Fakel Burner Inspection

CONDOR Solutions carried out new inspection of the fakel burner in the facility of Lunskoe OPF in October 2016. The facility is owned by Sakhalin Energy whose major shareholders are the companie s Shell and Gazprom. The facility of OPF is located in the Northeast coast of Sachalin island in the Russian territory. It is located 7km in the inland region, at the place of influx of the gas-pipeline from the platform Lunskoe A. The entire facility takes the area of more than 62,000 m2.

Fakel Burner

Thermal imaging camera Workswell WIRIS mounted on a drone

The primary function of OPF is aimed to processing of gas and condensate from the site of Lunskoe, as well as preparing them for transport by the pipeline to the export crude oil terminal and production plant of compressed gas LNG - Prigorodnoe Complex. It also receives gas and crude oil from the platform Piltun-Astochskovo-A and the platform Piltun-Astochskovo-B, while preparing them for transport to the export terminal in the south of the island. There are pumps which allow processing up to 195,000 barrels a day. At full capacity, this facility can handle 51 million m3 of gas/ day and 9,500 m3 of condensate or crude oil / day. All technological systems at the OPF were commissioned in 2008.

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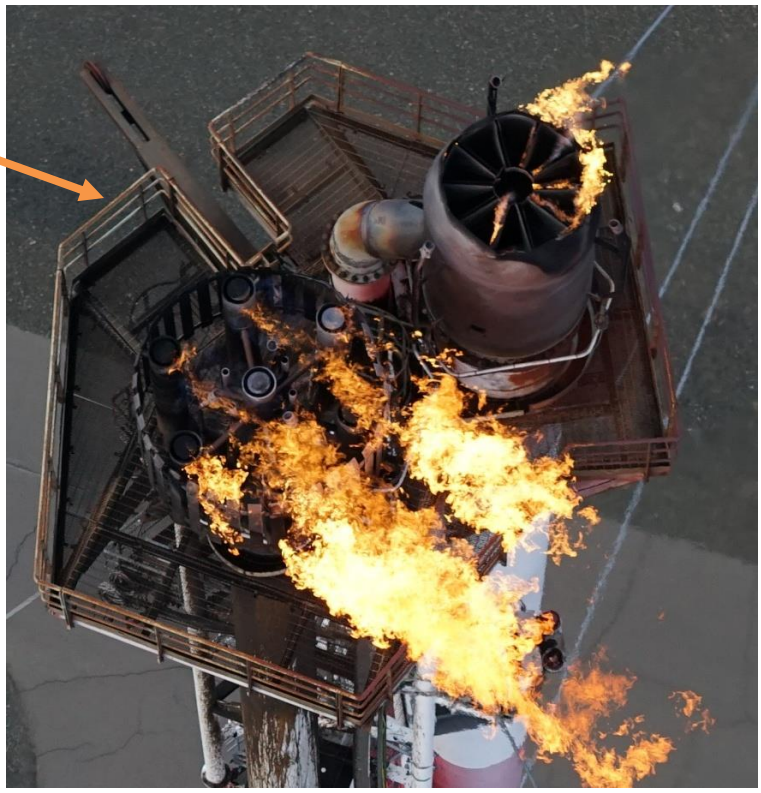
An important part of the facility is also a system of burners, e.g. the burners (Flare System) of low and high pressure. They were also subject to inspection carried out by the company CONDOR Solutions. The weather during inspection was cloudy, with the wind of 14 m/sec and the temperature of -10°C.

General view on Flare Stacks and Flare Tips. View from south.



Detailed view of Flare Tips. View from south.

Why inspection is important

The primary task was to conduct visual inspection using a UAV technology. However, in addition to the standard camera SONY Alpha 7R, we were newly using the thermal camera of Workswell, e.g. the thermal imaging camera Workswell WIRIS.

The operational technologies are exposed to extreme weather conditions due to the geographical location. Mast of the burners is exposed to very low and freezing temperatures (-) and also to extreme positive temperatures (+) caused by gas combustion. Therefore, it is important to check out the system of burners completely, using thermal imaging camera.

Thermal imaging camera Workswell WIRIS 2nd gen with high temperature filter.

