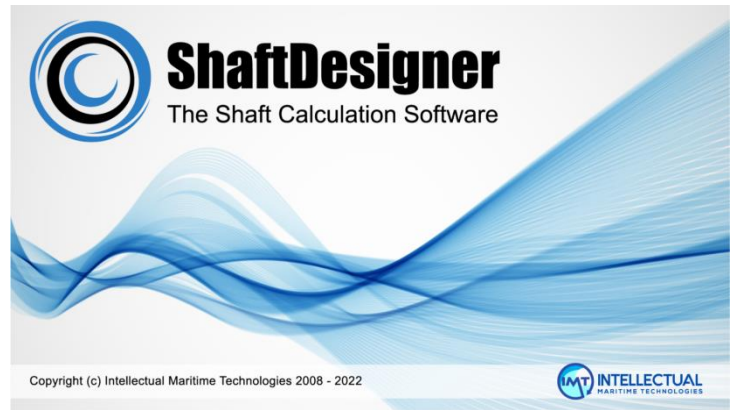


ShaftDesigner 1.10.0 Released

This article highlights the benefits of the next ShaftDesigner major update with a brand-new Graphical User's Interface (GUI). ShaftDesigner 1.10 family main differences compared to the previous version and new features are demonstrated. [Video related to this topic is also available.](#)

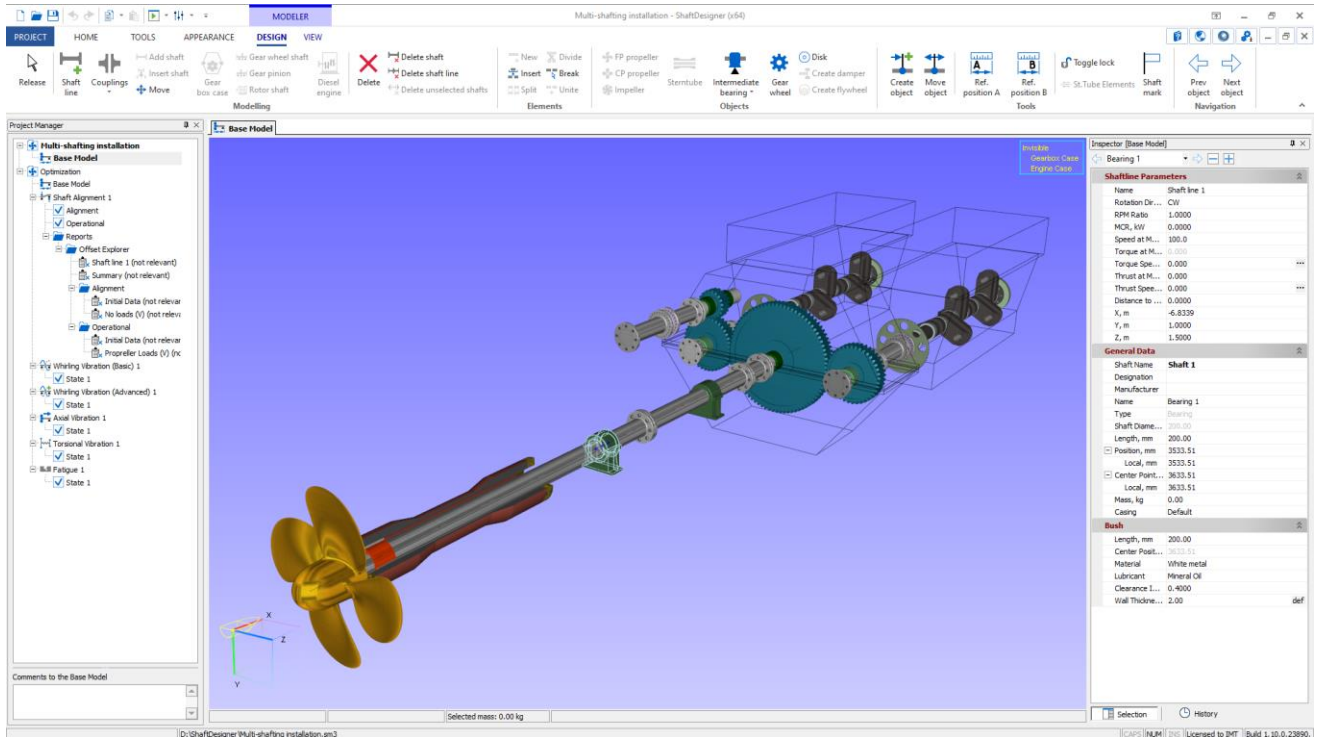


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1. Introduction

For the last 30 years, Intellectual Maritime Technologies have been supplying engineers around the world with high-quality software for marine propulsion shafting alignment and vibration calculations. This time we release the significant update of ShaftDesigner to the 1.10 version. This several years work has resulted in the User's Interface update as well as the new unique features added. This is a step forward to provide a comfortable working environment for the user and increase productivity.



