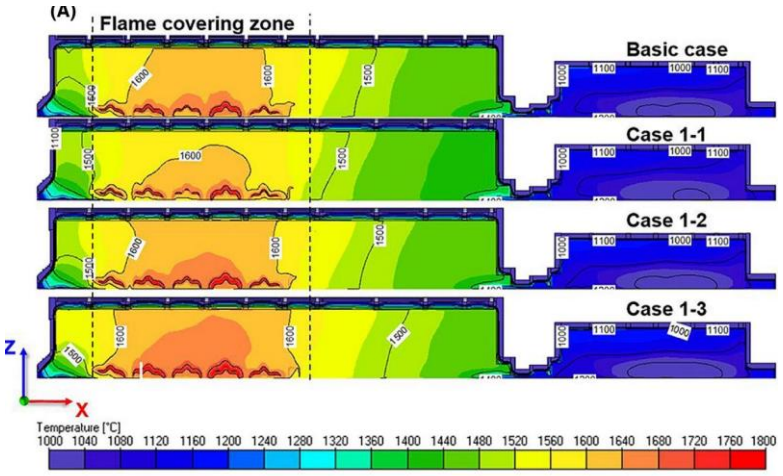
[Optimization the Glass Melting Furnace]

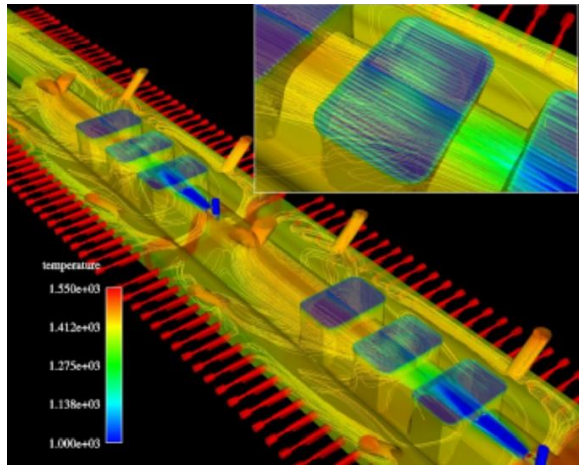
The INFINITE OPTIMAL SERIES™ applied to the melting furnace in the glass manufacturing process

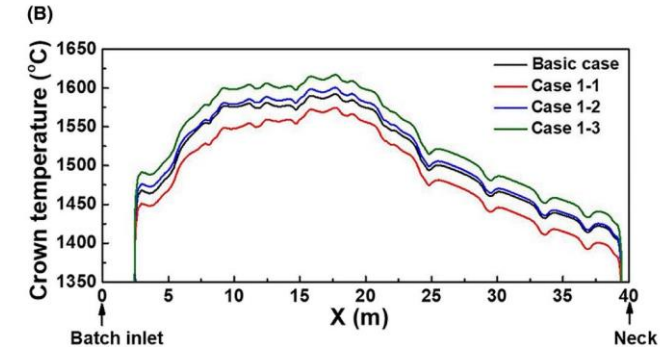
realized stabilization of production quality and optimization of energy saving in the glass melting furnace process

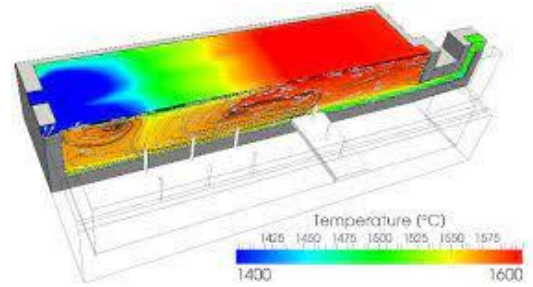
by guiding the process operator to the optimal energy consumption prediction system to prevent abnormal operation of the melting





