

# Dredge Monitoring System (TSHD)



## ▶ PICTURE OF SIMILAR VESSEL

### GENERAL

The Damen Dredge Monitoring system (DDM) provides the operator a real-time overview of the dredging process on a trailing suction hopper dredger. It supports the operator to control the dredge system and increase the operational efficiency.

The DDM system is available for all trailing suction hopper dredgers within Damen but can also be delivered as an instrumentation package for non-Damen vessels, including retrofits.

### HIGHLY FLEXIBLE SYSTEM

DDM consists of several modules that can be easily added to the system. This provides the opportunity to customise the monitoring system exactly to the operator's needs. The basis system comes with the trailing pipe position indication module, which is seen as essential for any dredging operation.

Depending on the preferences of the operator, the system can be visualised on one or multiple screens. On each screen, six user selectable fields can be chosen by the operator during operation.

### OPERATIONAL PRACTICALITIES

The DDM program is installed on a PLC and is visualised by an industrial computer that runs on Windows OS. For all sensors connected to the PLC, the system provides the possibility to investigate the sensor diagnostics. In case of a failure, the operator can verify the exact location of the failure.

Remote access is integrated in the system. It enables the Damen Services Department to facilitate the operator in case of any issue. This provides a fast and cost-effective way of helping the customer and reduces downtime to a minimum.

### DDM MODULES

#### TRAILING PIPE POSITION INDICATION (TPPI)

The Trailing Pipe Position Indication module visualises the side view of the trailing pipe and calculates the dredging depth. If required, the system can be extended with the top view position, giving the operator a complete visualisation of the trailing pipe. When pre-set angle values are exceeded, the system will inform the operator by generating an alarm on the screen.

#### LOADING

The loading module calculates the total amount of cargo and volume inside the hopper. The process is visualised in a real-time loading graph and enables the operator to fill the hopper as efficient as possible. To calculate the total amount of volume inside the hopper, four impulse radar sensors are installed at the fore and the aft of the coaming both on port and starboard side.

#### PRODUCTION

The production module computes the amount of material entering the hopper by combining the data from the flow meter with the data of the density meter. It supports the operator to find the right operating point where maximum production is reached combined with minimum energy consumption. The values are visualised on a digital cross needle indicator and show the daily as well as the total production since the start-up of the project.

If applicable, this module can be used to automate the Light Mixture Overboard (LMO) system. This function enables the operator to pre-set a certain density value. Below this value, the mixture is directly pumped overboard using the LMO system. Above this value, the mixture is pumped into the vessels hold resulting in a higher mixture density in the hopper.

#### ELECTRONIC MONITORING SYSTEM (EMS)

The Electronic Monitoring System module determines the dredging status and number of trips of the dredging campaign. If the required sensors are available it can also determine the volume of tanks installed on the TSHD and shows the real-time position of the vessel in coordinates. This data is frequently used for logging and analysing purposes.

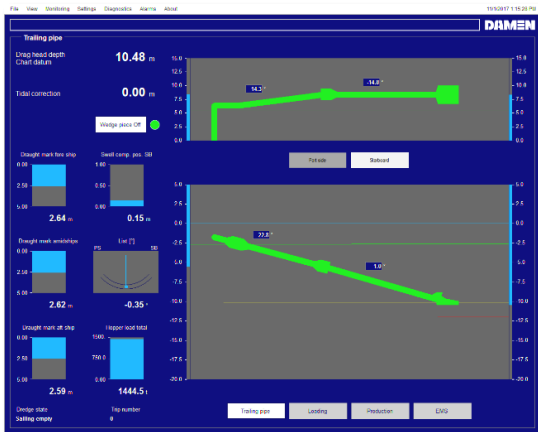
#### LOGGING AND REPORTING

The logging and reporting module collects all relevant data of the dredging process. Thus, it creates daily reports from dredging cycle of the TSHD. These data and reports are often required by authorities to track and monitor the completed dredging work. The data can also be used to optimise the overall dredging process.

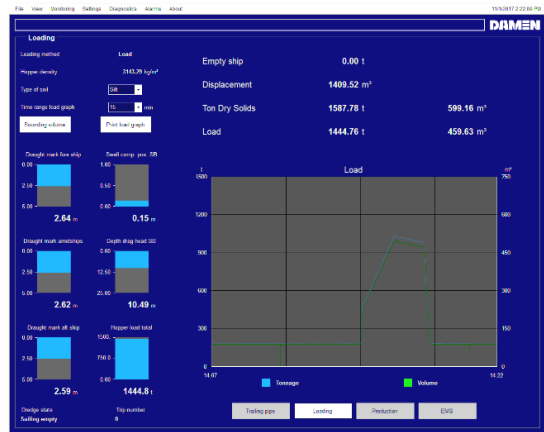
#### POSITIONING & SURVEY VISUALISATION

The DDM system can easily be extended with a positioning visualisation system. This system enables the operator to insert their own survey map and shows a real-time overview of the accomplished dredging track. It prevents unnecessary under and over dredging.

