Application Trailing Suction Hopper

PDS2000

Version 1.0.1

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RESON B.V.
Stuttgartstraat 42- 44
3047 AS Rotterdam
The Netherlands

Tel.: +31 (0)10 245 15 00
www.reson.nl

Amendment Record Sheet

Rev.	Date	Reason for Modifications
1.0.1	10/06/2010	New RESON logo added.
1.0	20/06/2007	First version of the Application Trailing Suction Hopper Manual. This is a draft version of the manual.

Contents

Figures

1 Introduction

1.1 Trailing Suction Hopper

The application type ‘Trailing Suction Hopper’ is for a project where a suction hopper is used for dredging.

In this application manual the setup of a trailing suction hopper project will be discussed. For the standard information of PDS2000 will be referred to the PDS2000 User Manual.

After the project is setup the separate tools of the trailing suction hopper configuration have to be calibrated. The calibrations of the upper pipe and lower pipe will be explained in a separate chapter of the manual.

The last chapters in this manual will discuss the Acquisition and the most used views in the Acquisition.

This manual is also available as a HTML Help file. Press F1 or select *Help* > *Help Topics* to open the PDS2000 help files.

2 Setup a New Project

2.1 Introduction

PDS2000 needs a project, an application type and a configuration before any of the modules can be started.

A project contains all the information about the settings, the method of surveying and the information to do a survey. To get a project for a trailing suction hopper application, a new project can be created or an existing project can be modified.

In the chapter 'Starting PDS2000' of the PDS2000 User Manual is described how to setup a project with an application type and a configuration.

2.2 Start a New Project

If PDS2000 is started for the first time an existing project has to be selected to start up the Control Center. If there is no project available, check the option 'Run the New Project Wizard' and click on OK to start up the new project wizard.

If the Control Center in PDS2000 is running, a new project can be created from the menu bar with *File* > *New Project*…. and the new project wizard will be started.

2.2.1 New Project Wizard

Create an empty project:

- Enter a new project name and click on Next >.
- Ignore the project configuration settings for the moment and click on Next >.
- Select as application type Trailing Suction Hopper and click on Next >.
- Uncheck the option 'Run the vessel wizard' and click on Next >.
- Uncheck the option 'Run the configuration wizard' and click on Finish.

The new project will become active in the Control Center. In this project no vessel and no configuration is created yet.

2.2.2 Geodesy

In PDS2000 a coordinate system has to be selected.

Select *Edit* > *Project Configuration* from the menu bar or click on  in the toolbar to open the project configuration to select or create a coordinate system for the project. Select in the Project Configuration window the Coordinate System and select one of the existing coordinate systems or create a new coordinate system with New.

See for a detailed explanation of the coordinate system the chapter 'Coordinate System' in the PDS2000 User Manual.

See for a detailed explanation of the Geo Calculator the chapter 'Control Center – Geo Calculator' of the PDS2000 User Manual.

If a coordinate system is selected or created, the coordinate system can be checked in the Geo Calculator. Select *Tools* > *Geo Calculator* from the menu bar and add coordinates for the satellite ellipsoid, the local ellipsoid or the projection.

2.2.3 Vessel

In PDS2000 the ship with the dredge equipment is called a vessel.

Select *Acquisition* > *New* > *Vessel…* from the menu bar of the Control Center an give a name for the vessel that has to be created. Click on Next > and the vessel wizard will be started with the Geometry page. With Next > the other pages of the vessel configuration can be opened.

Another way to create a new vessel is by selecting the tab Project in the Explorer of the Control Center. Click with the right mouse button on Vessel in the Explorer and select the option 'New File' to create a new vessel and the vessel configuration window with tabs for the Geometry, Equipment, Computations, Data Sources, Guidance, Tools, Logging, Simulation, Aliases and Alarms will be opened.

See the chapter 'Vessel Configuration' on page 5 for a detailed setup of the vessel configuration for a trailing suction hopper application.

2.2.4 Configuration

If the vessel is setup, a new configuration has to be created before the Acquisition of PDS2000 can be opened.

Select *Acquisition* > *New* > *Configuration…* from the menu bar of the Control Center and give a name for the configuration that has to be created. Click on Next > and the configuration wizard will be started with the Vessels page. With Next > the other pages of the configuration can be opened.

In the tab Vessels, click under 'Local' on Add to add the just created vessel configuration.

Another way to create a new configuration is by selecting the tab Project in the Explorer of the Control Center. Click with the right mouse button on Configuration in the Explorer and select the option 'New File' to create a new configuration and the configuration window with the tabs will be opened.

3 Vessel Configuration

3.1 Introduction

The vessel configuration contains al the settings necessary for the measurements and the displays of the dredging work.

The general information about the vessel configuration is explained in the chapter ‘Vessel Configuration’ of the PDS2000 User Manual.

In this chapter the specific settings are explained to setup the Trailing Suction Hopper application.

3.2 Geometry

In this page the contours of the vessel and the suction tube(s) has to be drawn. These contours can be drawn in 2D or in 3D - wireframe. The 2D drawings are created under the item ‘Vessel contour’ and the 3D – wireframes are 3D DXF files.

For the 2D contours a top view and at least one side view have to be drawn. The side views of all the contours should be from the same side, so the vessel with the suction tube(s) can be displayed in a Profile – Realtime Design view in the Acquisition (see page 42).

The suction tube of a trailing suction hopper dredger has to be drawn in segments, because each part of the pipe can be moved separately. The suction tube exists of a bend, an upper pipe, a lower pipe and a suction head.

Two suction tubes can not be displayed in one Profile – Realtime Design view. So draw for one suction tube a left side and for one a right side and open two profile views in the Acquisition.

3.2.1 Bend

The (0, 0, 0) of the drawing of the bend should be the centre of the connection with the upper pipe, as shown below.

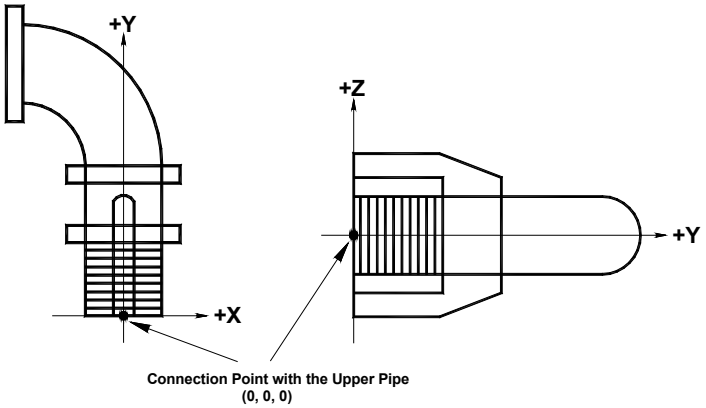

Figure 3-1 Top and right view of a bend on starboard side

3.2.2 Upper Pipe

The (0, 0, 0) of the drawing of the upper pipe should be the centre of the connection with the lower pipe, as shown below.

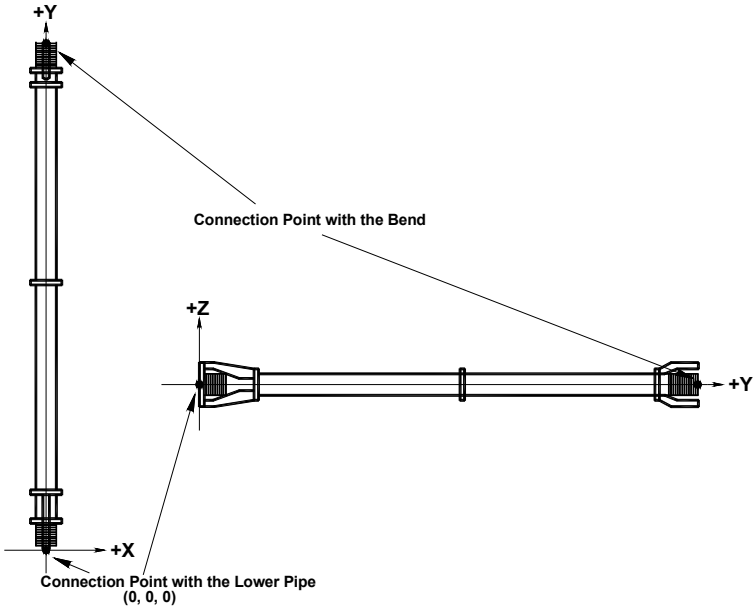

Figure 3-2 Top and right view of the upper pipe

3.2.3 Lower Pipe

The (0, 0, 0) of the drawing of the lower pipe should be the centre of the connection with the suction head, as shown below.

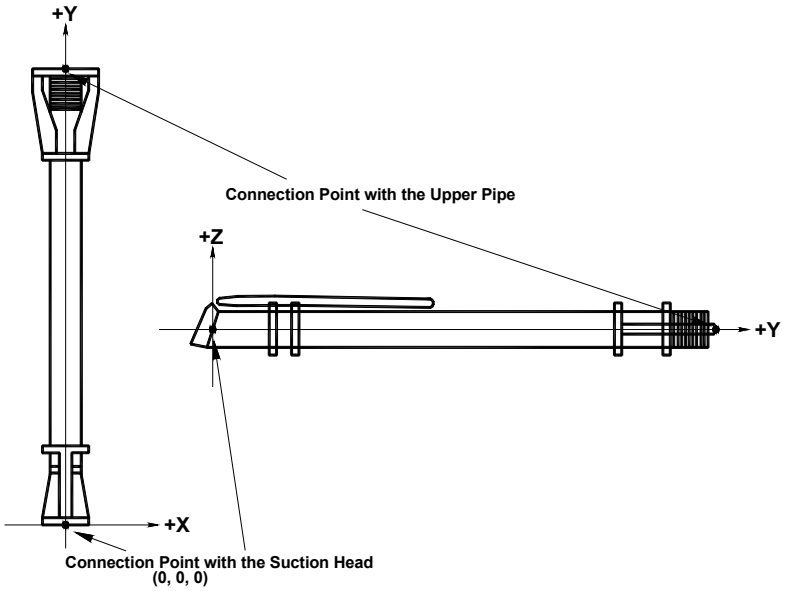

Figure 3-3 Top and right view of the lower pipe

3.2.4 Suction Head

The (0, 0, 0) of the drawing of the suction head should be the centre and the end of the suction head, as shown below.

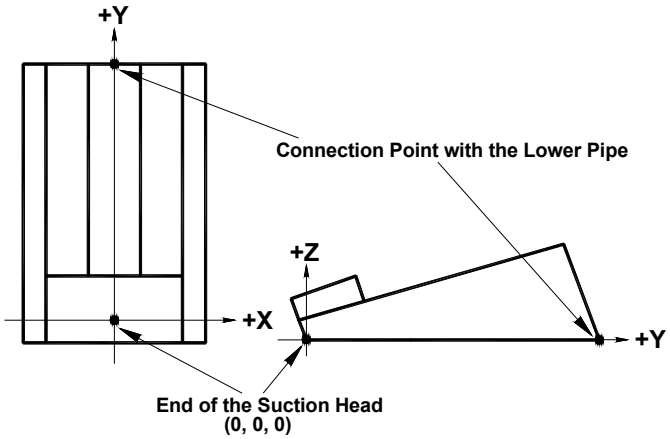

Figure 3-4 Top and right view of the suction head

3.2.5 Settings of the Geometry Page

After all the contours are drawn in the 'Vessel contour' or are available as wireframes in the 'Vessel wireframe', the drawing of the vessel should be selected as active vessel contour.

The offsets, which are needed on the vessel, have to be added to the offset table in the Geometry page.

- Antenna offset of a positioning system.
- The inlet location(s); the location(s) on the vessel where the suction tube(s) is/are connected to the vessel.
- The draught locations.
- The level locations.

The Zero offset correspond to the (0, 0, 0) as is used in the vessel drawing.

3.3 Equipment

In the Equipment page the sensors which are used on the vessel have to be selected. The sensors that will be discussed are the most used devices from the list. It is still possible, because of dongle settings, that some of these devices are not available for the selected application type.