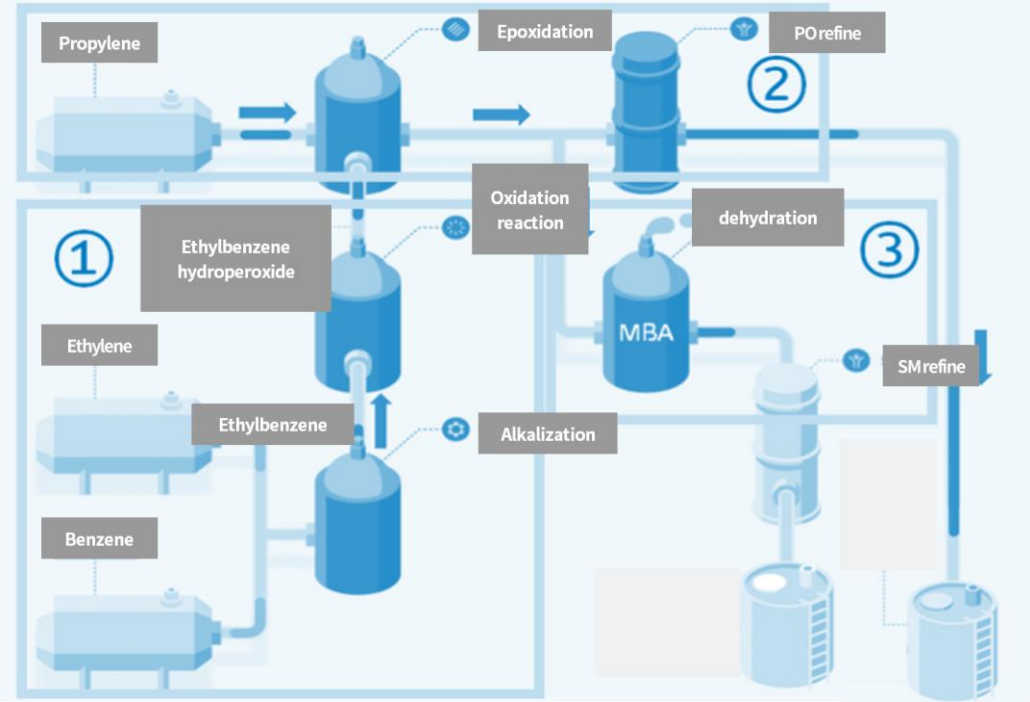


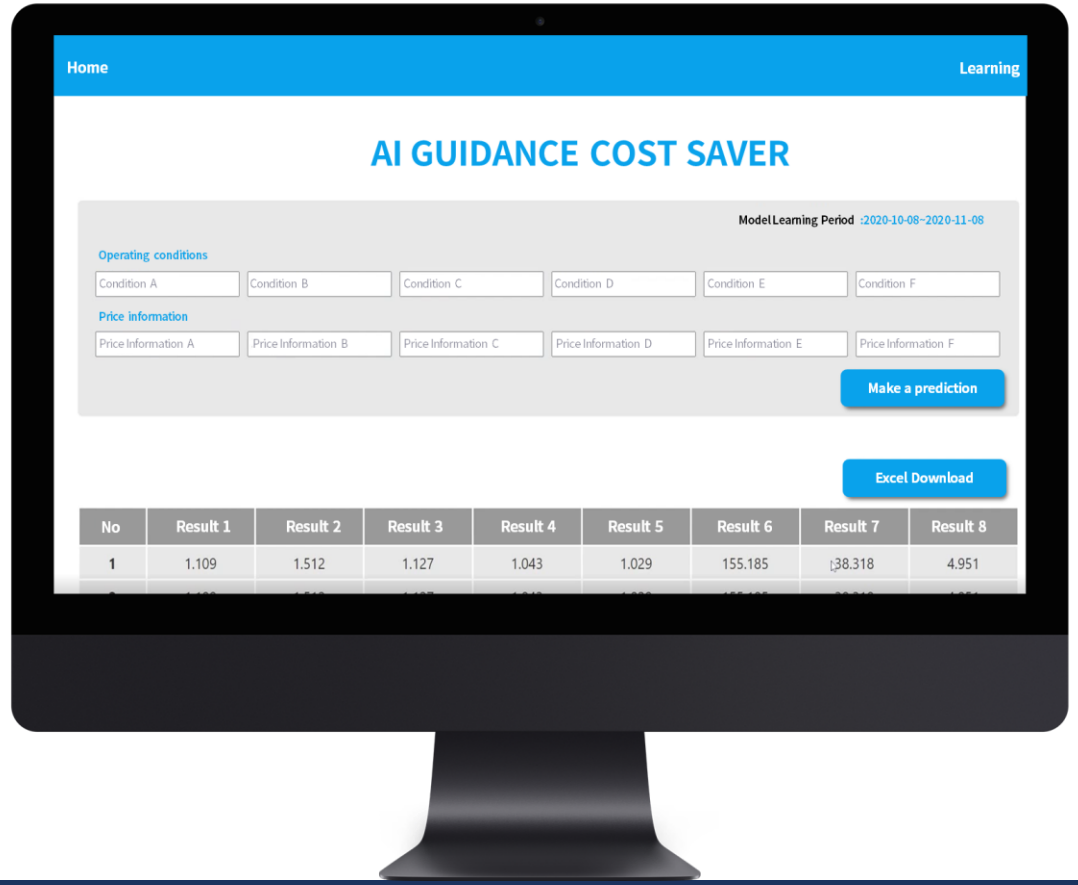




Low-temperature response optimization

[INFINITE OPTIMAL PREDICT™] - Oxidation Reaction Optimization





Sales Increased about $2M / year

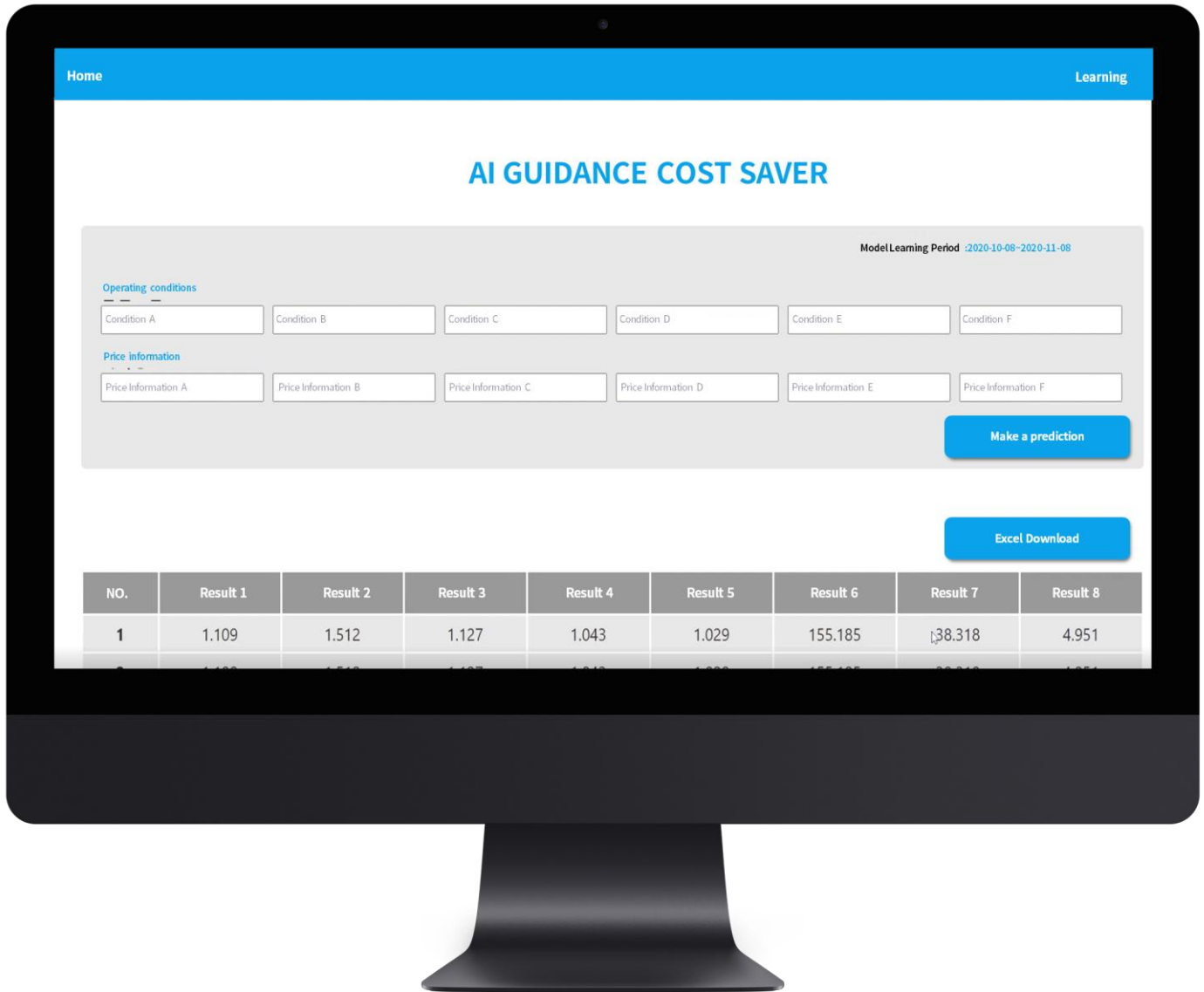
INFINITE OPTIMAL SERIES™ applied to the oxidation reactor by automatically recommending and guiding the process operator to the optimal temperature and oxygen inside the chemical reactor.
Increased daily production by 0.45% compared to the existing process, increased sales by about $2M per year.