# Dredge Monitoring System (TSHD)



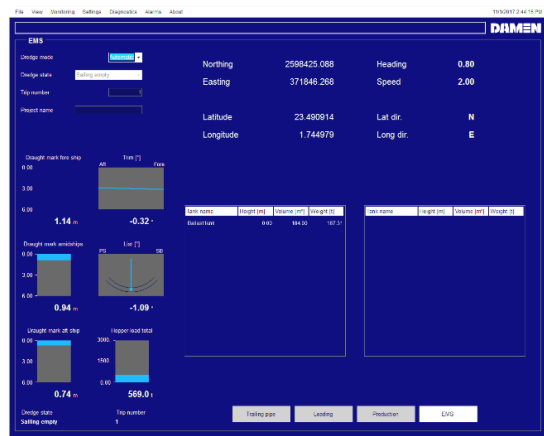
TRAILING PIPE POSITION INDICATION (TPI) MODULE



LOADING MODULE



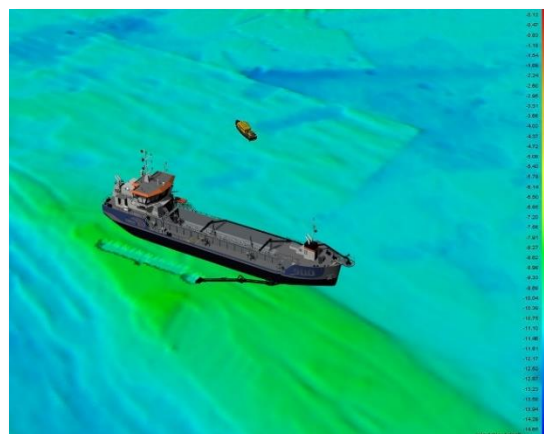
PRODUCTION MODULE



ELECTRONIC MONITORING SYSTEM (EMS) MODULE

Date/Time	Parameters 1	Parameters 2	Parameters 3	Parameters 4	Parameters 5	Parameters 6	Speed	Heading	Displacement	Load
18/03/2017 18:25:01	1	3	3	1.955	0.45	0.11	1.08	17.2	25.21	2.395
18/03/2017 18:25:10	1	3	3	1.955	0.45	0.05	1.04	17.75	25.44	2.295
18/03/2017 18:25:20	1	3	3	1.955	0.45	0.06	1.04	17.22	25.58	2.395
18/03/2017 18:25:31	1	3	3	1.955	0.45	0.05	1.04	17.19	24.79	2.395
18/03/2017 18:25:41	1	3	3	1.955	0.45	0.03	1.04	17.16	24.87	2.395
18/03/2017 18:25:51	1	3	3	1.955	0.45	0.1	1.04	17.21	25.88	2.295
18/03/2017 18:26:01	1	3	3	1.955	0.45	0.11	1.04	17.19	25.25	2.295
18/03/2017 18:26:11	1	3	3	1.955	0.45	0.11	1.04	17.19	25.25	2.295
18/03/2017 18:26:21	1	3	3	1.955	0.45	0.08	1.04	17.19	25.42	2.311
18/03/2017 18:26:31	1	3	3	1.955	0.45	0.06	1.04	17.23	25.87	2.307
18/03/2017 18:26:41	1	3	3	1.955	0.45	0.08	1.04	17.21	25.87	2.303
18/03/2017 18:26:51	1	3	3	1.955	0.45	0.04	1.04	17.23	25.19	2.333
18/03/2017 18:27:01	1	3	3	1.95	0.45	0.07	1.04	17.2	25.57	2.292
18/03/2017 18:27:11	1	3	3	1.955	0.45	0.04	1.04	17.22	25.48	2.299
18/03/2017 18:27:21	1	3	3	1.955	0.45	0.14	1.04	17.24	25.87	2.307
18/03/2017 18:27:31	1	3	3	1.955	0.45	0.08	1.04	17.22	25.87	2.307
18/03/2017 18:27:41	1	3	3	1.955	0.45	0.11	1.04	17.21	25.87	2.307
18/03/2017 18:27:51	1	3	3	1.955	0.45	0.03	1.04	17.22	25.13	2.289
18/03/2017 18:28:01	1	3	3	1.955	0.45	0.14	1.04	17.25	25.87	2.311
18/03/2017 18:28:12	1	3	3	1.95	0.45	0.08	1.04	17.22	26.1	2.299
18/03/2017 18:28:21	1	3	3	1.955	0.45	0.03	1.04	17.21	26.75	2.295
18/03/2017 18:28:31	1	3	3	1.955	0.45	0.06	1.04	17.2	26.74	2.298
18/03/2017 18:28:41	1	3	3	1.955	0.45	0.1	1.04	17.23	25.86	2.307

LOGGING AND REPORTING MODULE



POSITIONING VISUALISATION

\*The screens shown in the examples contain all options available in DDM. Depending on the customer's choice, these example screens can differ.