- Compass (see page 9)
- Depth Sensor (see page 9)
- Dredge Positioning System (Trailing Suction Hopper) (see page 10)
- Dredge Production (see page 10)
- Dredge Status (see page 10)
- Load and Draught (see page 10)
- Positioning System Geogs (see page 11)
- Tide Gauge (see page 12)
- Trip Info (see page 12)
- VRU (see page 12)

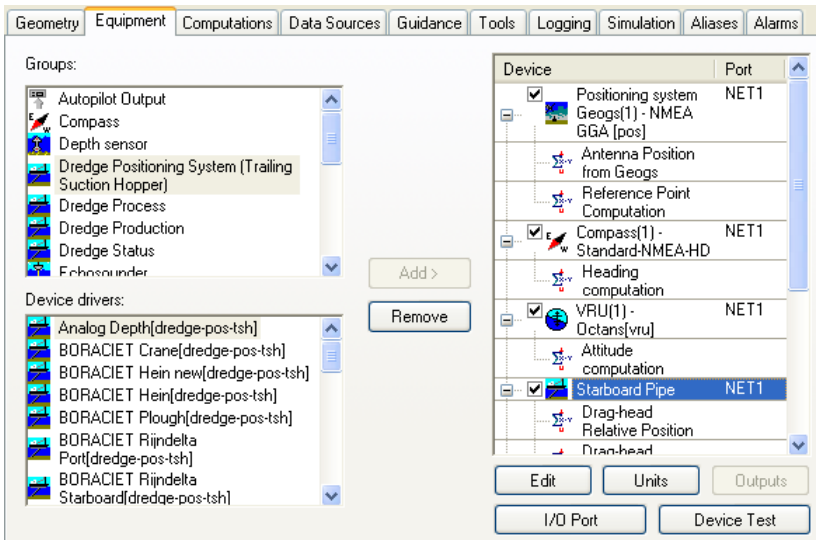

Figure 3-5 The Equipment page

Select from the list ‘Groups’ a group of devices, e.g. Dredge Positioning System (Trailing Suction Hopper). Select from the list ‘Device drivers’ one of the dredge-pos-tsh drivers and click on Add > to add the driver to the device list.

For more information about the interfacing, see chapter 'Control Center – Interfacing' in the PDS2000 User Manual.

If a device driver is added to the device list in the Equipment page, the communication port has to be selected. Click on I/O Port to open the interface page where the communication port can be added, modified or selected. If the communication port is set and the sensor is connected to PDS2000, click on Device Test to test the communication with the sensor.

For most of the items in the properties the default settings can be used. Below only the essential settings in the properties of the sensors will be discussed.

3.3.1 Compass

On the vessel the compass is used to get a heading of the vessel.

In the first properties window ('Compass'):

Heading Correction
This should be the correction derived from the compass calibration.

3.3.2 Depth Sensor

On the vessel the depth sensor will be used to measure the draught of the vessel.

In PDS2000 the depth (draught) sensor is used in the sea level computation to obtain the sea level and will be used for the load computation in the Load and Draught (see page 10).

By default the sea level value entered in the Geometry page will be used for the sea level computation. To make the sea level computation from the depth sensor the primary computation, select the sea level computation from the depth sensor as primary in the Data Sources (see page 14). Preferable is to select the depth sensor which is closest to the positioning system.

In the first properties window ('Depth sensor'):

Device Offset
Select the offset of the depth sensor from the list. The offset has to be created in the Geometry page.

Time Delay
Enter the delay in the output from the depth sensor. The time delay is always ≥ 0 sec.

In the second properties window ('Sealevel Computation'):

Integration Period (only for depth sensors with a depth as output)
Enter a value for the integration period over which the depth is calculated.

Approx. Latitude Mode (only for pressure sensors)
Select a manual input or latitude from the position.

Approx. Latitude (only for pressure sensors)
Enter the latitude if the mode is set on manual.

Atmospheric Pressure Correction (only for pressure sensors)
Select *Enabled* if an atmospheric pressure correction is necessary.

Atmospheric Pressure (only for pressure sensors)
Enter the atmospheric pressure correction if this is necessary.

3.3.3 Dredge Positioning System

This device driver reads the data from the sensors on the suction tube(s) to calculate the position and the height (depth) of the origin (0, 0, 0) of the suction head.

For this application it is possible to select two times a dredge positioning system, one on port side and one on starboard side of the vessel.

In the first properties window ('Dredge Positioning System (Trailing Suction Hopper)'):

Device Offset
This is the offset of the inlet location where the bend of the suction tube is connected to the vessel. The offset should be defined in the Geometry page.

Pipe Diameter
This is the pipe diameter of the suction tube and will be used in the calculation of the dredge production.

All other items in the first properties window can be set in the Production parameters page of the Tools page (see page 15) or are derived from the Tools Calibration in the Acquisition (see page 21).

In the second properties window ('Drag-head Relative Position') and the third properties window ('Drag-head Absolute Position') the defaults settings can be used.

In the third properties window the option 'Grid Model Update Mode' is set on *Volume Update* to give the best update of the active grid model.

3.3.4 Dredge Production

With this device the flow and concentration of the dredge material can be measured (see page 48). For calculating the dredge production the water density and the product density has to be known. The water density and the product density can be set in the Production Parameters page of the Tools page (see page 15).

The default settings in the properties window ('Dredge Production') can be used.

3.3.5 Dredge Status

With this device the status of the dredging can be monitored. The dredge status can be relevant for the start and end of the trip registration (see page 16).

There are no settings in the properties window ('Dredge Status') that can be set.

3.3.6 Load and Draught

This device will read in the draught sensors and, if available, the level sensors to measure the level in the bunker(s).

In the first properties window ('Load and Draught'):

Draught Sensor Offset
Select the offset of one the draught sensors (depth sensors) from the list. This offset has to be defined in the Geometry page.

Draught Correction
Specify the correction for the above selected draught sensor.

Level Sensor Offset
Select the offset of one the level sensors from the list. This offset has to be defined in the Geometry page.

Level Correction
Specify the correction for the above selected level sensor.

The number of draught sensors and level sensors in the properties window will depend on the selected device driver.

If only 2 draught sensors are used for the load and draught computation then is advisable to place the two draught sensors in the middle of the vessel.

In the second properties window ('Load and Draught') the defaults settings can be used.

3.3.7 Positioning System Geogs

This sensor gives a position derived from several GPS satellites.

In the first properties window ('Positioning System Geogs'):

Device Offset
Select the offset of the GPS antenna from the list. This offset has to be defined in the Geometry page.

Time Delay
If known, enter the delay in the output from the positioning system. The time delay is always ≥ 0 sec.

Datum Transformation
The position from the positioning system is in most cases a WGS'84 or ETRS'89 position. To recalculate the position to a local position the relevant datum transformation has to be selected. There are three options: *Use other datum transformation*, *Use project coordinate system* and *Use no datum transformation*.

When a different datum transformation is selected, an extra option appears in the properties called Datum Transformation. Select in this new option the right datum transformation for the positioning system.
When project coordinate system is selected, the datum transformation as specified in the coordinate system will be used.
When no datum transformation is selected, the coordinates of the positioning system will not be recalculated to a local position; they stay in the coordinates as received from the positioning system.

In the second properties window ('Antenna Position from Geogs') nothing can be selected.

In the third properties window ('Reference Point Computation'):

Height Source
Select for the computation of the height related to the received position the Z of the GPS RTK system or the tidal information from tide gauges or predicted tides.
PDS2000 needs a chart datum to calculate the depth of the suction head, so use always RTK or tidal information.

If no standard deviation is received, the height standard deviation mask has to be 0.05m.

Height Standard Deviation Mask
Enter a maximum value for the standard deviation of the RTK Z to accept the RTK Z for the height computation. If the standard deviation is more than the maximum value the height computation becomes 'Height Held'. Only valid if 'Height Source' is set on *GPS Height (RTZ)*.

3.3.8 Tide Gauge

In stead of using GPS RTK as height source, one or more tide gauges can be used in combination with the depth sensor to calculate the absolute height or depth of the vessel.

The tide station(s) has to be setup in the Explorer (see the chapter 'Explorer – Tide Station' in the PDS2000 User Manual).

In the properties window ('Tide gauge'):

Tide Stations
Select at the bottom of the properties window the tide station(s) that are related to the tide gauge driver.

With some of the device drivers tide data of more than one tide station can be collected at the same time. Select in that case in the properties window the relevant tide stations. Other device drivers are only for one tide station; select then only one tide station in the properties window.

If more than one tide station is used and the device driver is only for one tide station, select the device driver multiple times until all the tide stations are selected.

An advanced computation has to be created in the Computations after the tide gauge is setup (see page 13).

Also in the properties of the positioning system (in the 'Reference Point Computation') the 'Height Source' has to be set to *Tide* (see page 11).

3.3.9 Trip Info

This device can be used to change the trip number. And if in the trip registration (see page 16) the option *When trip number changes* is selected the new trip will be started.

There are no settings in the properties window ('Trip Info') that can be set.

3.3.10 VRU

A VRU is used to measure the attitude (roll, pitch and heave) of the vessel.

In the first properties window ('VRU'):

Time Delay
Enter the delay in the output from the VRU. The time delay is always ≥ 0 sec.

Device Offset
If only the roll and pitch of the VRU are used, no device offset has to be selected. If the heave is used then a device offset is necessary and the offset should be defined in the Geometry page.

Roll / Pitch Correction
A roll and pitch correction, derived from the VRU calibration, can be entered in the properties. Check the sign convention of the roll and pitch before entering the values.

In the second properties window ('Attitude computation') the default settings can be used.

3.4 Computations

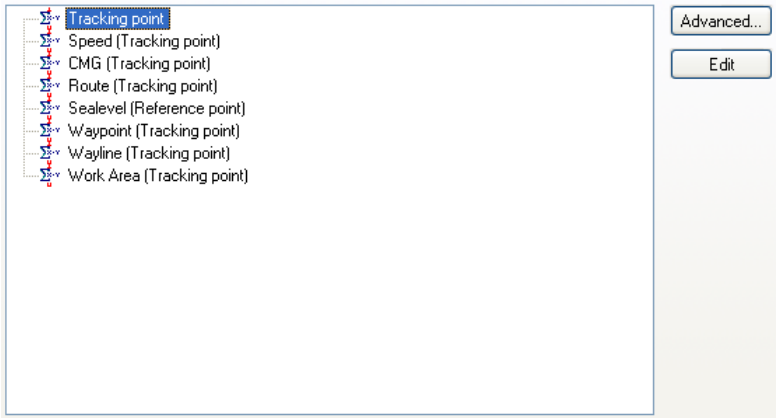

Figure 3-6 The Computations page

In PDS2000 a number of standard computations as shown above are available. The user influence on these computations is limited.

3.4.1 Advanced Computations

When a tide gauge is setup in the Equipment page (see page 12), an advanced computation has to be added to the computations. Click on Advanced... to open the Advanced Computations page.

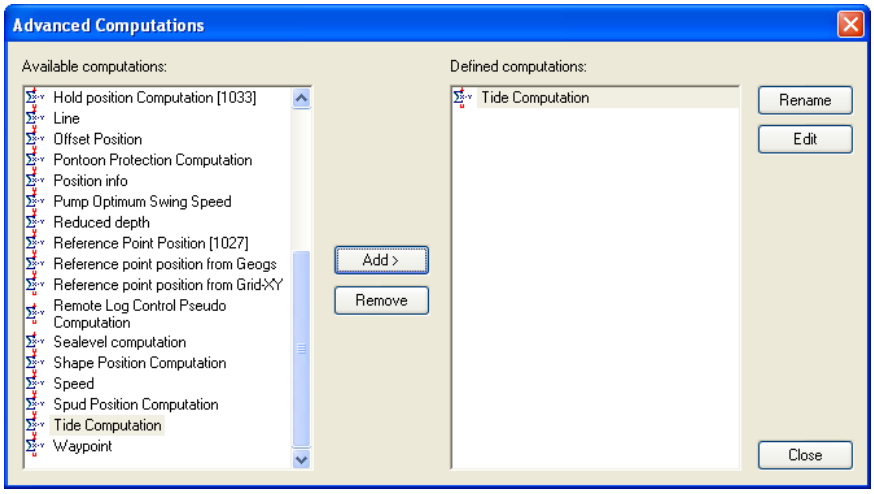

Figure 3-7 The Advanced Computations page

Select from the list 'Available computations' the 'Tide Computation' and click on Add > to add the computation to the list of 'Defined computations'. With Edit the properties of the selected computation becomes available.

The relevant items in the properties window of the 'Tide Computation' are:

The tide station(s) has to be setup in the Explorer (see chapter 'Explorer – Tide Stations' in the PDS2000 User Manual).

Tide Reduction Computation Mode
Select one of the modes for the tide computation; *Single Tide Station*, *Multiple Tide Station* or *Tide Stations Along Route*.

Tide Station Name / Tide Stations
Select the tide station(s) that are used for the tide computation with the above selected 'Tide Reduction Computation Mode'.

3.5 Data Sources

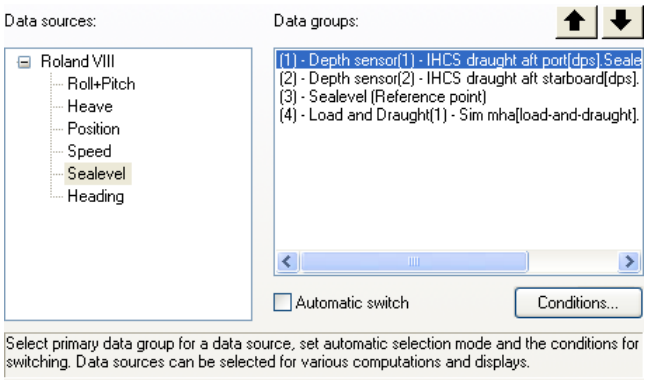

Figure 3-8 The Data Sources page with three Sealevel computations

If one or more depth sensors or a Load and Draught are selected in the Equipment page, then for the Sealevel computation more computations will be available.

