



Radar-based Video Leak Detection

In a remote section of the North Sea, west of the Shetland Islands, an offshore oil platform is in place to process an estimated 44 million barrels of crude oil, which will be extracted from the Solan oil field over 20 years. But unlike most oil platforms that have a permanent crew on board to monitor critical process areas and rig equipment, this platform will have a crew onboard for only one year. After that, the rig's primary operations will be managed remotely, 250 miles away, at an onshore control room in Aberdeen, Scotland, with monthly visits for inspection and maintenance.

Requirements

Premier Oil, the key investor and developer of the Solan oil field, decided to house its operations onshore to reduce operational costs. The company tasked Emerson Process Management, the main automation contractor for the Solan project, with supplying a remote monitoring solution that could:

- Replicate the robust controls and monitoring capabilities of an onboard operations center
- Be controlled over a redundant satellite link
- Integrate seamlessly with disparate sensor technologies and
- Integrate video and camera controls from on-board cameras into DeltaV Operate screens.

Emerson selected Industrial Video & Control's video management system to address Premier's requirements for remote monitoring. The final, integrated IVC/Emerson solution lets Premier's onshore operations team seamlessly monitor and manage offshore activity 24/7 over a satellite link.

A key requirement of the control system was the ability to detect oil spills and potential intruders. The customer desired that the video monitoring system integrate with the detection technology that was eventually chosen. This application note focuses on this aspect of the video system solution provided by IVC.

Radar-based Spill/Intruder Detection

After an exhaustive search and evaluation process, the customer and the control system contractor settled on a spill/intruder system from Rutter Radar of St. Johns, Newfoundland, Canada.

Rutter's *sigma* S6 OSD (oil spill detection) and STS (small target surveillance) systems were chosen as a cost-effective, yet robust solution to enhance the security and safety of the normally unmanned platform.

As one of the first companies to develop radar-based oil spill detection technology, Rutter's OSD System has been extensively tested and proven to be effective in independent trials conducted by the Norwegian Clean Seas Association for Operating Companies (NOFO). *sigma*



IVC's PTZ-3045, ATEX-rated explosion-proof camera was deployed throughout the offshore platform for process, safety, and security monitoring.

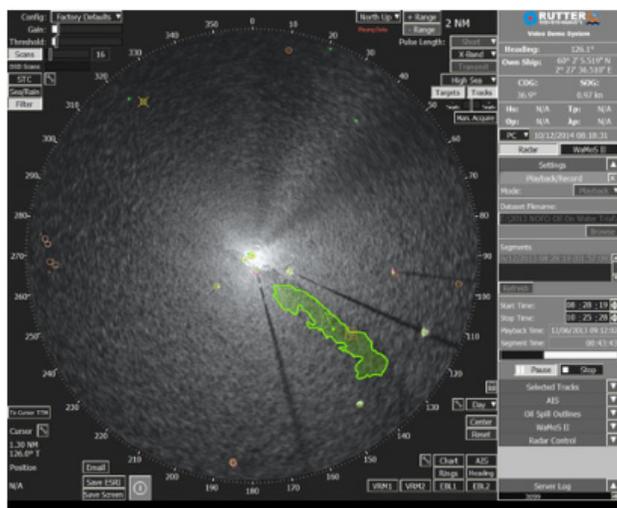


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S6 OSD System permits the user to set parameters that mitigate the occurrence of false positive spill detections. Users can select regions of the scan area to ignore based on known anomalies, and can also prescribe specific ranges or distances from the scanner to exclude for detection. Minimum alarm thresholds can also be set.

cameras to view the target detected by the spill detection system.

The ability to view video from both thermal and optical PTZ cameras that are under control of the spill/intruder detection system provides a comprehensive safety and security system in all weather conditions, 24 hours a day.



Rutter *sigma* S6 user display showing detected spill. The system is integrated with the video system so that GPS coordinate details from the radar-based system are used by the IVC video management software to position appropriate cameras on the platform.

The selection of this X-band 25kW radar-based spill detection system was based as much on economics as it was on technology. A key decision point was the ability of Rutter's system to communicate with the IVC video management system. This is required for two primary reasons:

1. The desire to incorporate video from two Synectics CS3000-VT thermal cameras that are included with this system into the general video system, thus providing easy access to this video from a variety of on-shore and off-shore clients.
2. The ability of the video management system to take GPS coordinates from the spill detection system and, if desired, move appropriate optical

Integration

The system installed on this rig has two 180° detection zones. The system uses Scan Average Processing, which enhances the definition of small, slow moving objects. It enables the operator to accurately monitor activity and positions of spill response vessels and equipment.

A secondary function of this system is vessel security. Its long-range capabilities give operators advanced warning of any possible intruders.

Integration of the Rutter system and the IVC video system is accomplished via IVC's Alarm Server component. IVC's Alarm Server is an alarm system integration tool and, along with the IVC View Station client software, a rules-based alarm management product. The Alarm Server enables users to create a reliable and flexible alarm management system.