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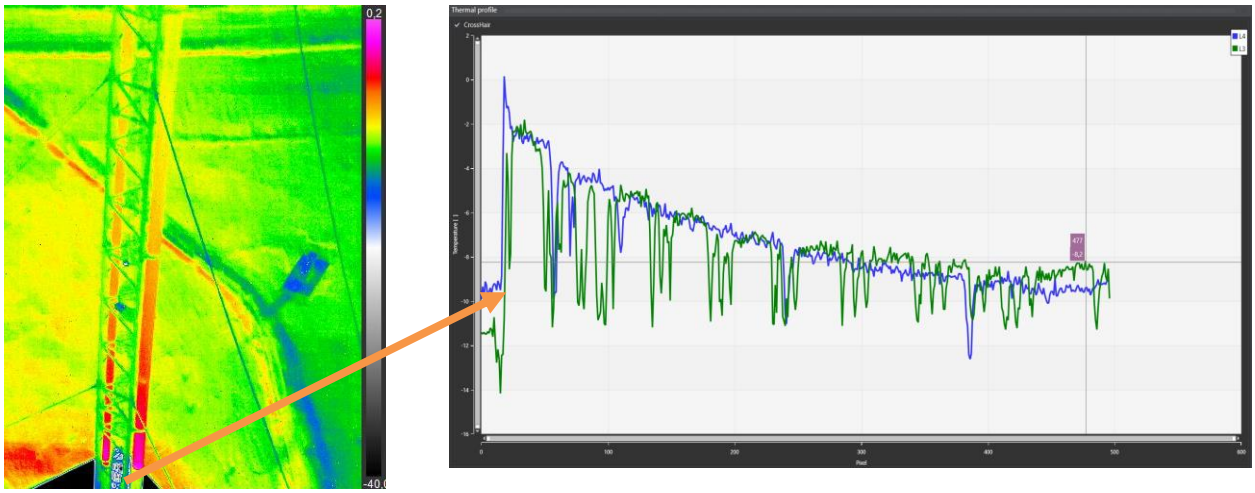
Inspection with Workswell WIRIS

Thermal imaging camera Workswell WIRIS allowed us to measure the temperature of the entire system of the burner. Doing the measurements, we have found that the burner system includes both low and very high temperatures. Therefore, we divided the measurements into two parts, as follows: - burner's mast from the bottom part up to the top service runway. - upper part of the burner's shank. This thermal imaging camera offers possibility of measuring the temperatures up to 1,500°C, using a high temperature filter, as the only one of the systems available for the drones.



Thermal profile measured on the surface of burner system. Software Workswell CorePlayer was used for thermogram analysis.

In the first part, we found out the temperature of the mast and the rising pipeline of the system of high and low pressure; we also prepared the temperature profile, as shown in the figure. The graph and thermogram clearly show where the pipeline isolation finishes. At this point, the temperature sharply increases up; and consequently the temperature gradually decreases together with the height, up to the upper part - the shank; then the temperature rapidly increases up again. Up to the temperature of about 2,000°C.

Conclusion

Based on information obtained by the thermal imaging camera of Workswell WIRIS and the unmanned aerial vehicle, the company CONDOR Solutions compiled the final report which described in detail the condition of the burner system of high and low pressure. The operator, e.g. Sakhalin Energy, has got the data on the basis of which it is possible to schedule maintenance works so that restriction of the production process in the facility is minimized as much as possible.

www.thedroneinspection.com

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Gas Detection by DJI

September 2019

U10 UAV Based Laser Methane Leakage Detector

The U10 is light-weight, high-sensititvity gas detector based on Tunable Diode Laser Absorption Spectroscopy (TDLAS), which enables rapid identification of methane from up to 100m away, or at a concentration as low as 5 ppm.m. Powered by DJI SkyPort, the U10 can be seamlessly integrated with DJI Matrice 200 Series V1 and V2 platforms.

Accurate Results from Afar

Get real-time readings on the concentration of methane from up to 100 m away, adjust the pitch of the gimbal to pinpoint gas leaks in dangerous or hard-to-reach areas while keeping personnel safe.

Visualize the Detection

The high sensitivity allows detection at a concentration as low as 5ppm.m. Receive concentration data in just 25ms, so you can make decisions quickly. Gain an aerial overview of the suspected leakage site through the 720p visual camera.

Automated Workflows

Plan flight missions and view flight paths, monitor gas concentration levels and historical trends in real-time, and flag specific points along the flight route for abnormalities, and generate inspection reports - all through the a-ONE iOS application.