By default the Sealevel (Reference point) computation is the primary computation. Change with the arrows (and) the order of the computations. The first computation will be used as the primary Sealevel computation.

The depth sensor closest to the positioning system should be selected for the primary Sealevel computation.

3.6 Guidance

The guidance will be used to guide the dredger. It will depend on the dongle which guidance types are available.

The guidance types that can be available for trailing suction hopper application are:

- Route
- Waypoints
- Design Model
- Work Area
- Restricted Area

See for a detailed explanation of the different guidance types the chapter 'Guidance' in the PDS2000 User Manual.

To use and show a guidance file in the Plan View – General Dredge Operation view (see page 32) or in the Profile – Realtime Design view (see page 42) in the Acquisition the guidance file has to be selected in the related Guidance page.

3.7 Tools

On this page the Production parameters, the Trip Registration and one or two Pipe Configurations for the trailing suction hopper have to be setup.

If there is no 'Dredge Positioning System (Trailing Suction Hopper)' selected yet in the Equipment page (see page 10), the Pipe Configuration page is not available.

3.7.1 Production Parameters

In the Production Parameters page settings which are used for the calculations of the load and draught have to be set.

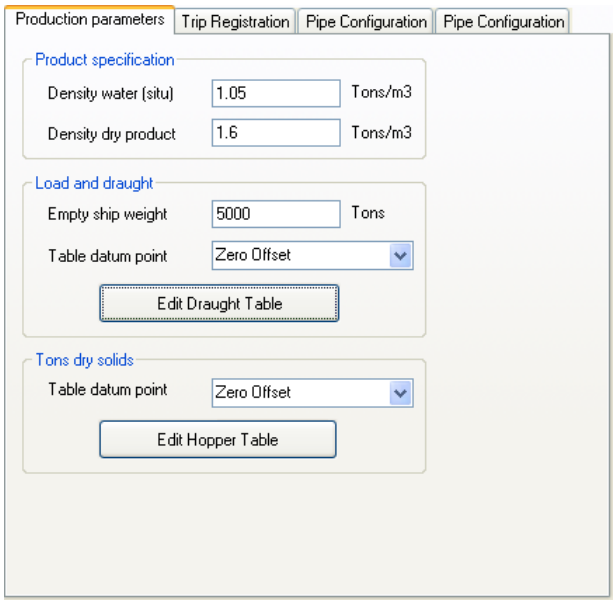

Figure 3-9 Production parameters page in the Tools page

Product specification

Density water (situ)
The water density in situ in tons/m³.

Density dry product
The density of the dry product in tons/m³.

Load and draught

Empty ship weight
The weight of the empty ship, without any load, in tons.

Table datum point
The reference point on the vessel to which the mean draught in the draught table is calculated. The reference point should be an offset as defined in the Geometry page.

In the draught table the relation between the mean draught of the vessel and the displacement of the vessel in tons is specified. The

mean draught is corrected for the density of the water in situ and for the offsets of the draught sensors.

Tons dry solids

Table datum point
The reference point on the vessel to which the mean level in the hopper table is calculated. The reference point should be an offset as defined in the Geometry page.

In the hopper table the relation between the mean level in the bunkers and the volume in the bunkers in m³ is specified.

3.7.2 Trip Registration

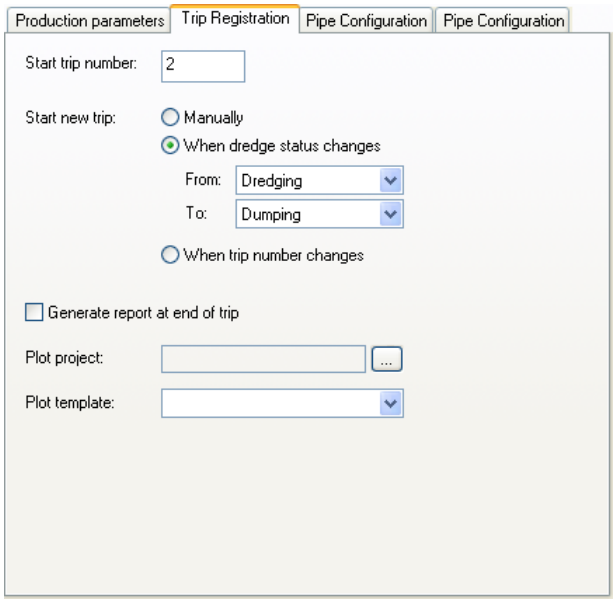

Figure 3-10 Trip Registration page in the Tools page

Start trip number
A trip number can be entered. The trip number will be part of the log data file name.

Start new trip
Three options are available to start a new trip.
Manually. With the menu option Start Next Trip in the Tools menu of the Acquisition the user can start the next trip.
When dredge status changes. Select the dredge statuses when the next trip has to be started. In the example above the next trip will start when the dredge status is changed from *Dredging* to *Dumping*.
When trip number changes. There are two options to change the trip number; in the Trip Registration page of the Tools Settings in the Tools menu of the Acquisition and with the trip info device.

Generate report at end of trip
If this options is checked, a plot will be generated according the selected plot template. The logged data file of the trip will be used to plot the dredge tracks.

3.7.3 Pipe Configuration

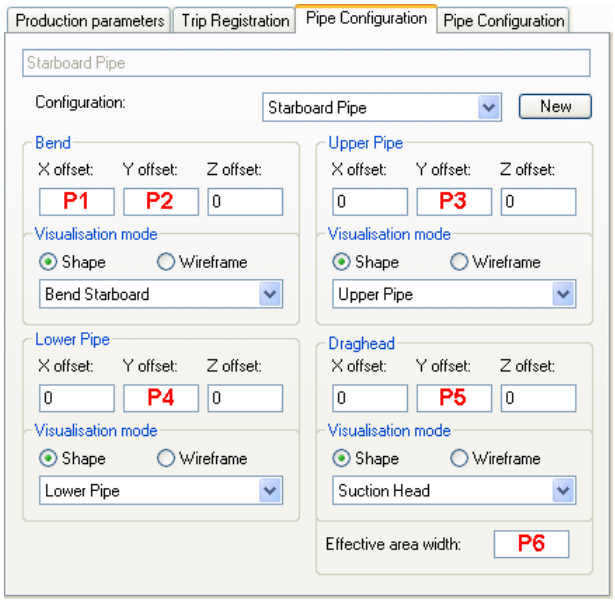

Figure 3-11 Pipe Configuration page in the Tools page

For each suction tube on the trailing suction hopper a pipe configuration has to be setup. The procedure to fill in the Pipe Configuration page is:

- Select a pipe configuration or create a new pipe configuration with New.
- Fill in the X and Y offset (P1 and P2) for the bend. For a starboard bend the X offset should be negative and for a port bend it should be positive. The Y offset is always negative. Select how the bend has to be presented in the views, a shape or a wireframe, and select the right shape or wireframe for the bend.

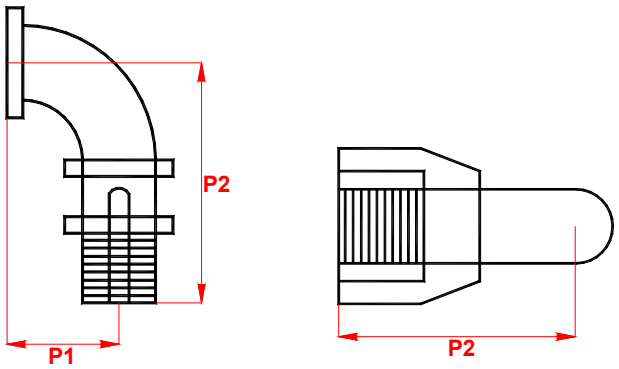

Figure 3-12 The offsets of the bend

- Fill in the Y offset (P3) for the upper pipe. The Y offset is always negative. Select how the upper pipe has to be presented in the views, a shape or a wireframe, and select the right shape or wireframe for the upper pipe.

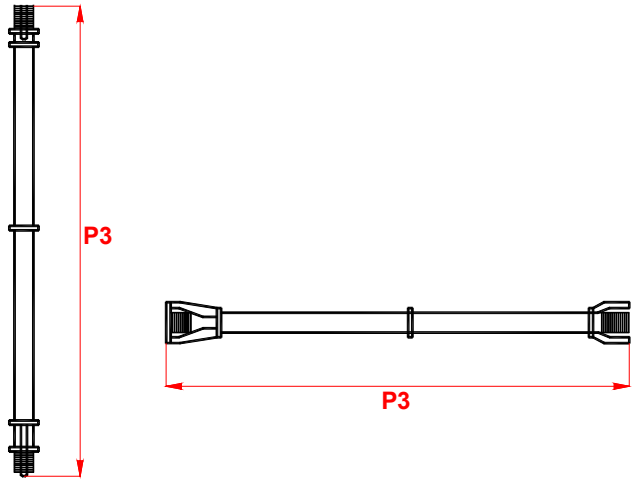

Figure 3-13 The Y offset of the upper pipe

- Fill in the Y offset (P4) for the lower pipe. The Y offset is always negative. Select how the lower pipe has to be presented in the views, a shape or a wireframe, and select the right shape or wireframe for the lower pipe.

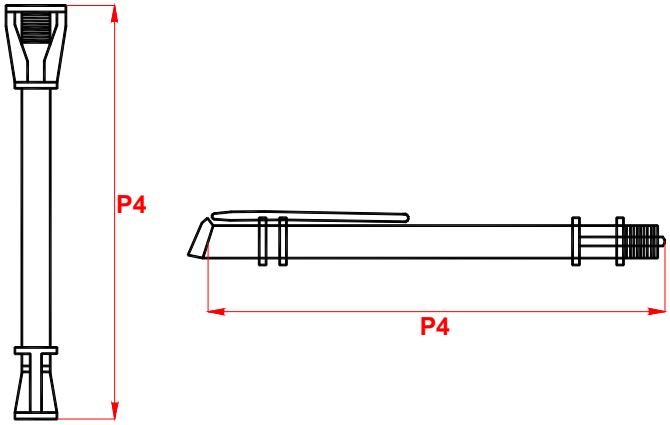

Figure 3-14 The Y offset of the lower pipe

- Fill in the Y offset (P5) for the suction head. The Y offset is always negative. Select how the suction head has to be presented in the views, a shape or a wireframe, and select the right shape or wireframe for the suction head. Fill in the effective width (P6) of the suction head.

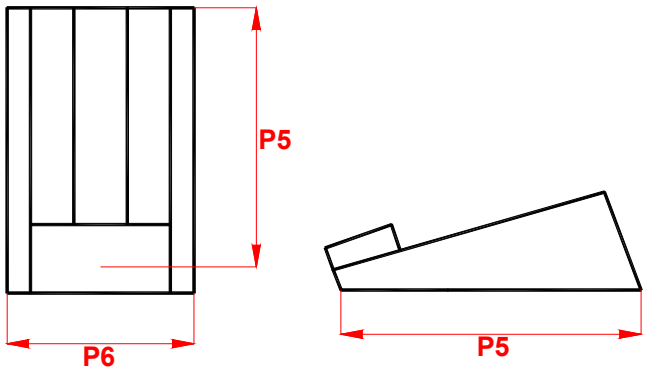

Figure 3-15 The offsets of the suction head

3.8 Logging

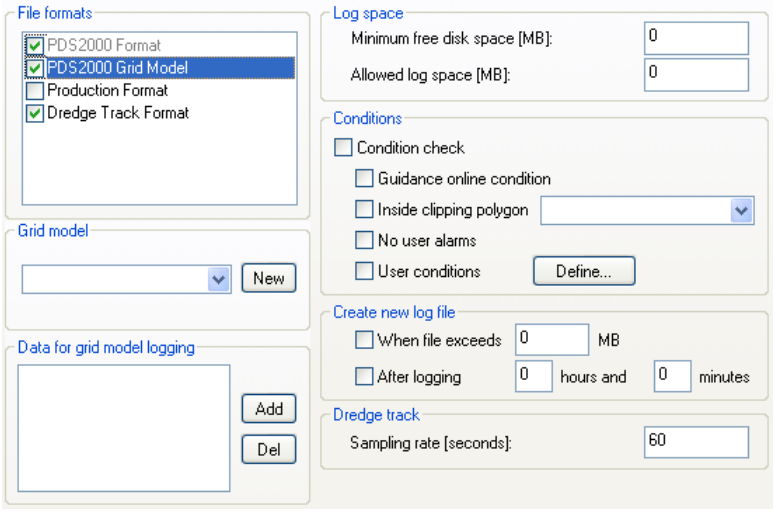

Figure 3-16 The Logging page

In the chapter 'Vessel Configuration - Logging' of the PDS2000 User Manual the options of the right side in the Logging page will be explained.

3.8.1 PDS2000 Grid Model

The PDS2000 Grid Model file format is used in the Acquisition to build up an on-line depth model during the work activities and can also be used as an on-line coverage.

If a PDS2000 Grid Model has to be used, check the option and some extra information will appear in the Logging page (see Figure 3-16 above).

Select the grid model file name. If a new file has to be created, click on New, give a new file name and click on Save in the file dialog. Select in the grid model setup one or more data types for the grid model and enter a cell size.