Low-temperature response optimization

Oxidation Reaction Optimization

INFINITE OPTIMAL SERIES™

based on the operating conditions and price information of the oxidation reactor, the production process guidance is automatically provided to optimize the AI based chemical production.

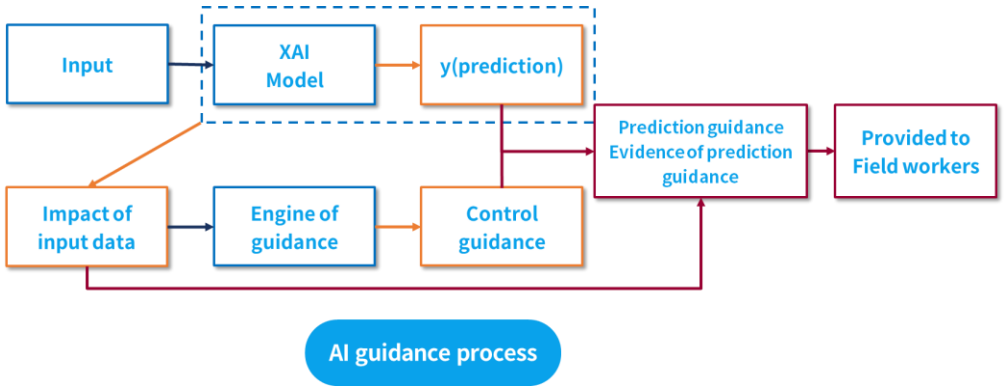


Low-temperature & High-temperature response optimization / Quality improvement and Product Stabilization

INFINITE OPTIMAL SERIES™ applied to the POE process not only reduces worker's fatigue by providing AI-based overshoot and undershoot prediction and control guidance but also

Improving process quality &

Realizing product stabilization



*MI (Melt Index)