Critical Facility Inspection

Use DJI's leading drone platforms equipped with the UlO to inspect and maintain facilities like Liquid Natural Gas plants, gas storage tanks, and gas pipelines in areas such that are difficult for human operators to access, such as mountains or rivers. With the U10, users can detect and monitor methane leakages accurately to make informed response decisions quickly.

SPECIFICATIONS

U10 UAV Based Laser Methane Leakage Detector			
Method of Detection	TDLAS	Detection target	Methane(CH4)
Stationary Detection Limit	5 ppm·m	Detection Laser	Class IIIR
Response Time	25 ms (0.025s)	Operating Temperature	-20 ~ 50°C
Sampling Rate	500KHz	Operating Humidity	<90%RH, no condensation

SPECIFICATIONS

Detection Concentration Range	0~50,000 ppm·m	Size	155 x 90 x 100 mm
Max Detection Distance	100 m	Weight	534g
Camera	Video at 720 p	Supported Aircraft	DJI Matrice 200 Series, Matrice 200 Series V2

UAV Platform

Model	Matrice 210 RTK
Package Dimension	31.1×15.4×11.4inch (790×390×290mm)
Dimension (unfolded)	34.9×34.6×16.1 inch (Unfolded, 887×880×408 mm)
Dimension (folded)	28.2×9.5×9.3 inch (Folded, 716×242×236 mm)
Folding Method	Folded Inward
Diagonal Wheelbase	25.3 inch (643 mm)
Number of Batteries	Two (TB50s and TB55s)
Weight (TB50)	Approx. 4.27 kg
Weight (TB55)	Approx. 5 kg
Max Takeoff Weight	6.14 kg
Max Payload (2 TB50)	Approx.1.87 kg (with two standard batteries)
Max Payload (2 TB55)	Approx.1.14 kg (with two optional batteries)
Hovering Accuracy (P-mode with GPS)	Vertical: ±1.64 feet (0.5 m) or ±0.33 feet (0.1 m, Downward Vision System enabled) Horizontal: ±4.92 feet (1.5 m) or ±0.98 feet (0.3 m, Downward Vision System enabled)
Max Angular Velocity	Pitch: 300°/s, Yaw: 150°/s
Max Pitch Angle	P Mode: 35°（Forward Vision System enabled: 25°）； A Mode: 35°；S Mode: 35°
P Mode: 35°（Forward Vision System enabled: 25°）；A Mode: 35°；S Mode: 35°	16.4 ft/s (5 m/s)
Max Descent Speed	Vertical: 9.8 ft/s (3 m/s)
Max Speed	P-mode: 61 kph (17 m/s); S-mode/A-mode: 83 kph (23 m/s)
Max Service Ceiling Above Sea Level	1.55 miles (2500 m)
Max Wind Resistance	32.8 ft/s (10 m/s)
Max Flight Time(No Payload, with TB50)	23min
Max Flight Time(No Payload, with TB55)	32min
Max Flight Time(Full Payload, with TB50)	13min
Max Flight Time(Full Payload, with TB55)	24min
Motor Model	DJI 3515
Propeller Model	1760S
Retractable Landing Gear	Standard
Operating Temperature	-4° to 113° F (-20° to 45° C)
IP Rating	IP 43

Contact

If you are interested to get more details, feel free to contact us

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Microdrones MD4-1000 Completes Inspection at BIGGEST OIL RIG IN THE WORLD

Condor Solutions flew the system in Arctic conditions at the Berkut Oil Rig in 2016. *by Renee Knight*

In February 2016, Condor Solutions, a Russian-based drone service provider, became the first to fly an unmanned aircraft system (UAS) to inspect the biggest oil rig in the world—and they used the Microdrones MD4-1000 to successfully complete the mission.

The Berkut Oil Rig weighs 200,000 tons and is expected to extract 4.5 million tons of oil every year. At 345 feet wide, 436 feet long and 472 feet tall, the rig is located in the Sea of Okhotsk on the Russian Pacific Coast, which is just north of Japan and in an area known for its brutally cold temperatures.

The size of the rig and the Arctic weather conditions presented unique challenge, which is why they needed a durable, reliable UAS like the MD4-1000 from Microdrones. Using this system, the team was able to provide the information the client needed to make decisions about the rig's flare system. Flying the drone also saved them time and made the process safer for the workers involved.