If the cell size is too small the update of the grid model takes too much time and if it is too big it looks like nothing is taken away in one go with the suction head.

The grid model will be filled with the information from the added device data in 'Data for grid model logging'. For two suction tubes two devices have to be selected, for each suction tube one.

3.8.2 Production Format

In the Acquisition the production of the suction tube(s) can be displayed with a grid model. The grid model is will show the production data from the device driver 'Dredge Production' (see page 10). For two suction tubes two devices have to be selected, for each suction tube one.

To create a grid model with the production the same procedure as for the PDS2000 Grid Model has to be followed (see above).

3.8.3 Dredge Track Format

The calculated position of the suction head(s) will be logged. For this log file a sampling rate has to be specified, because it is not necessary to log all the suction head(s) positions. The log file is used as an indication for the dredge positions.

4 Calibration

4.1 Introduction

For the trailing suction hopper application one or two suction tube calibrations are available.

Before the calibration can be started all other equipment on the vessel has to be installed and calibrated. PDS2000 should be running and a project should be setup correctly.

The calibration will take place in the Acquisition which can be started by clicking on 

.

The calibration of the suction tube(s) will take place in the Tools Calibration, which can be opened with *Tools* > *Tools Calibration* from the menu bar of the Acquisition.

4.2 Suction Tube Calibration

The suction tube calibration contains a horizontal and a vertical angle calibration of the upper and lower pipe.

At the moment is for the horizontal angel calibration only one calibration method available and for the vertical angle calibration two different methods.

4.2.1 Upper Pipe – Horizontal Angle

At the moment only one calibration method is available for the horizontal angle of the upper pipe:

- Horizontal angle with pipe in cradle

4.2.1.1 Horizontal angle with pipe in cradle

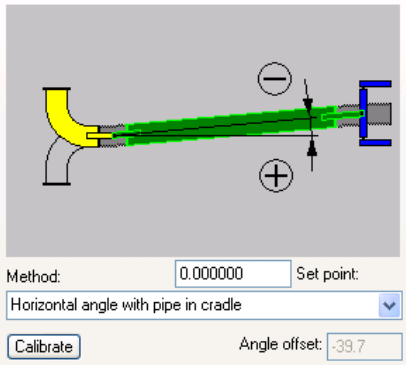

Figure 4-1 Top view of the horizontal angle with the upper pipe in the cradle

1. Place the upper pipe is on deck in the cradle.
2. Enter as 'Set point' the measured horizontal angle. The sign of the angle should be as explained in the figure above.
3. Click on Calibrate to start the horizontal angle calibration of the upper pipe.
4. The horizontal angle calibration is finished after the value in the angle offset box is changed.
5. Continue with the other calibrations or close the Tools Calibration window with OK. The angle offset will only be accepted when the Tools Calibration window is closed with OK.

4.2.2 Upper Pipe – Vertical Angel

At the moment two calibration methods are available for the vertical angle of the upper pipe:

- Pipe on water line
- Vertical angle with pipe in cradle relative vessel

4.2.2.1 Pipe on Water Line

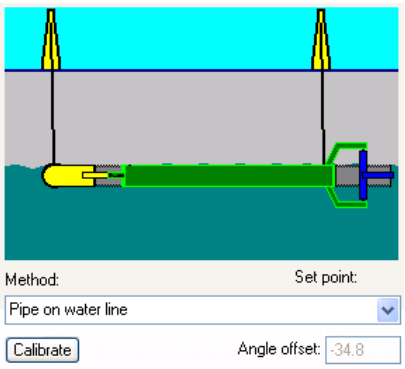

Figure 4-2 Side view of the vertical angle with the upper pipe on the water line

1. Select the calibration method ‘Pipe on water line’.
2. Place the upper pipe horizontal, the best way to do this is by placing the upper pipe on the water line.
3. No ‘Set point’ has to be entered.
4. Click on Calibrate to start the vertical angle calibration of the upper pipe.
5. The vertical angle calibration is finished after the value in the angle offset box is changed.
6. Continue with the other calibrations or close the Tools Calibration window with OK. The angle offset will only be accepted when the Tools Calibration window is closed with OK.

4.2.2.2 Vertical Angle with Pipe in Cradle Relative Vessel

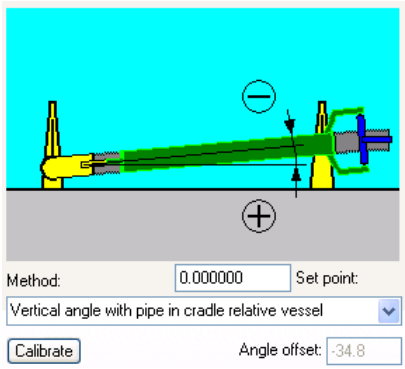

Figure 4-3 Side view of the vertical angle with the upper pipe in the cradle

1. Select the calibration method ‘Vertical angle with pipe in cradle relative vessel’.
2. Place the upper pipe is on deck in the cradle.
3. Enter as ‘Set point’ the measured vertical angle. The sign of the angle should be as explained in the figure above.
4. Click on Calibrate to start the vertical angle calibration of the upper pipe.
5. The vertical angle calibration is finished after the value in the angle offset box is changed.
6. Continue with the other calibrations or close the Tools Calibration window with OK. The angle offset will only be accepted when the Tools Calibration window is closed with OK.

4.2.3 Lower Pipe – Horizontal Angle

At the moment only one calibration method is available for the horizontal angle of the lower pipe:

- Horizontal angle with pipe in cradle

4.2.3.1 Horizontal angle with pipe in cradle

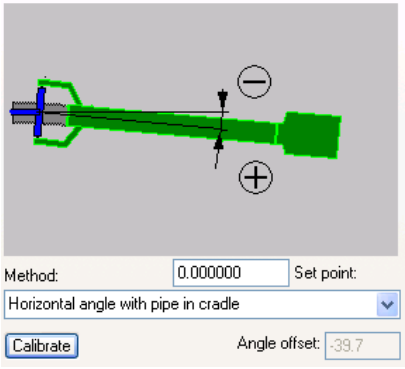

Figure 4-4 Top view of the horizontal angle with the lower pipe in the cradle

1. Place the lower pipe is on deck in the cradle the horizontal angle can be measured.
2. Enter as 'Set point' the measured horizontal angle. The sign of the angle should be as explained in the figure above.
3. Click on Calibrate to start the horizontal angle calibration of the lower pipe.
4. The horizontal angle calibration is finished after the value in the angle offset box is changed.
5. Continue with the other calibrations or close the Tools Calibration window with OK. The angle offset will only be accepted when the Tools Calibration window is closed with OK.

4.2.4 Lower Pipe – Vertical Angel

At the moment two calibration methods are available for the vertical angle of the lower pipe:

- Pipe on water line
- Vertical angle with pipe in cradle relative vessel

4.2.4.1 Pipe on Water Line

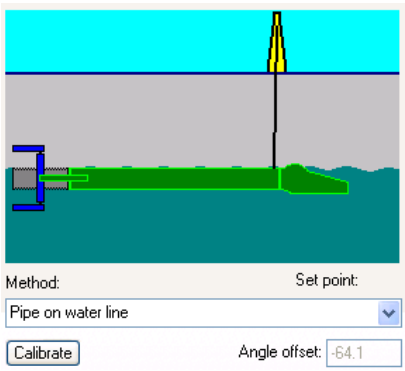

Figure 4-5 Side view of the vertical angle with the lower pipe on the water line

1. Select the calibration method ‘Pipe on water line’.
2. Place the lower pipe horizontal, the best way to do this is by placing the lower pipe on the water line.
3. No ‘Set point’ has to be entered.
4. Click on Calibrate to start the vertical angle calibration of the upper pipe.
5. The vertical angle calibration is finished after the value in the angle offset box is changed.
6. Continue with the other calibrations or close the Tools Calibration window with OK. The angle offset will only be accepted when the Tools Calibration window is closed with OK.

4.2.4.2 Vertical Angle with Pipe in Cradle Relative Vessel

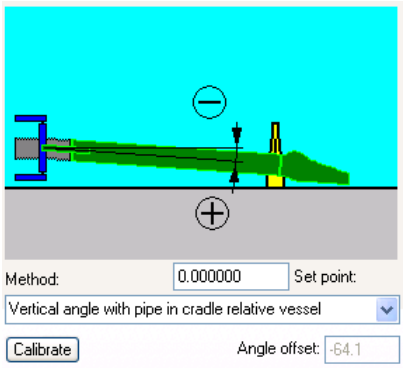

Figure 4-6 Side view of the vertical angle with the lower pipe in the cradle

1. Select the calibration method ‘Vertical angle with pipe in cradle relative vessel’.
2. Place the lower pipe is on deck in the cradle.
3. Enter as ‘Set point’ the measured vertical angle. The sign of the angle should as drawn in the figure above.
4. Click on Calibrate to start the vertical angle calibration of the lower pipe.
5. The vertical angle calibration is finished after the value in the angle offset box is changed.
6. Continue with the other calibrations or close the Tools Calibration window with OK. The angle offset will only be accepted when the Tools Calibration window is closed with OK.

5 Acquisition

5.1 Introduction

See the chapter 'Starting PDS2000' of the PDS2000 User Manual to add a presentation in the configuration.

When the Acquisition is started the default or last used layout will appear on the screen. To modify the layout see 'Layouts' on page 28.

If a Presentation is added in the configuration, it will open simultaneously with the Acquisition. In the Presentation, views can be added and layouts can be saved in the same way as in the Acquisition.

5.1.1 Realtime

The Acquisition in the realtime mode can be started when the project, a vessel configuration and a configuration are created. The Acquisition in the realtime mode can be opened from the Control Center of PDS2000:

- Click on 

in the acquisition bar.
- Click on  in the toolbar.
- Select *Acquisition* > *Start Realtime* from the menu bar.

The Acquisition can be stopped by selecting one of the above mentioned actions again or by closing the Acquisition window.

5.1.2 Logging

In the Acquisition the logging can be switched on and off with:

- The F4-key on the keyboard.
- Click on  in the toolbar.
- (Un)check *Logging* > *Enable Data Logging* from the menu bar.

At the right side in the status bar the logging indicator will be switched between 

(off), 

(conditional off) or 

(on).

The logging can be stopped by selecting one of the above mentioned actions again.

5.2 Layouts

When the Acquisition is started for the first time, it will have only one view.

In the Displays window the necessary views can be added to the layout. There are several ways to open the Displays window:

The context menu can be opened by clicking with the right mouse button in the Acquisition window.

- Select *View* > *Displays* from the menu bar.
- Click on  in the toolbar.
- Select *Displays* in the context menu.

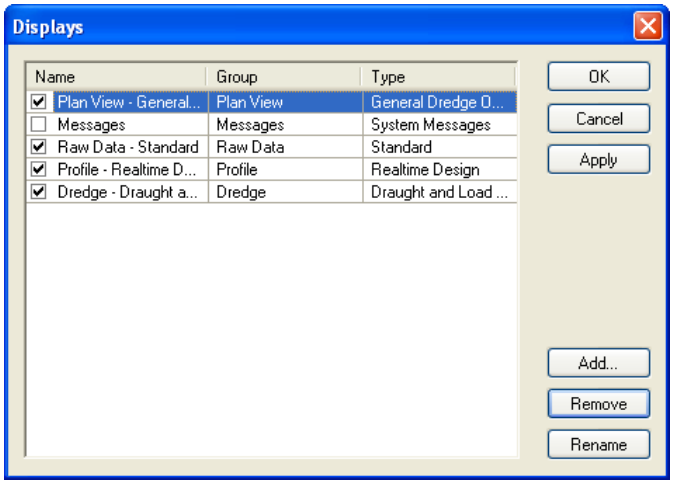

Figure 5–1 The Displays window to add, to switch on/off, to remove or to rename views

Click on  and the Add Display dialog will be opened to select a new view. For more information about the views that can be selected for a trailing suction hopper application see chapter ‘Views’ on page 31.

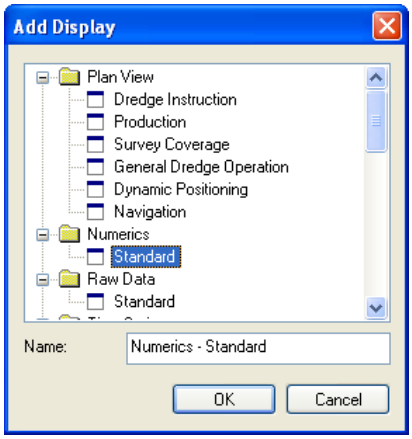

Figure 5–2 Add Display dialog to add a view

In the Displays window the views can be checked on or off. This means that the checked views will be displayed on the screen. The views that are checked off are not removed from the layout file. It only means that these views are not shown on the screen. A view can be removed from the layout file by using  in the Displays window.

There is also a quick method to add displays or views to the layout.

- Select *View* > *Add Display…* from the menu bar.

- Click on in the toolbar.
- Select *Add Display* in the context menu.