Low-temperature response optimization

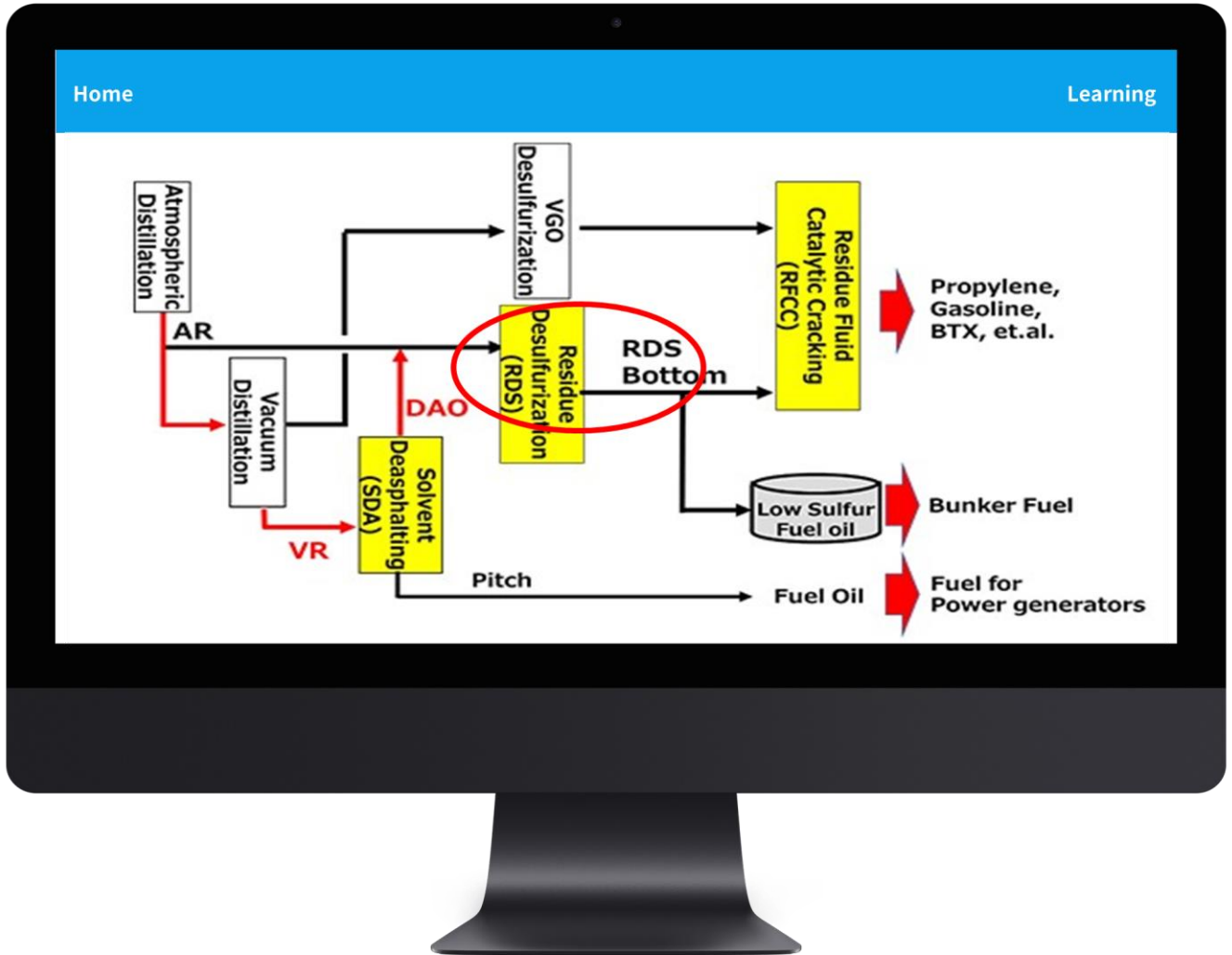
[INFINITE OPTIMAL CostSaver™]

INFINITE OPTIMAL SERIES™ applied to the RDS(Residual Desulfurization) manufacturing process by predicting the quality prediction error accurately,

Realization of diesel production quality improvement

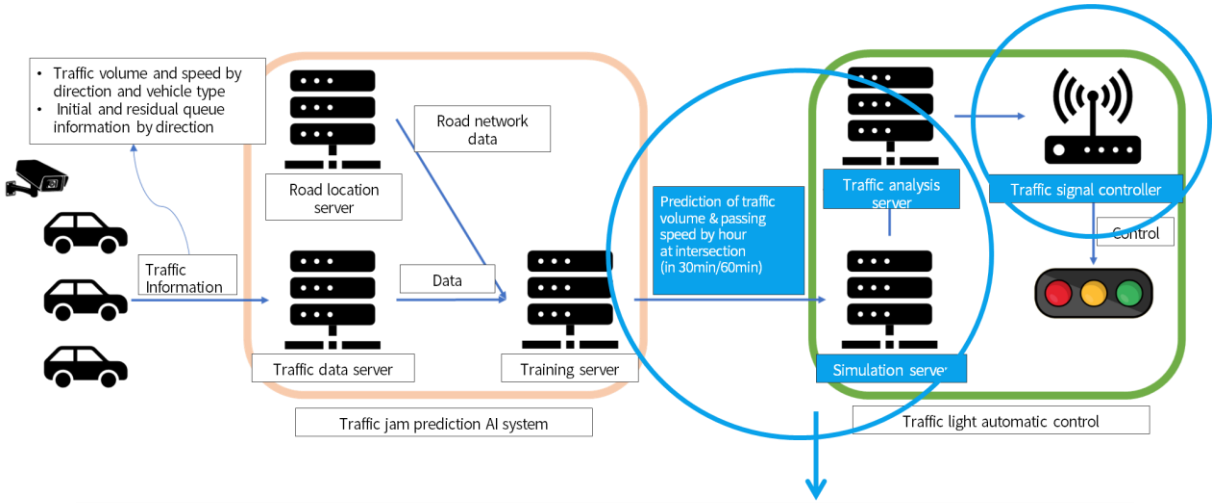
Prediction Error 70% down

(6.1℃ → 1.9℃)