For this application, the Alarm Server computer is connected to the *sigma* S6 server via a serial link. As the Rutter system detects spills or potential intruders, it sends TTM messages containing GPS



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SeaFusion Properties

General Serial Serial Port

Name: SeaFusion

Description:

Guid: 8a7669c3-5ae7-45b5-a7de-51280d6441e8

Poll rate

Query alarm status every 1.00 second(s)

Modbus alarm device

Select a modbus alarm device that the Alarm Server will communicate with for alarm information.

Rutter Sigma S6 Radar

OK Cancel

SeaFusion Properties

General Serial Serial Port

Modbus address and port

Modbus address: 192.168.25.50

COM port: 1

Modbus communication method

Communication method: RS422

Modbus transmission mode

Transmission mode: RTU

OK Cancel

IVC Alarm Server is programmed to view the TTM serial messages from the Rutter radar system as MODBUS events.

TARGET DETECTED Properties

General Alarm Source Rules Actions

Execute the following checked actions when the alarm is triggered

Notify IVC Alarm Server(s)

Move camera to detected position

Update camera to detected position

Update server to detected data

Save alarm log to text file

Save alarm content to a file

Save alarm events to database

Send email

Move camera to detected position properties

Camera file: ViewStation.Camera

Camera: Demo-Demo HD 18x PTZ

Position: GPS Position

Origin GPS

Unit: Decimal Degrees

Latitude: N 62.6624910000

Longitude: E 8.1736480000

Elevation: 15.000000 meter(s)

Origin bearing offset: 0.00 degree(s)

Detected bearing in degrees

Detected distance in meters

Range: 0.00 to 180.00

Range: 100.00 to 2000.00

OK Cancel

Event settings in Alarm Server determine if and how this camera will react to specific target position and bearing reported by the Rutter system.

coordinates and bearing of the detected target over this serial link. The Alarm Server is programmed to view messages on the COM port connected to the Rutter system as MODBUS events. The IVC Alarm Server software is programmed to poll this location. When an alarm is detected, the Alarm Server parses the information in memory for the GPS coordinates.

The alarm definition for an alarm from the Rutter system includes a list of response actions. Response actions may include:

- Positioning of optical and thermal PTZ cameras
- Recording of video from one or more cameras
- Initiation of visual cues for operators
- Initiation of audio cues for operators
- Alarm notifications sent to interested parties
- Control of other connected systems (process shutdown, for example)

For this application, the Alarm Server sends camera positioning commands to the IVC Relay Server software with the GPS coordinates of the detected target. The Relay Server software then sends commands to the appropriate thermal and optical cameras to position the cameras and initiate recording.

Target Acquisition

For each camera that is to respond to targets acquired by the Rutter system, an Alarm Server event is defined. The definition of this event determines how or



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if the camera will respond depending on the bearing and location of the target.

Each event definition includes the GPS location of the origin (the Rutter radar). When a target is detected, the Alarm Server parses the bearing and location information in the TTM message. This information is then measured against parameters of the defined event to determine if this camera is to react to the event. If the camera is to react, the target coordinates in the TTM message are used to calculate camera positioning commands, which are sent to the camera by the IVC Relay Server.

Benefits

Given that the video and spill/intruder detection systems are on a platform that is intended to be normally unmanned, quickly and accurately identifying potential process upsets and security threats is crucial.

The combination of the Rutter *sigma* S6 system and IVC's industrial video system provide a tightly integrated solution to address these needs.

Additional benefits of this system include:

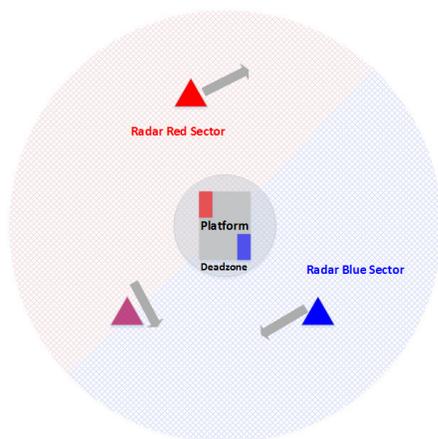
- Ability to integrate live video and camera control into DeltaV Operate HMI screens provide additional eyes on operations
- Remote video monitoring of platform operations help minimize unscheduled visits to the platform

- Remote video monitoring and recording of platform incidents help operators quickly identify proper response activities
- IVC Alarm Server capability to monitor alarm messages from a variety of sources helps automate responses to critical situations.
- Additional PTZ cameras deployed as part of the video system improve safety monitoring by offshore and on-platform operators when the vessel is manned.

A key reason this solution is a successfully operating is that the control systems contractor engaged Rutter and IVC early in the project to integrate their respective technologies. The open nature of IVC's Alarm Server made the integration process proceed smoothly and on schedule.

About IVC

Based in Newton, MA, IVC delivers a broad range of quality IP-based video systems to industrial, commercial and military applications. Their standards-based software, which delivers quality video to PCs and other client devices over a network, is designed to be scalable and easily integrate with third party software. A key strength of IVC is its ability to develop cameras, enclosures, and software to meet demanding customer requirements.



The detection area of the Rutter *sigma* S6 system is comprised of two 180° sectors. The sector in which a target is detected determines which cameras the IVC video management software controls.