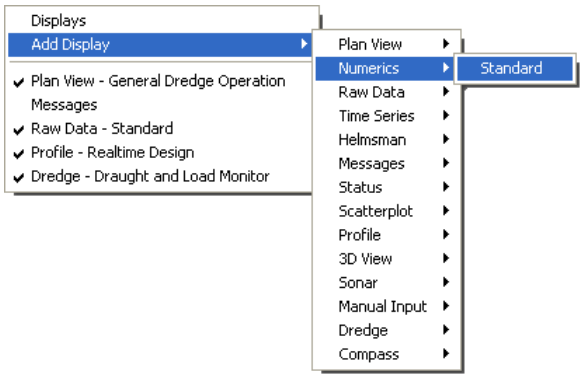

Figure 5–3 Add Display in the context menu

See for an explanation of the docking the chapter 'Using PDS2000 – Docking' in the PDS2000 User Manual.

After all the wanted views are selected and placed in the right place in the Acquisition, with or without docking, the layout can be stored. Use *File* > *Save Layout As…* from the menu bar to save the new layout. To open another layout use *File* > *Open Layout…* from the menu bar and select one of the created layouts.

It is essential to save the layout that has to be used during the survey. If something happens with one of the views, by opening the layout again with *File* > *Open Layout…* the original layout with the right views come back in the Acquisition and the survey can continue with the views open.

5.3 Menu Bar and Toolbar

It is possible in the Acquisition to select several options from the menu bar or the toolbar. Below the useful options will be explained.

Edit > ***Select Tracking Point…*** ()
Select from the list of offsets and computations a tracking point which will be used for the guidance.

Edit > ***Equipment*** ()
The equipment settings of the sensors can be checked or modified, only when logging is off (see page 8).

Edit > ***Computations*** ()
The computations can be checked or modified, only when logging is off.

Edit > ***Manual Input***
Select one of the devices with a manual input option (as selected in the Equipment page) and an input for the selected device can be entered.

View > ***Displays*** ()
The Displays window will be opened. In this window views can be switched on or off. Also views can be added, renamed or removed from the layout (see Figure 5–1 on page 28).

View > ***Add Display…*** ()
The Add Display dialog will be opened. In this dialog views can be added to the layout (see Figure 5–2 on page 28).

View > ***Display Mode***
One of the four display modes for the screen can be selected; normal (), night (), twilight () and bright ().

Guidance > ***Guidance Settings*** ()
The guidance settings can be checked or modified, only when logging is off.

Guidance > ***Select Waypoint…*** ()
Select an existing waypoint as active waypoint for the survey.

Guidance > ***New Waypoint*** ()
Add a new waypoint to the active waypoint file. The new waypoint will be located on the tracking point.

Guidance > ***Update Wayline***
Update the wayline from the vessel to the waypoint.

Guidance > ***Select Work Areas…***
Select one or more existing work areas as guidance in the survey.

Guidance > ***Enter Work Area Names***
Give one or more work areas by typing the names of the work areas. These work areas will be used as guidance in the survey.

Logging > ***Logging Settings*** ()
The Logging page can be checked or modified, only when logging is off (see page 19).

Logging > ***Enable Data Logging*** ()
The data logging can be switched on or off.

Tools > ***Tools Settings***
The Tools page of the configuration will be opened (see page 15). The parameters in the different pages (Production parameters, Trip Registration and Pipe Configuration) can be checked and/or modified.

Tools > ***Tools Calibration***
The Tools Calibration window will be opened, where the suction tube(s) of the trailing suction hopper can be calibrated (see page 21).

Tools > ***Start Next Trip***
The next trip for the trailing suction hopper will be started.

6 Views

6.1 Introduction

In the Acquisition several views can be created to display the relevant information. The minimum should be a Plan View where the vessel with the suction tube(s) is visible, one or more Profile views for a side view of the vessel with a suction tube and a Dredge view for the load and draught calculations.

The views that will be discussed in this chapter are:

- Plan View – General Dredge Operation (see page 32)
- 3D View – Online Dredge (see page 38)
- Profile – Realtime Design (see page 38)
- Dredge – Draught – Load – TDS (see page 46)
- Dredge – Flow/Concentration Meter (see page 48)
- Numerics (see page 49)

For other views, that can be used in the Acquisition, see the chapter 'Views' in the PDS2000 User Manual.

6.2 Plan View – General Dredge Operation

This plan view will show the vessel with the suction tube(s) in a top view with additional information.

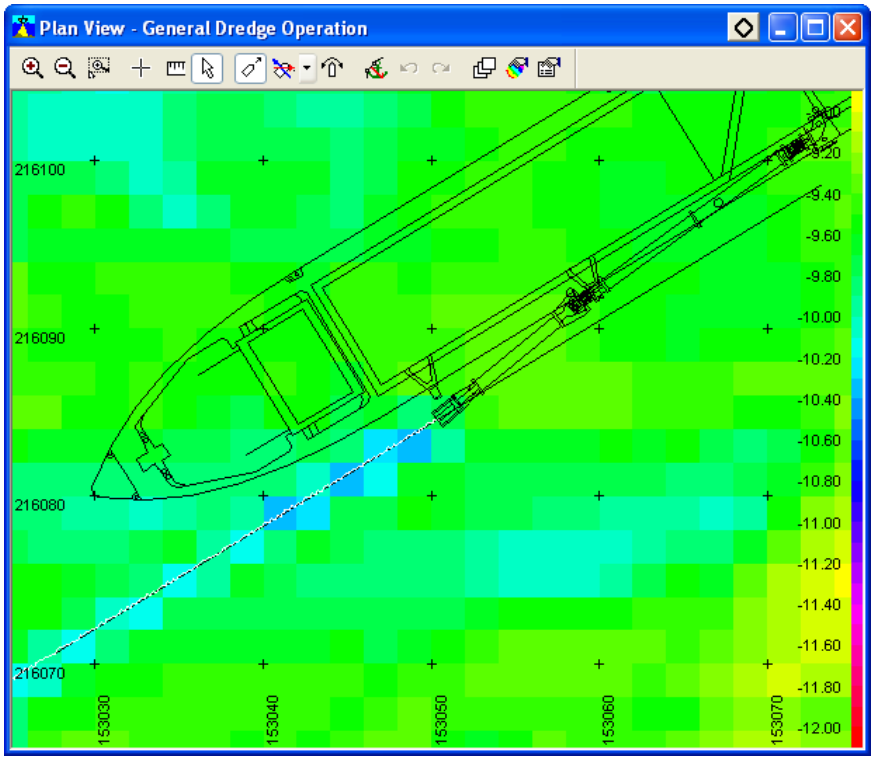

Figure 6-1 Plan View – General Dredge Operation view with orientation mode 'North Up'

When this plan view is created, automatically the active grid model is loaded. The active grid model will be shown in black, because there is no color table selected for the grid model. Click on in the toolbar or select 'Coverage Settings' in the context menu of the plan view to open the Coverage Settings and select the right color table for the grid model (see page 37).

At the moment a dredge layer for the first suction tube is added automatically to the layer control. If a second suction tube is used a second dredge layer has to be added before the suction tube becomes visible in the plan view (see page 36).

6.2.1 Plan View Toolbar

Most of the buttons in the toolbar are available in the context menu or can be defined in the properties of the plan view (see page 35).

Zoom In, Zoom Out (,)
Zoom in or zoom out in the plan view.

Zoom Window ( )
Zoom in by drawing a window in the plan view.

Center Screen ( )
The cursor will change into a cross. Click in the plan view to center on the cursor. Move the cursor to the edges of the plan view, it will change to a diamond and the view starts panning or scrolling. To

deactivate the cursor use the right mouse button. This option only works when the 'Follow Vessel' mode is off.

Measure ( )
To measure distances and bearings in the plan view. On the first use the measure starts at the vessel's tracking point. A mouse click makes the start at any location. The measure window shows start and end coordinates as well as the distance and bearing between the two locations.

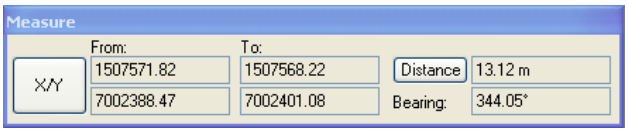

Figure 6-2 Measure window

Click on X/Y to change the presentation from grid to projection coordinates in a selectable format.
A right click stops the measure option.

Interactive Selection ( )
If 'in', it is possible to select items in the plan view with the mouse, for instance the color table bar on the right side.

Follow Vessel ( )
If 'in', the 'tracking point' will always stay in the plan view (in 'Follow Vessel' mode). If 'out', the 'tracking point' can be anywhere, even outside the plan view.
The type of the 'Follow Vessel' mode can be set in the properties of the plan view (see page 35).

Orientation Mode ( )
The orientation mode of the plan view. Three options are available; *North Up*, *Heading Up* and *Fixed Skew*.
North Up is that the plan view is always north up and the vessel will rotate in the plan view. This is the default mode.
Heading Up is that the heading of the vessel is always up. In this mode when the vessel rotates, all the data in the plan view will rotate accept the vessel.
Fixed Skew is that the plan view has a fixed orientation. The fixed value can be set so that the vessel is always looking up with fluctuation to the left and right. The data in the plan view is steady and the vessel will rotate.

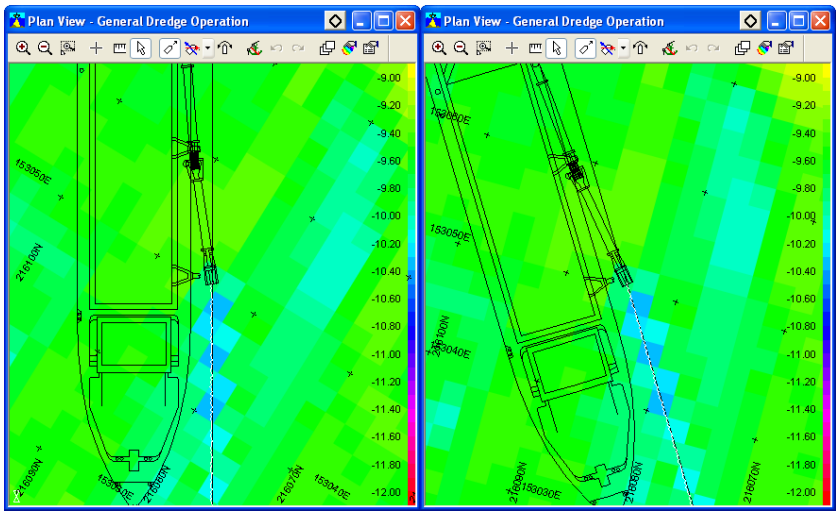

Figure 6-3 Plan View with orientation mode Heading Up (left) and Fixed Skew (right)

Set Fixed Skew From Heading ( )
Click on this button if the actual heading of the vessel has to be the orientation in the plan view. Select then as 'Orientation Mode' the *Fixed Skew* mode and the orientation of the plan view will change with the heading of the vessel looking up. If the vessel starts moving the orientation of the view is fixed.

Edit Mode ( )
If checked or 'in', it is possible to modify the routes and clipping polygons and to add or edit the user maps objects. For information about the edit mode and the user maps see the chapter 'Views – Plan View – Toolbar and Context Menu' in the PDS2000 User Manual.

Undo ( )
Will reverse the last action done in the edit mode.

Redo ( )
Only active after an *Undo* and will reverse the last undo action of the edit mode.

Layer Control ( )
Opens the Layers of the plan view with an overview of the background and foreground layers that are used in the plan view (see page 36).

Coverage Settings ( )
Opens the Coverage Settings for the settings of the color tables for the active grid model and active grid model difference (see page 37).

Properties ( )
Opens the Properties of the plan view with some extra settings for the 'Follow Vessel' mode and the 'Orientation Mode' (see below).

6.2.2 Plan View Properties

Click on  in the toolbar or select 'Properties' in the context menu to open the Properties of the plan view.

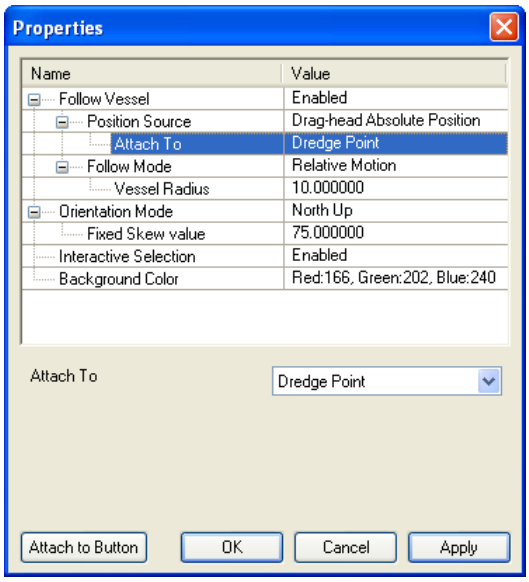

Figure 6-4 The Properties of the Plan View – General Dredge Operation view

Follow Vessel
Enabled; the 'Position Source' (tracking point) on the vessel will always stay in the plan view (in 'Follow Vessel' mode).
Disabled; the 'Position Source' (tracking point) on the vessel can be anywhere, even outside the plan view.