Intersection Signal Time Optimization and Visualization /

Traffic congestion Prediction



Predicted dependent variable	Prediction error 01~06.22'(MAE)	
Maximum waiting vehicle	2.1	Vehicle queue length at individual intersections is 27m on average
Passing traffic	6.1	The number of vehicles per hour at individual intersections are 436 on average

Passing traffic on daily average (in July)

66M → (4.72% up) **69M** vehicles

Applied to habitual congestion section, Bumyung intersection in Bucheon-si, INFINITE OPTIMAL SERIES™ predicted road congestion on the network and cameras in the intersection and distribution of signal time at intersections by learning a deep-learning model to predict collected traffic correlation data.
from real-time traffic information (vehicle movement speed, traffic volume, the number of waiting vehicles) of sensors

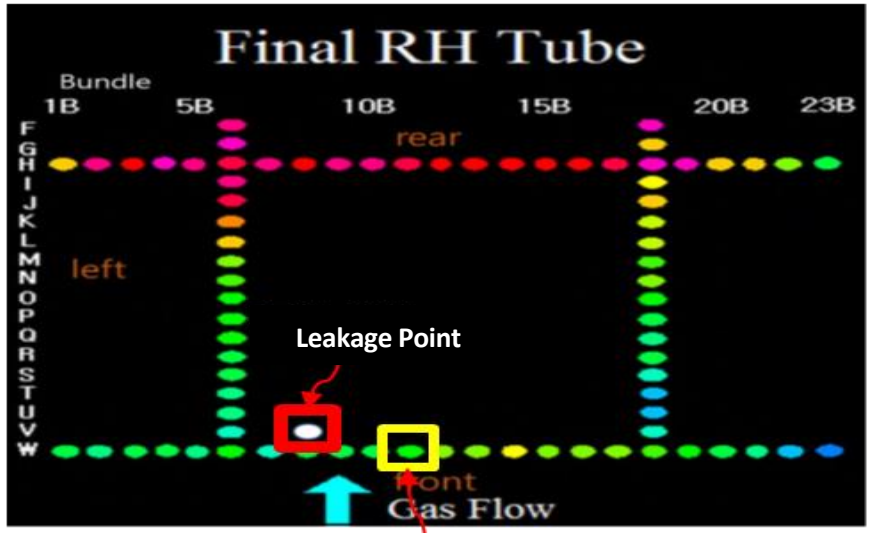
Anomaly Detection

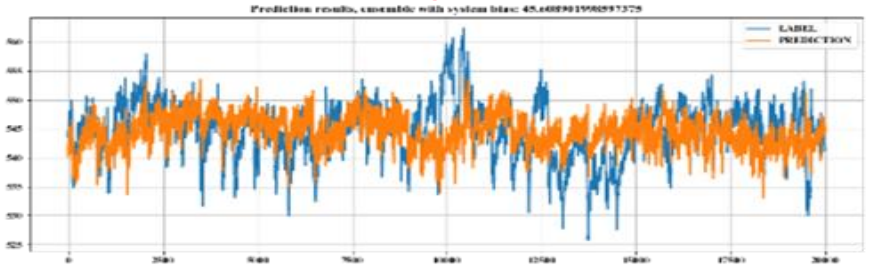
Demonstration of Detection Based on a Temperature Sensor

