

SmartPredict

Maneuvering Guidance for Safer Operations

BUSINESS WHITE PAPER



CONCEPT

Wärtsilä Dynamic Positioning Incorporated (WDP) reviewed the risks associated with vessel maneuvering and found that current coordinated control methods could be vastly improved with active motion prediction. Adding this functionality to any existing Wärtsilä joystick or DP system provides safer and more efficient vessel operations by:

- Displaying the vessel's predicted future position and heading
- Using proven DP analysis algorithms to evaluate forces affecting the vessel providing advanced motion prediction
- Configurable prediction time display



HOW

A special software module was developed to extend the capability of the DP systems control functionality focused more on vessel maneuvering. Named “SmartPredict,” this module takes advantage of the DP system’s built-in mathematical model to provide advanced motion prediction capability for the vessel. While most traditional prediction systems offer limited usability due to their inputs (see table), SmartPredict utilizes all of the parameters used for automated control by the DP adjusting them for the motion characteristics of the specific vessel. Inputs to the control algorithm include the vessel’s current heading and position as well as velocity and rate of turn and the associated accelerations; manual commands from the coordinated control joystick (3 axis); and finally the environmental input from the onboard wind sensor(s). All of these factors are continually evaluated to provide a constant update of the vessel path. Allowing the operator to see into the future provides a basis for making smarter and safer decisions about ship-handling, avoiding incidents like those recently shown in the media where improved navigational aids could have avoided property damage.

| Input and modeling | Traditional | SmartPredict |
|--------------------------|-------------|--------------|
| Current Position | Yes | Yes |
| Current Heading | Yes | Yes |
| Current Velocity | Yes | Yes |
| Current Heading rate | Some | Yes |
| Main propulsion commands | No | Yes |
| Thruster commands | No | Yes |
| Rudder commands | Some | Yes |
| Wind input | No | Yes |

OPERATION

The Wärtsilä user interfaces provides a simple, intuitive display allowing the operator to toggle on or off the “ghost ship” indicators for the predicted positions. This display also allows the user to configure the time step for the predictions. Fully compatible with the ECDIS overlay function in our systems SmartPredict provides clear indications of potential dangers during ship maneuvering immediately increasing the safety and efficiency of operations. This capability is targeted at passenger vessels, but brings added safety to any vessel performing challenging maneuvers. Development is also underway to allow display of the ghost ship indicators on other displays within the NACOS platinum family allowing the power of SmartPredict to be available even when using the manual controls.

FUTURE POTENTIAL

SmartPredict forms the foundation for moving forward to increased vessel automation. Typical DP handles station-keeping and basic tracking functions, but as more operators look for the safety and reliability of automatic operations, each phase of vessel control will need to be validated and proven for true vessel autonomy to begin. SmartPredict is the first step towards the future of autonomous vessel maneuvering.