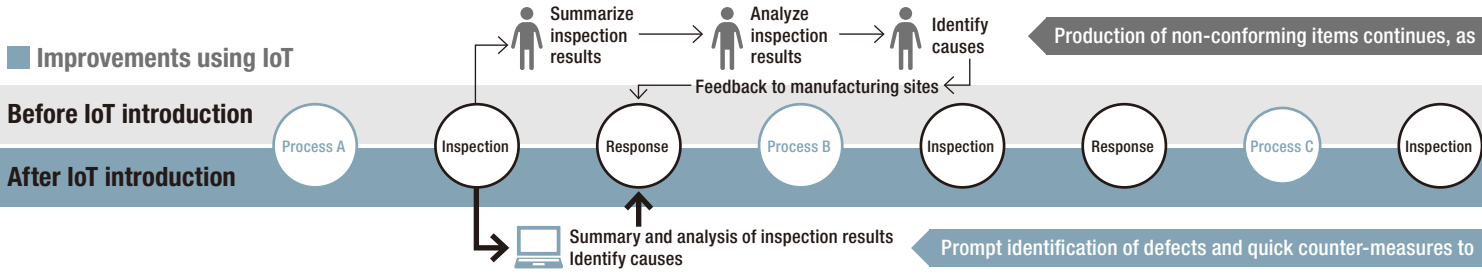
CASE 2

# Visualizing events using IoT

**Management quality improvement efforts from the No. 5 Plant of Nagoya Guidance & Propulsion Systems Works expanding worldwide**

Mitsubishi Heavy Industries Aero Engines, Ltd. (MHIAEL) is engaged in the production of aircraft engines. The company is using IoT in order to leverage manufacturing data in real time.




## Utilizing measured results on site as quickly as possible

The commercial aircraft engine business has been expanding significantly year on year, thus leading to growth in the number of parts that MHIAEL handles. In 2008, the company completed the construction of the No.5 Plant in the district of Nagoya Guidance & Propulsion Systems Works to respond to orders from Rolls-Royce. One of the products manufactured there is turbine blades; approximately 1,000 turbine blades are used in just one engine, and the average production volume is as many as 12,000 to 15,000 blades per month.

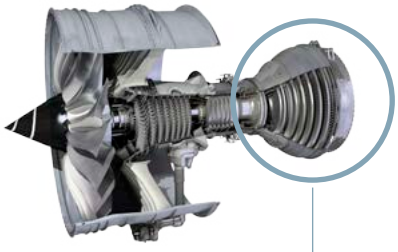
The customer required very strict traceability of the product and asked us to record a production log for every single process. We had to measure and record all numeric data, including dimensions, required for each part. At that time, we measured hundreds of blades at one time and then analyzed the data in excel files. That was very time-consuming and it usually took one- two weeks to summarize the data. Also, defect rates were higher than now, so if there was a process issue, many non-conforming parts were being produced till we analyzed data, identified causes and took appropriate on-site countermeasures.

We wanted to reduce non-conforming items; we wanted to quickly collect measured results and immediately take appropriate on-site countermeasures. What we came up with was the utilization of IoT. By introducing a system using IC tags, we were able to manage each product item in the form of data. We decided to build a line that enabled us to immediately know when, why and under what conditions each item was made on site, in addition to measuring results with instruments. Project members visited Sagamihara Machinery Works and other plants of the MHI Group to study lines using IC tags.

## Working together for better quality manufacturing and management

Nine years have passed since the line using IC tags was launched at the No.5 Plant. Due to a rapid increase in production volumes over the last three to four years, operations have become more challenging, but the defective rate percentage has been significantly reduced to one-tenth of that prior to the introduction of the IC tag system. Now, everyone can check measured results on site, and if there are any

1 Each item is controlled by putting products into an IC tagged case and feeding it to the line
2 Measured results immediately checked via line monitor
3 Checking product dimensions with monitor to confirm they are within required range and implementing a countermeasure on the spot if any problems appear



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Turbine blades are used in this part.
Approximately 1,000 blades are used in one engine

it takes a couple of weeks to identify causes


non-conformities

signs of non-conformity, they can easily identify the cause and handle it on their own. “A virtuous operational cycle is being created on site,” Koji Mizutani said. “I am not yet fully satisfied though. From collected data, we can identify slow moving inventory and waste in processes. Therefore, what we can do next is to change mechanisms using such data, thereby contributing to an improvement in management quality.”

Currently in progress is an initiative to introduce a similar system to not only manufacturing but also other divisions and ultimately business partners so that the entire value chain can achieve consistency. Some industrial clusters have already deployed the system. The real purpose of this is to improve information sharing, quality and speed by strengthening cross-divisional collaboration. “Sooner rather than later, we will spread the system to overseas business partners. Also, we want to apply the system to not only turbine blades but also other parts.” Initiatives to improve quality are now extending to the enhancement of management quality from the production site of turbine blades to various business partners around the world. These very initiatives that began at the No. 5 Plant are expanding further.

## Project team

### Koji Mizutani

Manager,
Design & Manufacturing
Engineering Section,
Engineering Dept.,
Mitsubishi Heavy Industries Aero Engines, Ltd. (MHIAEL)

Right from the beginning, everyone on site made every effort to manufacture top quality products. With this activity, such efforts are more evident and everyone is now more aware of the company’s assets and management. Making high quality products is a matter of course for all of us. We will continue to improve not only quality of parts but also quality in management.

### Shinsuke Murota

Deputy Manager,
Quality Assurance Section,
Quality Assurance Dept.,
Mitsubishi Heavy Industries Aero Engines, Ltd. (MHIAEL)

In the past, people might have thought “the business of manufacturing is to produce goods, while inspection is a matter for quality assurance.” Industrial clusters might also tend to think “We have delivered products. Quality management now lies with Mitsubishi.” Now, people both on site and at industrial clusters are aware they are also responsible for the quality of products they make.

### Shiro Miyahara

Deputy Manager,
No.3 Parts Manufacturing Branch,
Parts Production Section,
Production Dept.,
Mitsubishi Heavy Industries Aero Engines, Ltd. (MHIAEL)

In order to further reduce the defective rate, we need to work on a more advanced approach. Currently, we make judgments based on dimensional data, but we want to prevent the occurrence of non-conformities from different perspectives, such as equipment noise or the amount of power consumed by a motor, and of course, at the lowest cost. I want to establish such methods and apply them to building production lines in the future.

### Yusuke Masai

Acting Manager, IT System Team,
General Affairs & Administration Group,
Management & Administration Dept.,
Mitsubishi Heavy Industries Aero Engines, Ltd. (MHIAEL)

I am always thinking of making things better for everyone involved with manufacturing in terms of usability and visibility and achieving quicker responses. By stepping even further beyond, I will improve my data analysis skills and create mechanisms that help the production site more than ever. My ultimate goal is to create the world’s best engine parts plant.