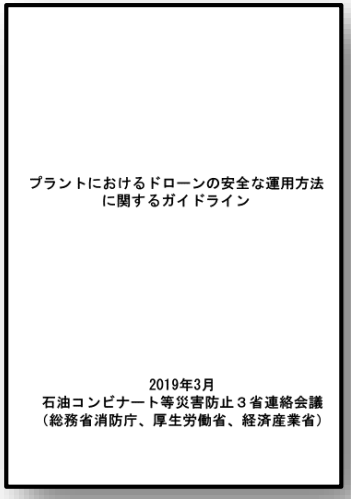
Guidelines for Approaches to Safe Operation of Drones at Plants

- Based on the discussions of the Study Group for Examination of Safe Drone Utilization at Plants,* **the Liaison Council of Three Ministries on Disaster Prevention of Petroleum Complexes and Other Facilities** (the Fire and Disaster Management Agency, Ministry of Internal Affairs and Communications; the Ministry of Health, Labour and Welfare; and the Ministry of Economy, Trade and Industry) **compiled the Guidelines**, a well-organized compilation of key points that plant operating companies should note for their safe utilization and operation of drones on the premises of plants.

*Note: Chairman: Dr. Yuji Kimura, Emeritus Professor, Kogakuin University



Background and objectives

Currently, some plant operating companies have started experimental utilization of drones, but they have not yet presented any criteria or methods for safe utilization of drones. This prevents them from embarking on full-fledged utilization of drones.
The Guidelines is a well-organized compilation of key points that plant operating companies should note for their safe utilization and operation of drones on the premises of plants and other facilities.

Target of the Guidelines

The Guidelines target activities involving: flying a drone with a camera or the like mounted on the premises of oil refineries, petrochemical or other chemical engineering plants; and shooting photos of the premises using the camera. However, as for the areas over which drones fly, the Guidelines only target the outdoor private premises of a target plant placed under the control of the company operating the plant. Accordingly, they do not cover the areas out of the control of such companies.

Application of related laws and regulations

The Guidelines explicitly describe that plant operating companies are required to comply with related laws and regulations, such as the Civil Aeronautics Act and the Radio Act, if they utilize drones.

The Guidelines categorize the conditions of plants in which drones are used into three groups:

[i] Under normal operation

✓ This refers to the situation where a plan is under normal operation for production activities.

- **Flying drones in an area in which no explosive atmosphere is expected and no fire limit is set**
- **Flying drones in an area in which some explosive atmosphere is expected or where a fire limit is set**

[ii] Under open check of facilities

✓ This refers to situations where no fire limit is set at any facilities of a target plant under maintenance with the facilities remaining open or at any facilities or buildings not in use since no explosive atmosphere is generated or expected to be generated.

[iii] Upon the occurrence of disasters

✓ This refers to the situation where any accidents, e.g., fire, occur on the premises of a target plant or where the premises of a target plant are at risk of facing accidents, e.g., fire, due to the impact caused by earthquakes, tsunamis, wind and flood damages or fire occurring in the vicinity of such plants.

The Guidelines request plant operating companies to conduct a risk assessment according to the situation where drones are used or the area over which drones fly.

The Guidelines explicitly describes that such companies need to develop countermeasures against potential risks based on the results of such assessment.

Collection of Use Case Examples of Drones at Plants

- This Collection was formulated as a compilation of case examples from leading companies inside and outside Japan to encourage companies to make use of drones.

- The Collection was **compiled by the Liaison Council of Three Ministries on Disaster Prevention of Petroleum Complexes and Other Facilities** (as were the Guidelines).

Contents of the Collection

1. Current situation of domestic companie's drone utilization

This section explains the results of a questionnaire survey targeting domestic companies operating plants for oil refinery or petrochemical and other chemical engineering and shows the current situation of their utilization of drones at domestic plants.

2. Case example of demonstration tests

Under the FY2018 Project for Enhancement of Safety Regulations over New Energy and Other Resources, an initiative that METI commissioned, a drone demonstration test for plant safety was conducted at Negishi Refinery operated by JXTG Nippon Oil & Energy Corporation. This section explains details of the test, risk assessment and countermeasures against potential risks taken in the test, and test results.

3. Case examples of leading domestic companies

The Liaison Council conducted a survey of case examples of leading companies' utilization of drones, targeting domestic companies operating plants for oil refinery or petrochemical and other chemical engineering. This section shows case examples of such companies, including inspection targets for which such companies used drones, risk assessments and countermeasures against potential risks that they expected, advantages, challenges, etc.

4. Case examples of leading overseas companies

This section features case examples of leading overseas companies' utilization of drones at plants and explains such examples based on the results of literature research and an on-site interview-based survey.

Case examples of leading domestic companies (12 cases)

JSR Corporation

Basic information on the company

Type of industry	Petrochemistry	Total area of target plant	Approximately 345,000 m^2

Achievement in utilization of drones

Condition of plant to be inspected	Under normal operation (inspection work)
Purpose of inspection and sections to be inspected	Monitoring of operation / appearance check and a burner for a flare stack
Operator of drone	JSR Corporation
Expected risk events	- Fall of a drone due to misoperation while out of the sight of the drone operator. - Abnormal operation of or damages to a drone due to heat damage from flying closely to a burner.
Countermeasures against potential risks that the companies have taken	- Checking of the behaviors of the drone by a supervisor and regularly communicating with the operator of the drone. - Checking of the drone before and after flying and checking of the behaviors of the drone by a supervisor. - Prior ascertainment of the condition of plant operation to confirm whether the plant is under non-routine operation.
Advantages in utilization of drones	- Orders for parts before failures are possible since the condition of the plant can be confirmed by a drone before building scaffolds. - Areas that workers cannot access during the operation of the plant can be inspected.
Challenges in utilization of drones	- Replacement of inspection equipment, e.g., zoom camera and infrared device, is not easy. - Increasing the altitude of a drone makes it difficult for the operator to confirm the spatial areas around the drone.

Case examples of leading overseas companies (14 cases)

TOTAL

In its emergency management drill, Total S.A. conducted a demonstration test for sending images and other data to the emergency management team by making use of a drone.

Source: UAVIA website

SHELL

Royal Dutch Shell has been utilizing drones in gas leakage detection, etc. in high altitude areas of plants.

Source: Royal Dutch Shell website