Position Source
Any position computation can be selected as 'tracking point' on the vessel for the 'Follow Vessel' mode.

Attach To
If the 'Position Source' is 'Drag-head Absolute Position' then there will be two options that are useful as attach point.
Dredge Point; the position of the suction head will be followed.
Sensor Reference Point; the position of the attach point of the bend with the vessel (the inlet) will be followed.
For all other position sources the attach point will be set by default to the right point.

Follow Mode
The 'Follow Vessel' mode is by default *Relative Motion*; the 'tracking point' on the vessel will always be displayed in the center of the plan view.
The other option is *True Motion*; the 'tracking point' will not stay in the center of the plan view and the plan view will be updated when the 'tracking point' is nearly leaving the view.

Vessel Radius
The minimum distance from the 'tracking point' on the vessel to the edge of the plan view before the display of the plan view will be updated.
This is only valid if the 'Follow Mode' is *True Motion*.

Orientation Mode
The three modes are *North Up*, *Heading Up* and *Fixed Skew*. See for an explanation of the modes in 'Plan View Toolbar' on page 33.

Fixed Skew Value
Give the skew for the plan view if the 'Orientation Mode' is set on *Fixed Skew*.

Interactive Selection
Enabled; it is possible to select items in the plan view with the mouse.

Background Color
The background color of the plan view can be set.

6.2.3 Plan View Layers

The layers can be used to add extra information to the plan view.

Click on in the toolbar or select 'Layer Control' in the context menu to open Layers. In Layers only the used layers will be displayed; new layers can be added if data has to be shown in the plan view. To add data to a new or an existing layer click on Add..., select one of the layers from the list in Add Layer and edit the properties of that selected layer.

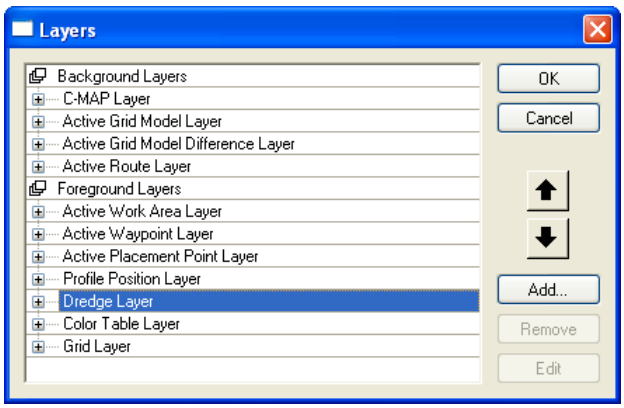

Figure 6-5 The Layers of the Plan View – General Dredge Operation view

Below only the relevant layers for a trailing suction hopper application will be explained. Most of these layers are already filled when the plan view is created.

Background Layers:

Active Grid Model Layer
This layer shows the grid model which is selected in the logging page.

Both active layers are overlapping each other. Make a choice which active layer to show in the plan view.

Active Grid Model Difference Layer
This layer shows the difference between the active grid model and the design model. Add an active grid model difference layer if the user wants to see the differences between the two models.

If for both active layers another active grid model has to be used, select *Logging* > *Logging Settings* from the Acquisition menu bar or click on in the Acquisition toolbar and change the grid model name.

The design type and name of the design model is the same as the specified model in the guidance page. If this is not the right one, select *Guidance* > *Guidance Settings* from the Acquisition menu bar or click on in the Acquisition toolbar and change the design model name in the tab Design Model.

For both active layers a color table has to be selected. This can be done in the layers, but the best way is to use the Coverage Settings (see below).

Foreground Layers:

Dredge Layer
This layer will show a suction tube as it is configured in the Pipe Configuration (see page 17). Two dredge layers have to be added to the layer control if two suction tubes are used.
In the properties of the second dredge layer the shape layer for the vessel has to be *Disabled*, otherwise two vessels are displayed in the view.

Color Table Layer
This layer will show the color table that is selected in the Coverage Settings (see below) for the grid model or the grid model difference. This layer is automatically filled when the color table is selected in the Coverage Settings and the option 'Show color table' is checked.

Numerics Layer
This layer will display the value of a data item in the top or bottom of the plan view. For each data item a separate layer has to be created.

6.2.4 Coverage Settings

Click on  in the plan view toolbar or select 'Coverage Settings' in the context menu of the plan view to open the Coverage Settings.

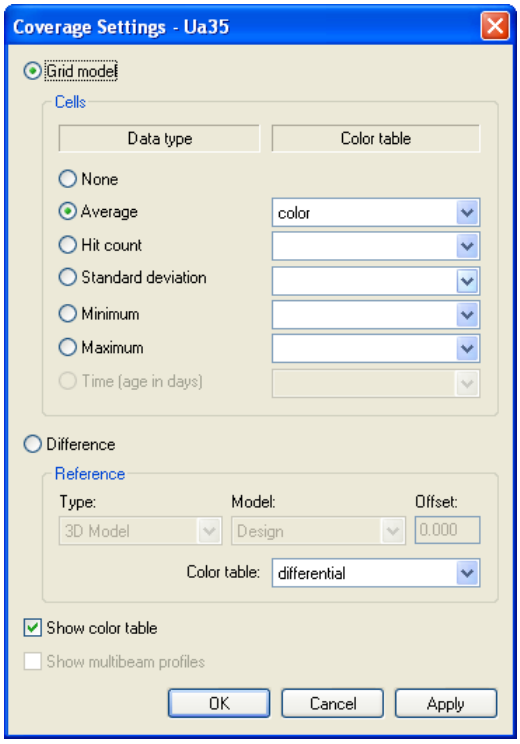

Figure 6-6 The Coverage Settings for the plan view

If a grid model has to be shown in the plan view, check the option *Grid model* on top of the window. Check then under *Grid model* the data type of the grid model that has to be shown in the plan view. This data type has to be available in the active grid model. Select the right color table for that data type.

If a grid model difference has to be shown in the plan view, check the option *Difference* and select the right color table.

With the Coverage Settings is it easy to switch between the active grid model and the active grid model difference in the plan view. Check one of the two options and the settings in the Layers are automatically updated.

Check the option *Show color table* if the user wants to show the color table of the selected option, *Grid model* or *Difference*, on the right hand side of the plan view.

6.3 3D View – Online Dredge

If 3D DXF wireframes or 3D Studio models are available from the hopper and the suction tube(s), a 3D View – Online Dredge can be used to show the hopper in 3D with an 3D active grid model.

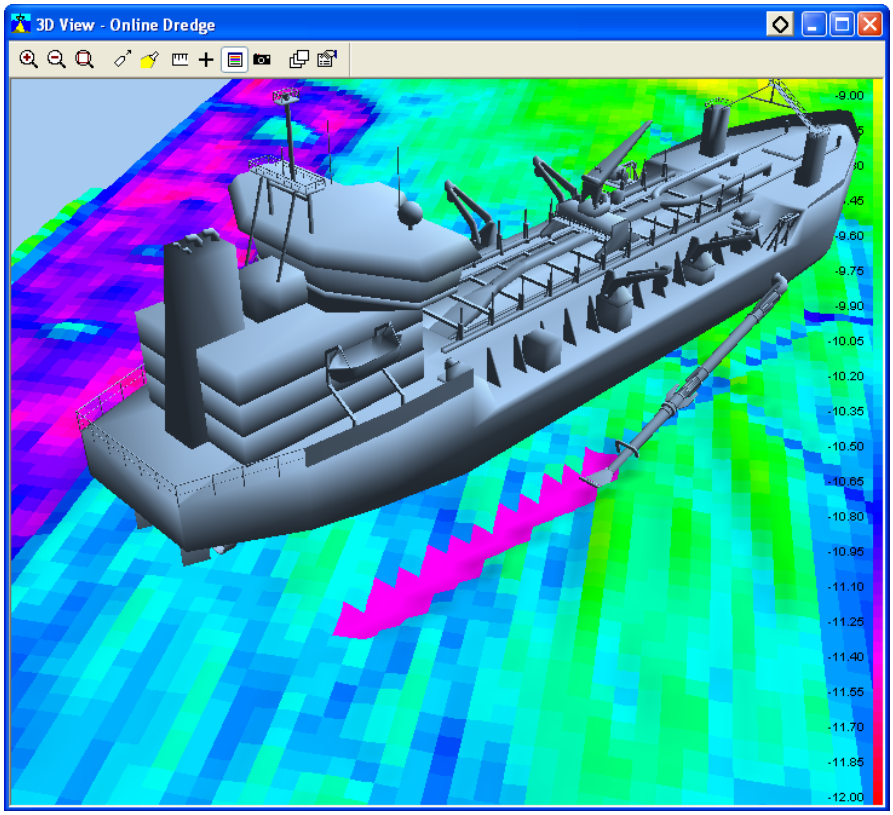

Figure 6-7 The 3D View – Online Dredge with the 3D studio models of the hopper and the suction tube

6.3.1 3D View Toolbar

Most of the buttons in the toolbar are available in the context menu or can be defined in the Properties of the 3D view (see page 40).

Zoom In, Zoom Out (,)
Zoom in or zoom out in the 3D view.

Zoom Extents ( )
Show all the data in the 3D view.

Follow Vessel ( )
If 'in' the 'tracking point' will always stay in the 3D view (in 'Follow Vessel' mode). If 'out' the 'tracking point' can be anywhere, even outside the plan view.

The type of the 'Follow Vessel' mode can be set in the Properties of the 3D view (see page 40).

Show Spotlight ( )
If 'in' the spotlight window will be displayed in the 3D view. By moving the yellow dot in the circle the light source can be changed.

Measure ( )
To measure distances and bearings in the plan view. The measure starts always at the vessel's tracking point. The measure window shows start and end coordinates with the altitude (depth) as well as the distance, bearing and elevation between the two locations.

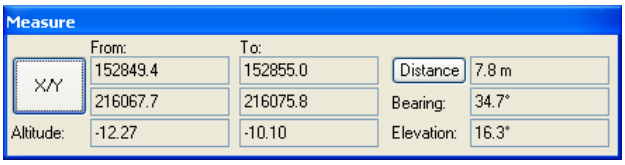

Figure 6-8 Measure window in 3D view

Click on X/Y to change the presentation from grid to projection coordinates in a selectable format.
A right click stops the measure option.

Grid Axis Layer ( )
If 'in' the coordinate axis system is shown in the center of the view.

Color Table Layer ( )
If 'in' the color table will be displayed on the right side in the 3D view. The color table will only be displayed when in the Properties a color table is selected (see below).

Save Snapshot ( )
An image of the 3D View – Online Dredge will be saved as a BMP file.

Layer Control ( )
Opens the Layers of the 3D view with an overview of the foreground layers that are used in the view (see page 41).

Properties ( )
Opens the Properties of the 3D view with some extra settings for the 'Follow Vessel' mode and for the color table (see below).

6.3.2 3D View Properties

Click on  in the toolbar or select 'Properties' in the context menu to open the Properties of the 3D view.

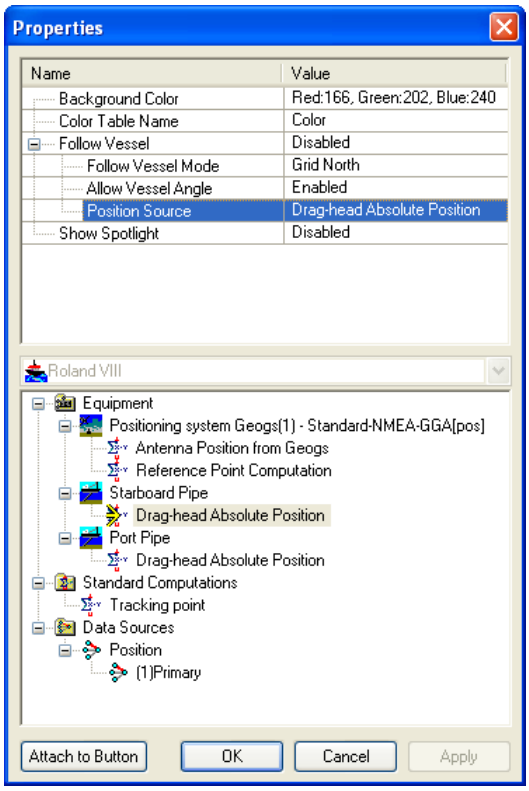

Figure 6-9 The Properties of the 3D View – Online Dredge

Background Color
The background color of the 3D view can be set.

Color Table Name
Select the name of the color table that will be used to display the data in the 3D view.

Follow Vessel
Enabled; the 'Position Source' (tracking point) on the vessel will always stay in the 3D view (in 'Follow Vessel' mode).
Disabled; the 'Position Source' (tracking point) on the vessel can be anywhere, even outside the 3D view.

Follow Vessel Mode
If the option 'Follow Vessel' is *Enabled*, this mode will define how the view will follow the 'Position Source'.
Grid North will show the data with a fixed orientation, although the user can rotate the view. The vessel will rotate.
Vessel North will show the vessel with a fixed orientation, although the user can rotate the view. The grid model data will rotate.