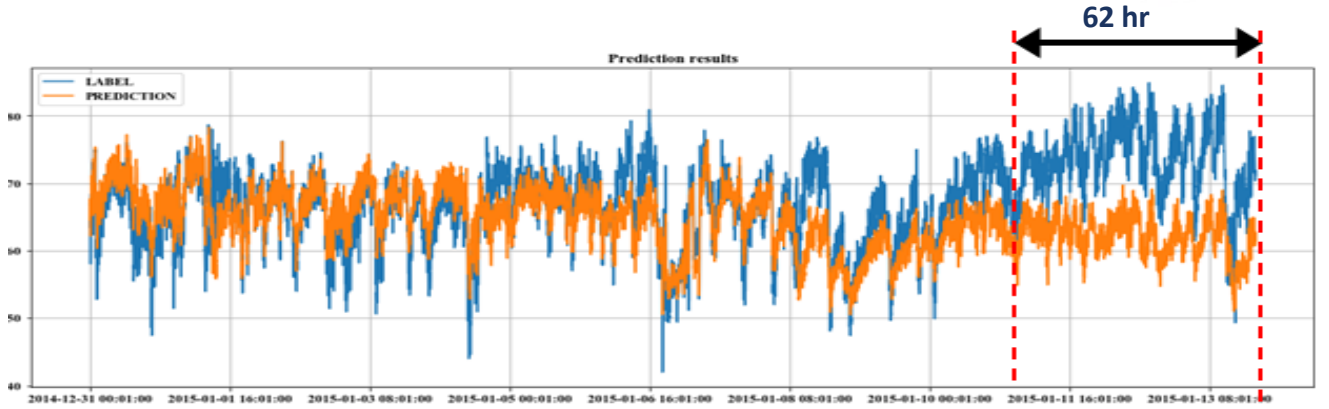
62hr
early detection

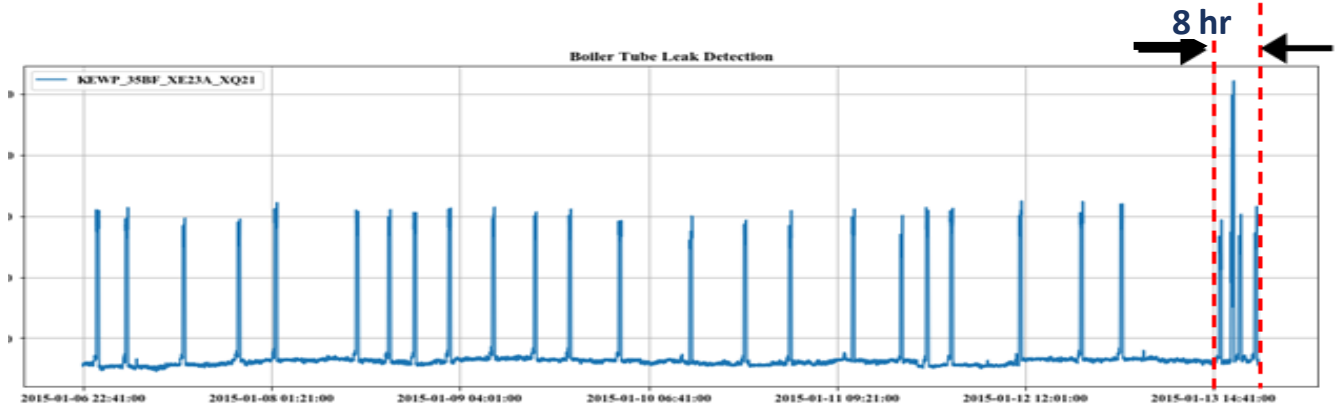
January 14, 2015 Korea East-West Power Unit 5 Reheater Tube Leak Detection

- Detect tube leakage by detecting abnormal local overheating of boiler tube temperature
- Detection up to **62 hours earlier than BTLD based leak detection**