"We inspected the rig's flare system, which is the most important system of any oil and gas object," said Pavel Reichert, of Condor Solutions. "We delivered a detailed report of the complete flare system, including infrared analyzation. Every bolt was inspected there."

The Many Challenges

February is known as the coldest month in this area, and during the inspection the temperature came in at -13°F with wind speeds reaching about 27 miles per hour. The rig's parameters combined with the wind speed led to high turbulences that the UAS had to overcome to complete the mission—which was no easy feat but one the Microdrones system could manage. The Mil Mi-8, a medium twin-turbine helicopter produced by Russia that is typically used for these inspections, has a wind limit of about 18 miles per hour.

Photos courtesy of Microdrones.

The team also had to rely on batteries during the inspection, which were of course affected by the Arctic temperatures, Reichert said. The drone, the base station, the control panel, the camera and the external screen were all powered by battery. The cold batteries reduced the drone's flight time from 40 minutes to 20, with the pre-check flight time taking a minimum of 10 minutes. Another option involved using cables, but that combined with the cold led to the loss of gimbal stabilization.

With only seven or eight visible satellites, limited GPS signals also made it difficult to fly, Reichert said. This meant the system had to be operated in full manual mode, which, while safer than other methods used to complete these inspections, comes with its own risks. The magnetometer was switched off to eliminate malfunctions.

Thermal analysis was the priority during the inspection, Reichert said, but the team couldn't fly a standard thermal camera because of the big differences in high and low temperatures. They instead used a thermal imaging system from the Czech Republic based Workswell WIRIS, which offered full radiometric images for precise post processing.

"For me and my guys any offshore work is stressful, but maybe that's because we're not the sea guys," Reichert said of the challenges that came with this milestone mission. "We didn't have space for any mistakes during this inspection. There was no place for an emergency landing."

Despite all the challenges, the Microdrones MD4-1000 performed as expected and completed the mission successfully.

Why Microdrones

To fly such a massive structure in these extreme weather conditions, the team needed a robust system from a manufacturer they could trust. This marked the first time the rig was inspected via drone, and there really was no room for error.

The MD4-1000 features a drive system that automatically maintains proper flight attitude in changing winds—which was key for this project. It is designed to fly in harsh conditions, including strong winds, magnetic fields, high temperatures, voltage, humidity and any number of environmental factors that can negatively impact a drone's performance. The system also can handle most popular sensors and carry a payload of up to 2.7 lbs.

The MD4-1000 behaved well during the mission, Reichert said, and was equipped with the features needed to perform this industry first, successfully collecting thermal imagery of the Berkut Oil Rig's flare system via drone—and doing so in harsh Arctic conditions that most systems couldn't handle.

The Team

Two people from Condor Solutions were on site to operate the UAS and one representative from the Berkut Oil Rig helped coordinate the mission. Other workers were on the rig as well during the flights.

About Condor Solutions

The Russia-based drone service provider has more than five years of experience completing visual and thermal flare system inspections using self-modified drones from Microdrones. They deploy both the MD4-1000 and the MD4-200 for a variety of drone inspection services.

Bridge inspection on bustling section of the Trans-Siberian railroad by DroneProfi & FlyAbility

Drone inspection provider DroneProfi used the FlyAbility Elios 2 to help Russian Railways complete an inspection on a bridge that has constant train traffic.

01 | Introduction

Bridge inspections are a crucial part of ensuring proper maintenance for critical infrastructure. These inspections help uncover potential defects in a bridge, allowing inspectors and maintenance crews to perform risk evaluations and address potential issues before they become worse.

In the case of bridges used by train lines, inspections can be incredibly challenging due to the constant train traffic these bridges support. For example, trains run every 15 minutes in both directions across the Oktyabrsky Bridge, a bridge that crosses the Volga River in the Samara region of Russia. A typical bridge inspection takes several hours, and there is no way these time increments would allow inspectors to get their work done. Further, the bridge is a critical part of the Trans-Siberian Railway and the train traffic it supports cannot be stopped or rerouted to provide inspectors with the time they need to conduct an inspection.

02 | The customer needs

Russian Railways needed to inspect two spans of the Oktyabrsky Bridge (each span is 150 meters, or about 492 feet in length), and hired inspection company DroneProfi to complete the work. One of the most challenging aspects of bridge inspection work is getting access to the underside of the bridge. Inspectors often use bucket trucks, which have an extendable arm and a bucket that allows them to get access to the visual data they need. However, this approach could not be used on the Oktyabrsky Bridge because it is in constant use.