Allow Vessel Angle
This option is only valid when the option 'Follow Vessel' is *Enabled* and the 'Follow Vessel Mode' is *Vessel North*.
Enabled; the orientation of the vessel can be modified.
Disabled; the orientation of the vessel in the view is always up.

Position Source
Any position computation can be selected as 'tracking point' on the vessel for the 'Follow Vessel' mode.

Show Spotlight
Enabled; the spotlight window will be displayed in the view.

6.3.3 3D View Layers

The layers can be used to add extra information to the 3D view.

Click on in the toolbar or select 'Layer Control' in the context menu to open Layers. In Layers only the used layers will be displayed; new layers can be added if data has to be shown in the plan view. To add data to a new or an existing layer click on Add..., select one of the layers from the list in Add Layer and edit the properties of that selected layer.

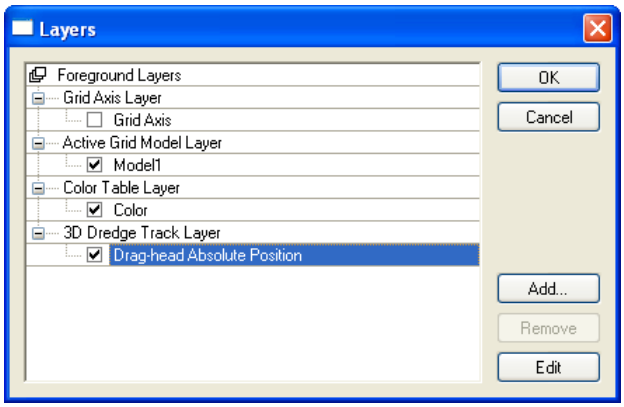

Figure 6-10 The Layers of the 3D View – Online Dredge

Below only the relevant layers for a trailing suction hopper application will be explained. Most of these layers are already filled when the plan view is created.

Foreground Layers:

GridAxis Layer
This layer displays the coordinate axis in the center of the view.

Active Grid Model Layer
This layer shows the grid model which is selected in the logging page.

Color Table Layer
This layer will show the color table that is selected in the Properties (see above).
This layer is automatically filled when the color table is selected in the Properties and the button 'Color Table Layer' ( ) is 'in'.

3D Dredge Track Layer
This layer can show the suction tube(s) and the vessel as wireframes or as 3D Studio models. The bend, the upper pipe, the lower pipe and the suction head has to be available as separate wireframes or models to have a real animation of the working situation.
Select in the properties of the layer for the Dredge Tool Absolute Computation the Drag-head Absolute Position of the suction tube that has to be tracked. Select for the 3D objects first the suction head, then the lower pipe, the upper pipe, the bend and as last 3D object the vessel.

6.4 Profile – Realtime Design

This view will show the vessel with one of the suction tubes as a side view with additional information.

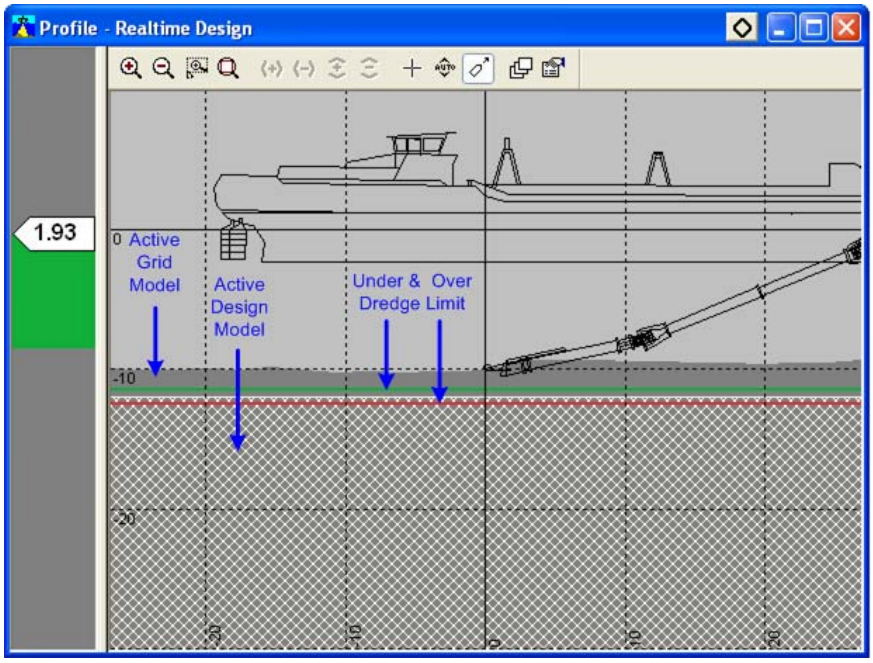

Figure 6-11 Profile – Realtime Design view with a right view of the vessel, a starboard suction tube, an active grid model and a design model

6.4.1 Profile Toolbar

The buttons of the toolbar are also available in the context menu of the profile view.

Zoom In, Zoom Out ( )
Zoom in or Zoom out in the profile view.

Zoom Window ( )
Zoom in by drawing a window in the profile view.

Zoom Extents ( )
Show all the data in the profile view.

Horizontal Zoom In and Horizontal Zoom Out ( )
The display in the profile view can be zoomed in or out only in the horizontal direction of the view.
These two buttons are only available when in the properties of the profile view the option 'Scale Mode' is set on *Fixed Vertically* or on *Scale Freely* (see page 44).

Vertical Zoom In and Vertical Zoom Out ( )
The display in the profile view can be zoomed in or out only in the vertical direction of the view.
These two buttons are only available when in the properties of the profile view the option 'Scale Mode' is set on *Fixed Horizontally* or on *Scale Freely* (see page 44).

Center Screen ( )
The cursor will change into a cross. Click in the profile view to center on the cursor. Move the cursor to the edges of the view, it will change

to a diamond and the view starts panning or scrolling. To deactivate the cursor use the right mouse button. This option only works when the 'Follow Vessel' mode is off.

Vertical Auto Ranging ( )
If 'in', a vertical zoom extents is active.

Follow Vessel ( )
If 'in', the attach point selected in the properties (see page 43) will always be located in the center of the view.

Layer Control ( )
Opens the Layers of the profile view with the overview of the foreground layers that are used in the profile view (see page 44).

Properties ( )
Opens the Properties of the profile view with some extra settings for the 'Follow Vessel' mode and the 'Scale Mode' (see below).

6.4.2 Profile Properties

Click on in the toolbar or select 'Properties' in the context menu to open the Properties of the profile view.

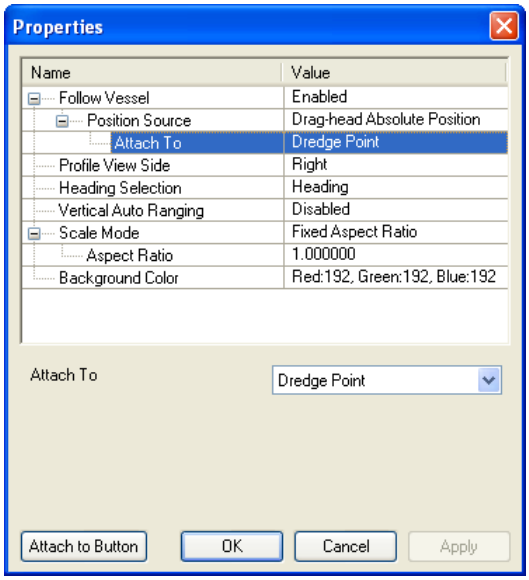

Figure 6-12 The Properties of the Profile – Realtime Design view

Follow Vessel
If *Enabled*, the selected attach point will always be located in the center of the view.

Position Source
This position source has to be 'Drag-head Absolute Position'.

Attach To
Dredge Point; the end of the suction head will be followed.
Sensor Reference Point; the attach point of the bend with the vessel (the inlet) will be followed.

Profile View Side
For a profile view four different view sides can be selected; *Left* side, *Right* side, *Front* and *Back* of the vessel with the suction tube(s). The selected side view has to be created in the Geometry page of the vessel configuration (see page 5).

Heading Selection
The heading selection has to be *Heading*.

Vertical Auto Ranging
If *Enabled*, a vertical zoom extents is active.

Scale Mode
The display of the profile view has different scaling options; *Fixed Aspect Ratio*, *Fixed Vertically*, *Fixed Horizontally* and *Scale Freely*.
With *Fixed Aspect Ratio*, the ratio between the horizontal and the vertical scale is fixed. After using one of the zoom functions the ratio between horizontal and vertical scale will stay the same.
With *Fixed Vertically* the vertical scale is fixed and the horizontal scale will change after the use of one of the zoom functions ( ).
With *Fixed Horizontally* the horizontal scale is fixed and the vertical scale will change after the use of one of the zoom functions ( ).
With *Scale Freely* the horizontal and vertical scale can be changed separately with one of the zoom functions (and).

Aspect Ratio
This is the ratio between the horizontal and vertical scale used in the profile view. An aspect ratio of 1 indicates that the horizontal scale is the same as the vertical scale.
With an aspect ratio >1 the information in horizontal direction will be compressed and with an aspect ratio <1 the information in vertical direction will be compressed.

Background Color
The background color of the profile view can be set.

6.4.3 Profile Layers

For the left panel and the graphics of the profile view, a separate layer control is available.

6.4.3.1 Graphics of the Profile

Click on in the toolbar or select 'Layer Control' in the context menu to open Layers. In Layers only the used layers will be displayed; other layers can be added if data has to be shown in the profile view. To add data to a new or an existing layer click on Add..., select one of the layers from the list in the Add Layer dialog and edit the properties of that selected layer.

Only the relevant layers for the trailing suction hopper application will be discussed.

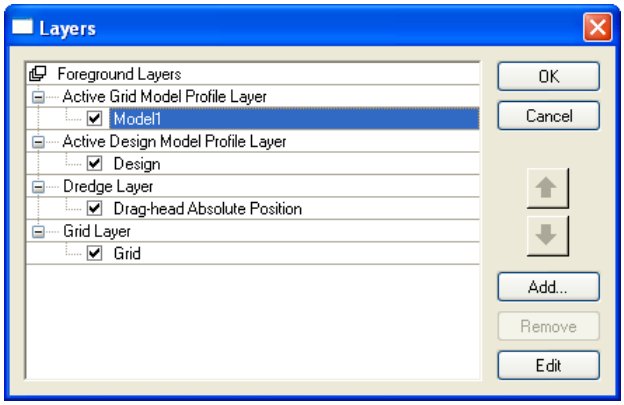

Figure 6-13 The Layers of the Profile – Realtime Design view

Select Guidance > Guidance Settings in the menu bar of the Acquisition and add in the tab Design Model the values for the under and over dredge limit.

Active Grid Model Profile Layer
This layer shows the grid model which is selected in the logging page.

Active Design Model Profile Layer
This layer shows the profile of the design model which is created in the guidance.
It is also possible to show an under and over dredge limit in the profile view (see Figure 6-11 on page 42). By default the dredge limits will be displayed with a default color. In the properties of the Active Design Model Profile Layer the dredge limits can be switched on/off and the color can be changed.

Dredge Layer
This layer shows the vessel with selected suction tube ('Drag-head Absolute Position'). If two suction tubes are used, only in the front or back view both two suction tubes can be shown.
It is also possible to open two profile views to display both suction tubes in a side view, one with a right view and one with a left view.

Numerics Layer
This layer will display the value of a data item in the top or bottom of the profile view. For each data item a separate layer has to be created.

6.4.3.2 Left Panel of the Profile

It is possible to show an up/down indicator in the left panel of the profile view (see Figure 6-11 on page 42). Click with the right mouse button in this panel, select 'Layer Control' in the context menu and select the Up Down Indicator.

Click on Edit and select for the 'Up/Down Source Item' the computation 'Design Difference' (in 'Drag-head Absolute Position') to show the difference between the end of the suction head and the Z-value of the design model.

Another option is to select the computation 'Absolute Z Dredge Head(1)' to show the depth of the end of the suction head.

