

Offloading Monitoring Telemetry Systems (OMTS)

Overview / Background

The Oil and Gas products are offloaded from offshore FPSO (Floating Production, Storage and Offloading) platform to the shuttle tankers or from the shuttle tanker to another tanker. There are different offloading techniques, while the most common is the Bow Offloading System (BLS).

As an extra safety measure, the shuttle tankers and the FPSO are equipped with a wireless based Offloading Monitoring Telemetry System (OMTS). The OMTS must prevent any safety or environmental accidents. The offloading system has a “Green Line” signaling between the FPSO and the BLS in the tanker, to signal that “all is clear” for the offloading. Prior to giving a permit to start crude export from the FPSO to the tanker, this monitoring circuit controls that all valves and couplers onboard the tanker are in correct position and that the mooring system and hose connections are properly secured.

Upon completion of establishing the “Green Line”, a “Permit to Pump” signal is sent from the tanker to the FPSO. Before receipt of “Permit to Pump” signal from the shuttle tanker, it will not be possible for the FPSO to start their crude export pump.

If any “Green Line” status is altered for any reason during loading, the OMTS will immediately initiate a Shutdown of the crude export and close the tanker inlet valve. The reasons to initiate a Shutdown can be drifting of the tanker from the Offloading Safe Zone, High Pressure in the offloaded crude oil and High Tension in the Hawser that links the tanker to the FPSO. The OMTS that supports the “Green Line” and “Permit to Pump” signaling is based on radio communications and advanced RTUs (Remote Terminal Units). The OMTS take part in both sides of the offloading, the FPSO and BLS at the tanker.

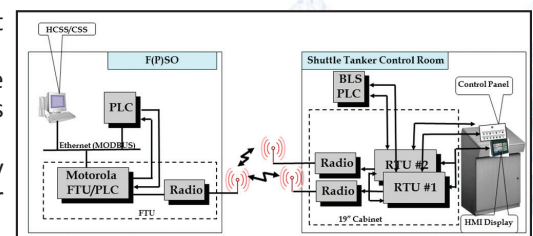
Since system addresses Mission Critical task, the OMTS must demonstrate high availability, resiliency and accuracy. All components, hardware and software, must be designed to accomplish the mission. During the design and the development Star Controls’ engineers focus on improving the availability and the ease of use of the OMTS. In order to improve the availability, the designers considered the empowerment of the crew on the tanker and the FPSO by including powerful and simple to use software tools to troubleshoot the system in the field.

Offloading Telemetry - System Architecture and Requirements

Telemetry System Configuration and Design Considerations

The OMTS at the tanker is based on a duplicated fail safe mode, including duplicated UHF radios, with automatic changeover.

- The Offloading Telemetry System includes RTUs (Remote Terminal Units) that establish a radio link between the tanker and the FPSO.
- The Remote Reception Units, namely FTU, is installed at the production vessel (FPSOs) while the Remote Transmitter Units (RTUs) are placed at the tankers, as shown in the figure on the right.
- The RTUs are the Motorola ACE3600 that uses the best industry class over-the-air protocol. The protocol was designed and has been used for Mission Critical applications.
- The RTUs will be placed at the ship bridge and hardwired with the signals from the BLS PLC.
- Tanker-to-Tanker offloading – Star Controls’ OMTS can support this unique offloading mode
- The OMTS is designed with the following main guidelines:
 - High Availability and Resiliency.
 - Ease of use.
 - Enables the crew in the field, both at the tanker and the FPSO, to address Tier 1 Troubleshooting.
 - Accommodate future technologies, such as IP-based wireless communication, without a need to go through major redesign.



Offloading Telemetry System - Functionality

The offloading system will support two modes:

- Mode 1 - FPSO offload oil to the tanker.
The FTU will send "Offloading Permitted" signal to the RTUs, and the BLS system will communicate through the RTUs the "Pumping Permitted" signal.
- Mode 2 - One shuttle tanker offloads oil to another shuttle tanker.
In this case, the "Offloading Permitted" signal received would be the "Pumping Permitted" signal sent by the other shuttle tanker.
 - In this mode, only one RTU will work at the same time, i.e. not Hot Standby.

Interface with BLS

There are few signals that must be ON in order to establish the "Green Line", Pumping Permitted and Offloading Permitted. In the case of Tanker-Tanker offloading, the BLS and OMTS have two additional signals: "Cargo Receiver Ready" and "Offloading Commenced".

The "Green Line" signal enables the transfer of oil and is supplied by the BLS interlocking system through a voltage free contact. The BLS can also signal through different current levels (in the range of 4-20mA) that indicates "1" for Closed and "0" for Open. The contact (or the current) shall be kept closed while all conditions required for offloading are fulfilled (from the viewpoint of the shuttle tanker). Such signal is the result of a logic performed at the BLS and its loss shall stop the pumps or prevent their start up.



Solution Features and Conclusions

Since the OMTS serves a Mission Critical application, the following design and implementation guidelines were incorporated.

- High Availability – The system architecture and all components that are included in the OMTS are designed and tested for very High Availability and resiliency This includes providing the crew in the field with powerful troubleshooting software tools.
- Safety - Database consistency, loop status, Watchdog, Radio Communications Failure, & Radio Emergency Shutdown.
- Interface with BLS at the Tanker – The interface with BLS is based on a fail-safe mechanism.
- The system can accommodate future technologies, such as IP-based wireless communications.

Projects / References

Star Controls developed several systems that aim Mission Critical applications, and was able to deliver them to the full satisfaction of the customers. The team is experts in Industrial Internet of Things (IIoT), SCADA/Telemetry, Wide area Wireless Data Networks and Cyber Security.

The OMTS was implemented in different offshore oil fields around the globe. Star Controls provided, directly and through partners, several OMTS systems that are operating in different around the world. To learn more please visit www.star-controls.com or email sales@star-controls.com.

