

# APPLICATION STORY



*FLIR Tau 2 enables accurate detection of leaks and insulation defects in long-distance pipelines*

## AERIAL PIPELINE INSPECTION DRONE RELIES ON FLIR THERMAL CAMERAS

*Inspecting long-distance pipelines for leaks or damage can be a serious challenge for pipeline owners. The sheer length of a pipeline makes it impossible to inspect everything from the ground. And even with conventional cameras looking down from an aircraft, some problems are just undetectable. Czech company Workswell s.r.o., has introduced a pipeline monitoring solution that is time-efficient and able to spot problems that conventional visible-light cameras cannot see. It is called the WIRIS drone system and it uses thermal imaging technology from FLIR Systems.*

Liquids, gases and practically any chemically stable substance can be transported through pipelines. Pipelines for the transport of hot water, steam, crude oil, gas and other products are used in the chemical and food industry, agriculture, power plants, mining industry, etc. Defective pipelines are a constant focus for pipeline operators. Pipelines need to be perfectly sealed, because leaks will result in loss of product or energy. Leaks can result from poor design, bad materials, defective construction, or from accidents. Heating systems based on pipeline networks are also insulated. Bad insulation might result in huge energy losses.

Especially external piping systems are

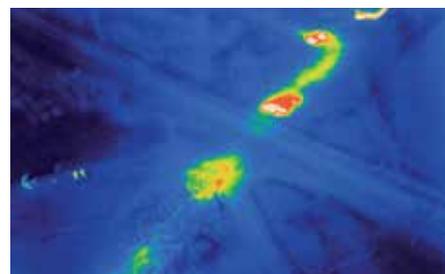
permanently affected by atmospheric influences and constantly threatened by accidental mechanical damage, vandalism or even terrorist attacks. The cladding on the external insulation can become weak, but also the internal piping structure can wear out through corrosion or mechanical stress. Timely discovery of areas where the insulation is thinner or where the cladding on the pipeline is damaged can prevent major accidents, as well as major economic losses, health and safety risks.

### DIFFICULT ACCESS

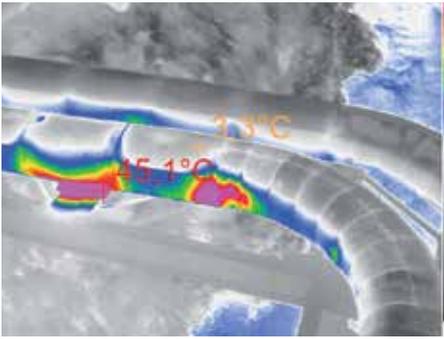
Occasionally, there are indications of a leak, for example when pressure is dropping or when product is visible in nearby valve wells, pipe ground exit points, seawater or on the ground. But



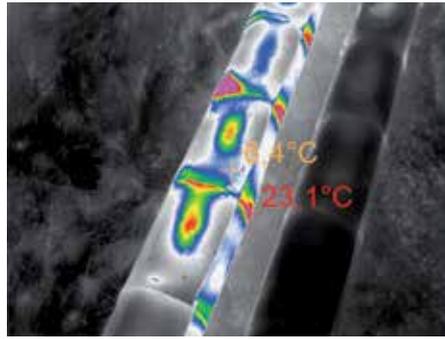
*The Workswell WIRIS system includes the FLIR Tau 2 longwave infrared camera core.*



*Visual and thermal image of a hot-water pipeline: Some pipeline defects are invisible to the naked eye. On the thermal image, hot areas clearly indicate where the pipeline is broken or where the penetration of hot water heats up the affected ground surface.*



Although in the visible spectrum this hot-water pipeline is completely without defects, the WIRIS monitoring systems clearly shows a series of thermal bridges resulting in thermal losses on the left hot-water pipeline.



even then, it can be hard to exactly locate the position of the leak in order to take corrective measures.

Pipeline systems are often located underground or run for many kilometers along access-restricted roads. Due to wide distances, a complete, visual pipeline inspection from the ground is therefore not physically possible. Built-in measuring systems, like pressure meters or flow meters, can be a partial solution, but these systems are not able to cover all risky areas.

## AERIAL INSPECTIONS

Aerial pipeline inspections by airplane or helicopter can effectively bypass the problem of accessibility. Although the inspection results of this type of inspection are usually fairly accurate, aerial inspections can be expensive and dangerous. Today, many pipeline operators prefer an even more effective method: aerial pipeline inspections with drones. A drone, or Unmanned Aerial Vehicle (UAV), can fly over the entire distance of the pipeline and an onboard camera can record and display the monitored scene in real time.



By showing temperature differences on the surface of the pipeline, hidden defects like leaks and missing insulation can be found.

Many drones use visible-light cameras to spot leaks or damage. However, the visible spectrum will only discover a fraction of the defects and ignore areas with damage or leaks that are not visible, such as defects to internal heat insulation or underground leaks. A thermal camera can detect such defects based on the thermal energy of objects. By showing temperature differences on the surface of the pipeline, hidden defects can be found. For example, areas with missing or damaged insulation will have a different temperature than the surrounding surface. In the case of underground pipelines, penetration of hot water causes the affected earth to heat up, which will be clearly visible on a thermal image. By accurately locating the place of escape with a thermal camera, it is not necessary to excavate kilometers of pipelines in search of a leak.

## PIPELINE INSPECTION SYSTEM

The WIRIS thermal imaging system for drones is ideally suited for aerial inspection of pipelines. The system, developed by Workswell s.r.o., combines a visible light camera (for the detection of visible defects) and a thermal camera (for the detection of hidden defects) and allows operators to remotely switch between cameras, to record radiometric videos or to make static images in both the visible and infrared spectrum.

Unlike similar systems, the Workswell WIRIS lets operators manually set the range of temperatures, e.g. in the interval of 15 °C to 25 °C, even during

a flight. Without landing, the thermal sensitivity can be adapted, which is required for localization of minor hot water leaks below the surface or for more precise localization of large defects. WIRIS can also be fitted with a GPS sensor for storing information on the position of the drone.

The onboard thermal camera can measure temperature in the central point, as well as in the local minimum and maximum. This function can be used for navigation, because the system automatically shows where the largest potential problem is located. The continuous zoom (up to 14x for the thermal camera and 16x for the visible camera) allows for an exact localization of the problem.

“The combination of the visual and thermal inspection enables pipeline owners to discover a series of potentially hazardous problems before they become dangerous or financially demanding, and without shutting down the pipeline” says Jan Sova, managing director of Workswell.

## TAU 2 LWIR THERMAL IMAGING CAMERA CORE

Workswell relied on the FLIR Tau 2 longwave infrared camera core for the thermal imaging part of the Workswell WIRIS system. Jan Sova from Workswell comments: “The Tau 2 is very light and compact, which helped us to build a drone of half the weight compared to previous drone systems.” Improved electronics now give Tau 2 even more capabilities, including radiometry, increased sensitivity (<30mK), 640/9Hz frame rates, and powerful image processing modes that dramatically improve detail and contrast.

For more information about thermal imaging cameras or about this application, please visit:

[www.flir.com/oem](http://www.flir.com/oem)

The images displayed may not be representative of the actual resolution of the camera shown. Images for illustrative purposes only.