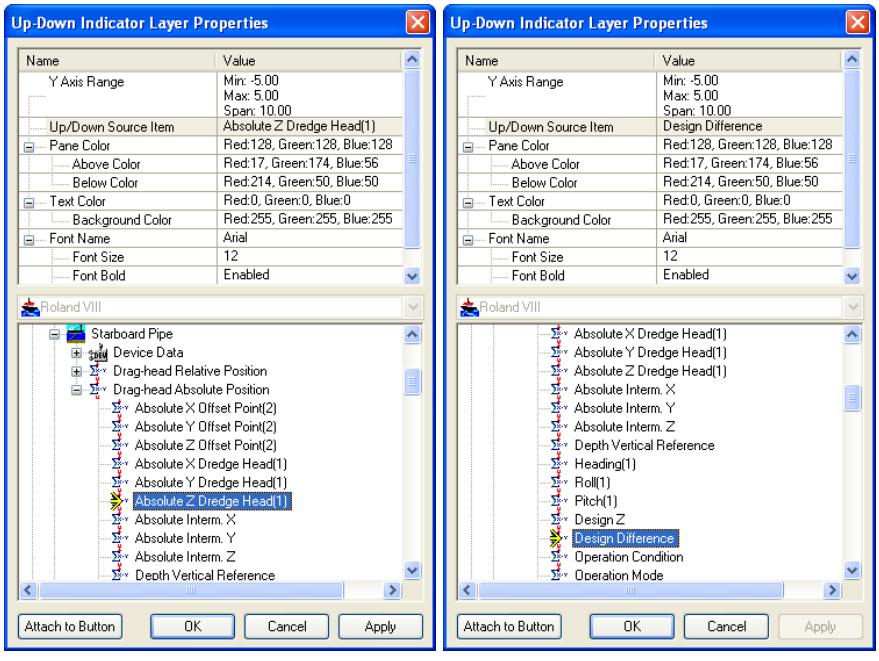

Figure 6-14 Properties of the Up Down Indicator with the two possible computations

6.5 Dredge – Draught – Load – TDS

This view will give the draught, load and Tons Dry Solid information in a time based editor in combination with a numerics view.

If no hopper sensors are used, so no tons dry solid can be calculated, then there is also a stripped view with only the draught and load information. This view is called ‘Dredge – Draught – Load’.

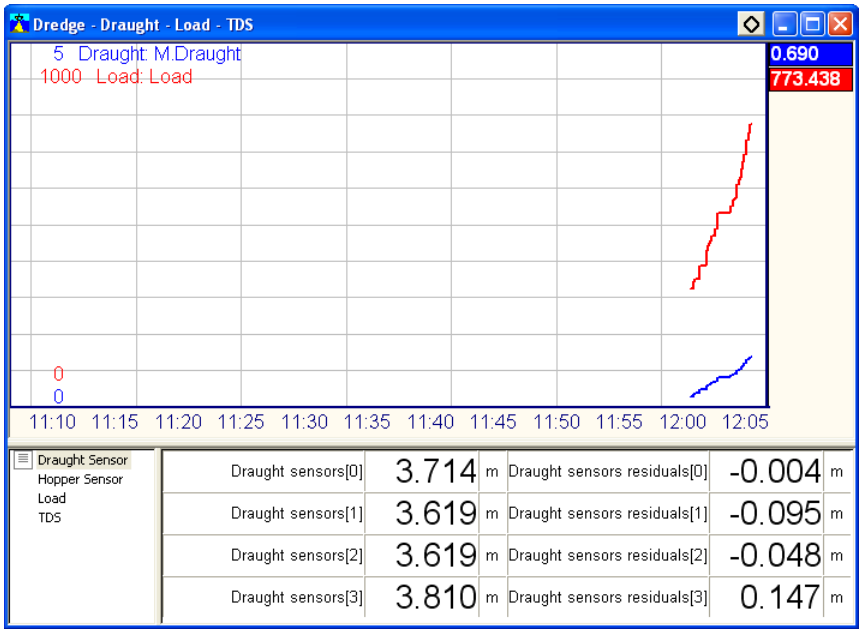

Figure 6-15 Dredge – Draught – Load – TDS view with 4 draught sensors

By default are in the time based editor the mean draught and the load selected. In the numerics part of the view are four pages by default defined; Draught Sensor, Hopper Sensor, Load and TDS (see below). For the ‘Dredge – Draught – Load’ view only the Draught Sensor and Load pages are defined.

In the time based editor a context menu is available to setup the editor or to add extra items to the editor. In the context menu the options Add Channel, Layer Control and Properties are available.

The items in the four different pages of the numerics part will be explained below. In the numerics part context menus are available to modify the pages (see the Numerics view on page 49 for details).

6.5.1 Draught Sensor

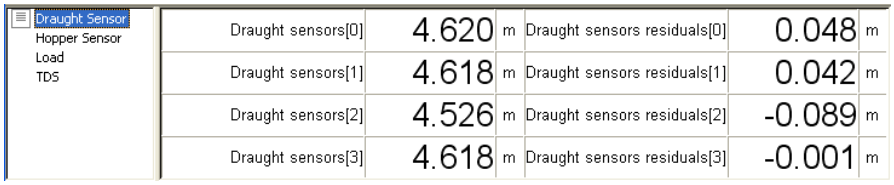

Figure 6-16 The draught sensors with their residuals

In this example are four draught sensor mounted on the vessel. The draught sensor values as displayed in this page are corrected for the water density. Through the corrected draught values (also corrected for the offsets) a plane will be calculated, which will results in a mean

draught. The residuals are then the difference between the calculated plane and the corrected draught values. The plane will become the horizontal level of the vessel.

When only two sensors are used no plane can be calculated, so there are no residuals. For three sensors a plane can be calculated, but the plane goes always through the three points, so there are no residuals. The residuals will be calculated with four or more draught sensors.

6.5.2 Hopper Sensor

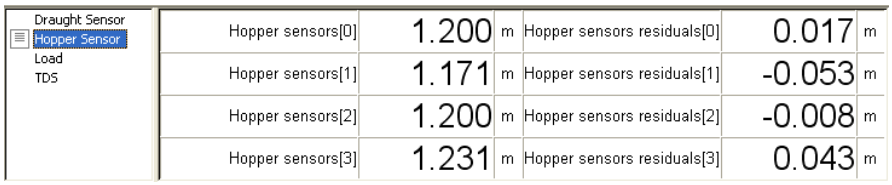

Figure 6-17 Hopper sensors with their residuals

In this example are four hopper (level) sensors mounted on the vessel. The hopper sensors are mounted in or on top of the bunkers to measure the amount of dredged material. With use of the hopper table in the Production parameters page of the Tools (see page 15) the volume of the dredge material in the bunkers can be calculated.

The residuals and the mean hopper level are calculated the same way as for the draught sensor (see above).

6.5.3 Load

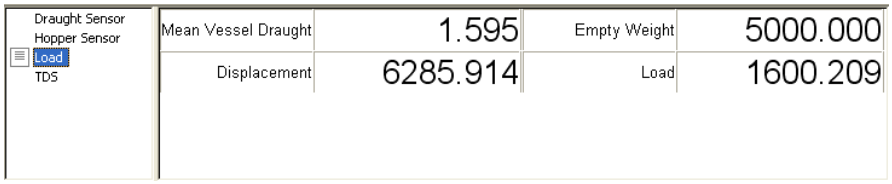

Figure 6-18 Load page

Mean Vessel Draught
The mean vessel draught as calculated from the draught sensors (see above).

Empty Weight
This is the Empty Ship Weight as entered in the Production parameters page of the Tools (see page 15).

Displacement
This is the displacement as is calculated from the draught table in the Production parameters page of the Tools (see page 15).

Load
The load is the difference between the displacement and the empty weight. Before the load is calculated the displacement is corrected for the water density.
Load = (Displacement x Water Density) – Empty Weight

6.5.4 TDS

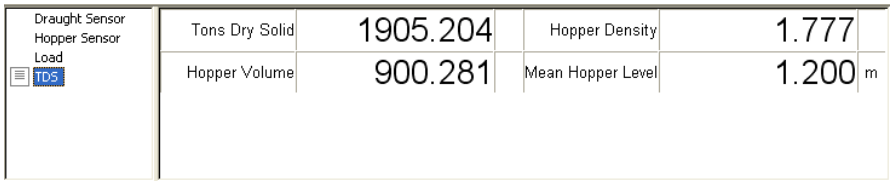

Figure 6-19 TDS page

Tons Dry Solid
The tons dry solid (TDS) is calculated from the water density (ρw), the product density (ρp), the hopper density (ρh) and the hopper volume (V) with the formula:
TDS = {(ρh – ρw) / (ρp – ρw)} x ρp x V

Hopper Density
The hopper density is calculated from the load and the hopper volume.
Hopper Density = Load / Hopper Volume.

Hopper Volume
This is the volume as it is calculated from the hopper table in the Production parameters page of the Tools (see page 15).

Mean Hopper Level
The mean hopper level as calculated from the hopper sensors (see above).

6.6 Dredge – Flow/Concentration Meter

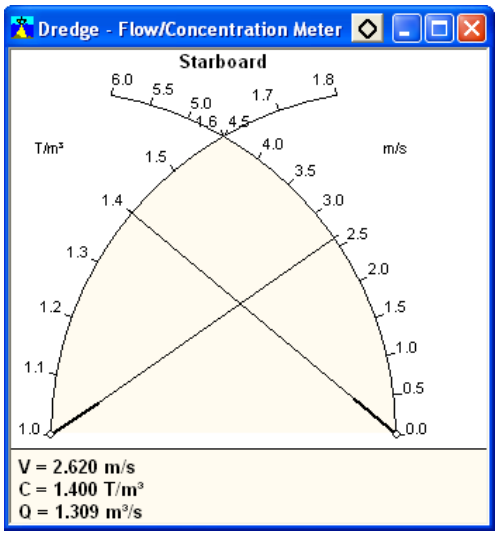

Figure 6-20 Dredge – Flow/Concentration Meter view with the information of the starboard suction tube

This view displays the velocity (V) and the density (C) of the dredge production. With these two values the production (Q) can be calculated. The view can only display information if in the Equipment page a 'Dredge Production' device is selected (see page 10).

The production is presented in the view as the crossing between the two needles. In principal how higher the crossing of the two needles the higher the production is. The production is also depending on the pipe

diameter of the suction tube. This pipe diameter can be set in the properties of the Dredge Positioning System (see page 10).

By default this view has two meters in the view, one for port and one for starboard. In the properties of the context menu one meter can be switched off (disabled) and the range of the meters can be adjust.

6.7 Numerics

This view will show the relevant data as alpha numeric values.

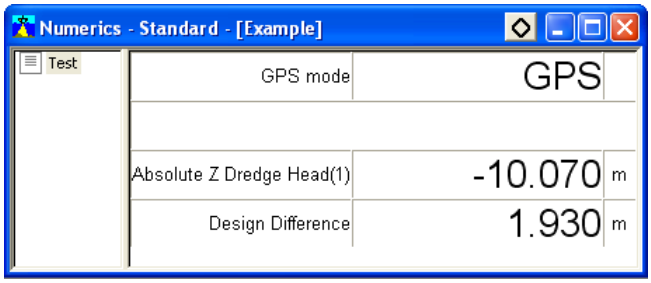

Figure 6-21 Numerics view

This view is empty when it is opened for the first time. Click with the right mouse button in the left panel of the view and select ‘Add New Page’ to add a name for the page. Because the view has no name yet, a dialog will be opened where a new name can be entered.

Click with the right mouse button in the right panel and select ‘Edit Page’ and select in the numerics page configuration the data that have to be shown in the Numerics view.

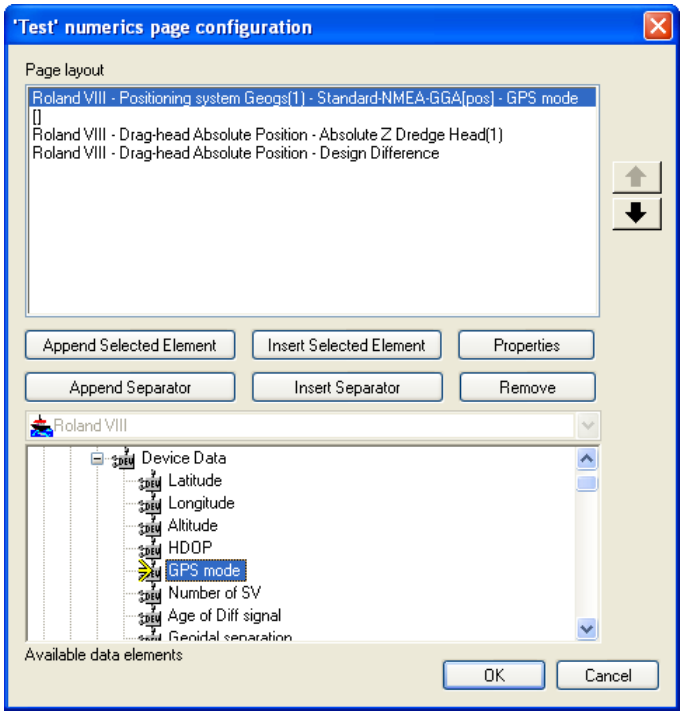

Figure 6-22 Numerics page configuration to select data for the Numerics view

Select one of the available data elements at the bottom of the window and click on Append Selected Element to add this data element from a device or

computation to the page. With Insert Selected Element the selected data element can be added between the selected items in the page layout.

With Insert Separator a separation can be added between the selected items, while with Append Separator a separation can be added below the last selected item in the page layout.

Select a separation and click on Properties to add text to the separation. With this option headers can be made between the selected items. It is also possible to change the color, background, font and font size.

With Remove a data element or separation in the page layout can be removed.

In the Numerics view the font, the background, etc. can be changed by selecting the option ‘Properties’ from the context menu. Double clicking on an item in the Numerics view gives also the possibility to change the color, the font and font size of that item.

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