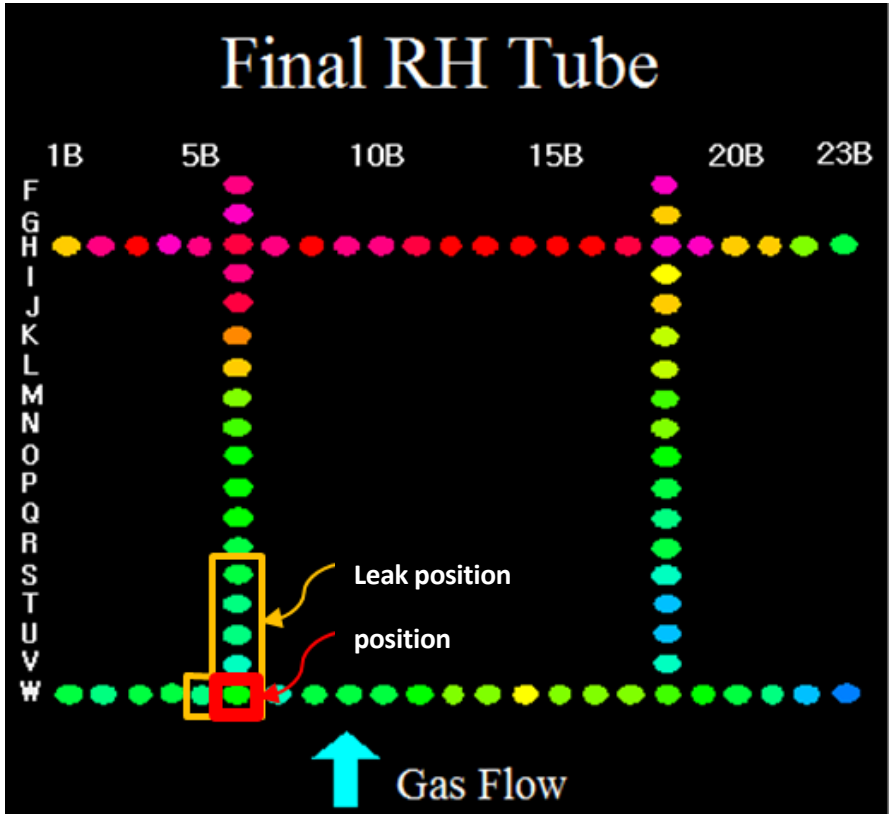


Anomaly Detection

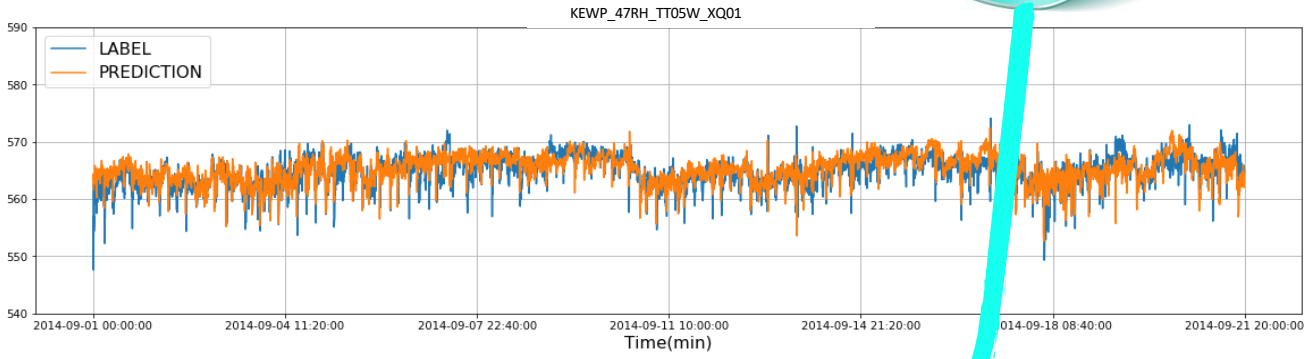
Demonstration of Detection Based on a Temperature Sensor

January 14, 2015 Korea East-West Power Unit 5 Reheater Tube Leak Detection

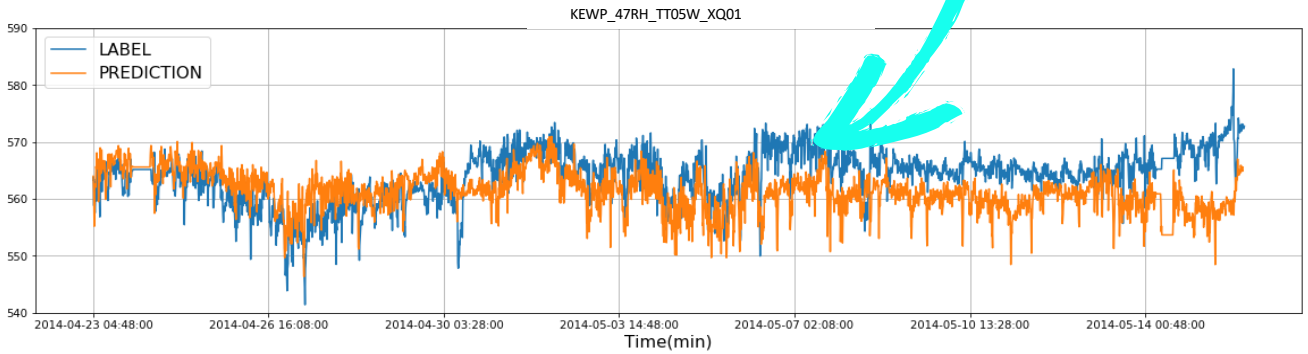
- Detect tube leakage by detecting abnormal local overheating of boiler tube temperature



Detection success



[Predicted result when operating normally]



[Predicted result of tube leakage]

INEEJI EMPOWERING EXPERTISE

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