The bridge was originally built with special rail trolleys that ran underneath it using a manual cable drive, made specifically so that inspectors could get access to its underside. But these trolleys have fallen into disrepair, and are so thoroughly rusted that they are no longer usable.

An alternative to using the trolleys was to hire a group of inspectors that could use special permits and high-rise equipment to get access to the underside of the bridge. But these services are extremely expensive. In addition to the cost, coordinating such services can be complicated, since the list of service providers is short and the list of assets in Russia that need them is quite long.

Drones seemed like the obvious solution to Russian Railways. Before contacting DroneProfi, the Russian Railways team had tried using a traditional commercial drone to get the visual data needed for the inspection. But this approach also did not work: Flying in manual control mode, inspectors found that the drone they were using quickly lost signal when it came close to the metal structures that make up the bridge, especially when a train was passing through it. In addition to signal issues, the strong wind caused by the passing trains created problems for the drone's stability. After an accident almost occurred during a test flight, inspectors decided that they needed to find another way to complete the bridge inspection at the Oktyabrsky Bridge.

03 | The solution

After failing to find a way to inspect the two spans at the Oktyabrsky Bridge, Russian Railways turned to DroneProfi, a company that specializes in using drone technology for inspections. Due to the challenges the bridge posed, the DroneProfi team decided to test Flyability's Elios 2 for the mission—given that the Elios 2 is protected by a collision-tolerant cage and is specifically designed for inspections in hard-to-reach, dangerous places, they thought that it seemed like the right tool for the job.

04 | Convincing results

Using the Elios 2, inspectors from DroneProfi were able to complete a successful inspection of the inside and undercarriage of the two spans of the Oktyabrsky Bridge. The drone allowed them to access objects on the bottom and the side of the spans, providing high-quality visual data on critical parts of the bridge, including:

- Bolted joints
- Mounts
- Painting quality / degradation
- Welded joints of the bridge structural elements to detect cracks and corrosion

After reviewing the visual data they collected for the spans, inspectors found some loose mounts (shown below) but otherwise there were no major defects identified. The drone's signal quality remained stable throughout the mission, with no signal interference at all detected throughout the mission, either from the metal structure or from passing trains. Also, since the drone was operating below or inside the bridge spans, there was no turbulence from the passing trains to interfere with its stability while in flight.

Using the visual data they collected with the Elios 2, the DroneProfi team also constructed a 3D model of the internal structural elements of the bridge spans.

05 | Conclusion

Russian Railways personnel were impressed by the professional services of DroneProfi and its technical capabilities of inspecting hard-to-reach structural elements on the bridge. The success of the mission provides a model that can be used for future train bridge inspections, since it provided a cost-effective, high-quality solution to the unique challenges these types of inspections present. Based on the results of the Oktyabrsky Bridge test, Russian Railways is currently considering equipping its entire operation with Elios 2 units to support train bridge inspections and other inspections in confined spaces.

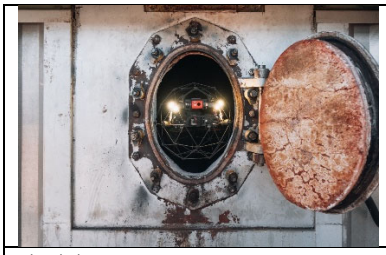
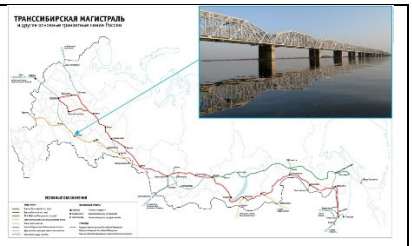
The end product the DroneProfi team delivered to Russian Railways was thorough visual data on the two spans in the form of high-quality 4K photos and video footage. They also delivered 3D models of the spans, including models of hard-to-reach objects in chambers below the spans.

06 | Media

Watch this video featuring footage captured by DroneProfi using the Elios 2 at the Oktyabrsky Bridge:

>> see the video

Some images of the inspection (more online):

		
FlyAbility in action	Results of faults;	A map highlighting the location of the Oktyabrsky Bridge;

07| Contact DroneProfi

You can reach us at any time by email: contact@droneprofi.eu | Also have a look to our website, where you can find further case studies and exciting information on our services.