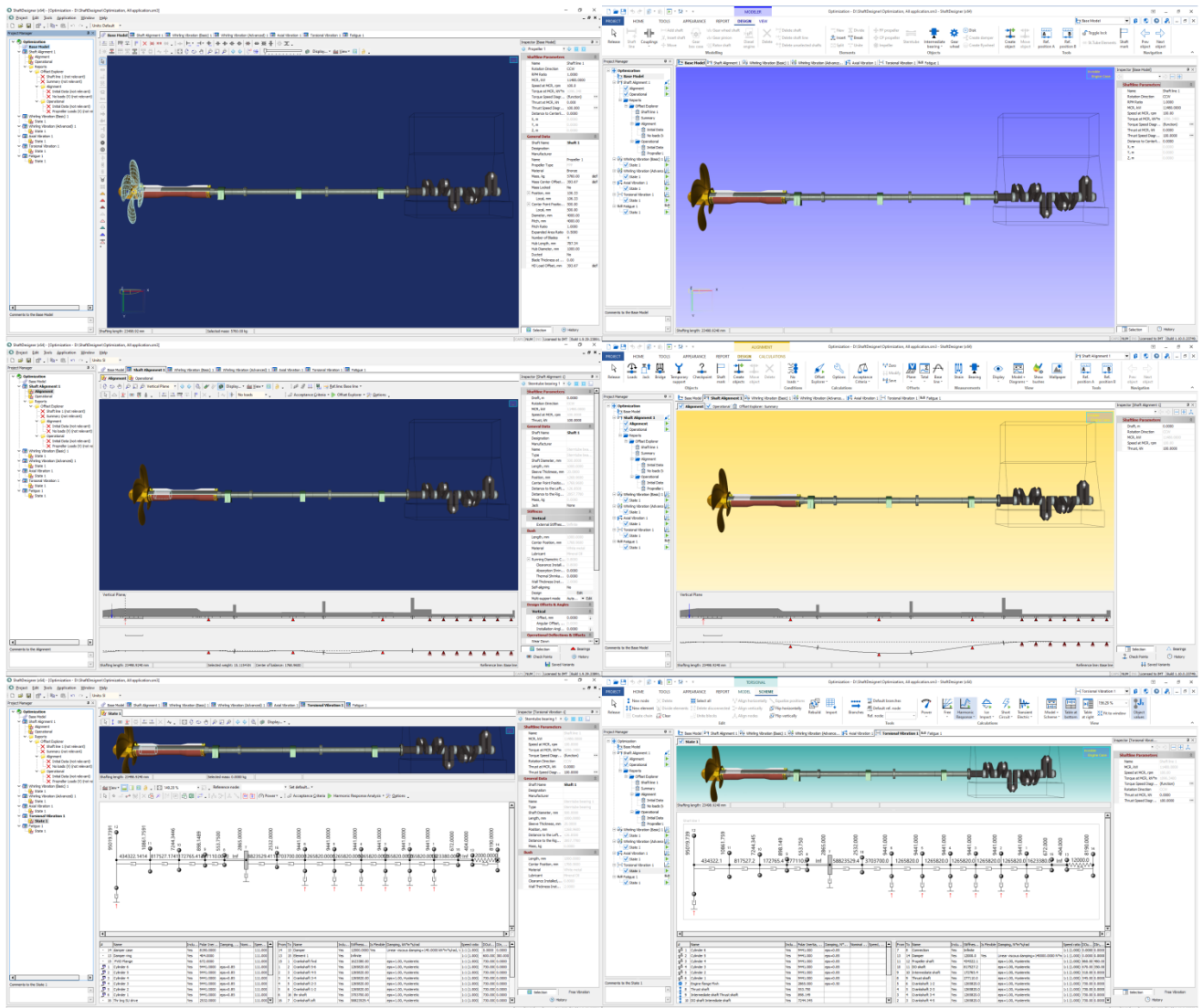
The new interface is based on the ribbon concept, similarly to the modern office and engineering software GUIs. The ribbon at the top groups the buttons and controls conveniently for the user. The new interface contains all the features familiar to experienced users of ShaftDesigner. The beginners will speed up the learning process because now it becomes much easier to find the necessary features.

2. Changes

Let's have a look at the main differences in the User's Interface. The look and feel of the graphical user's interface were redesigned significantly, however the main idea of the software is still the same. Specifically, ribbon toolbars, gradient background, more relevant modern icons' style.

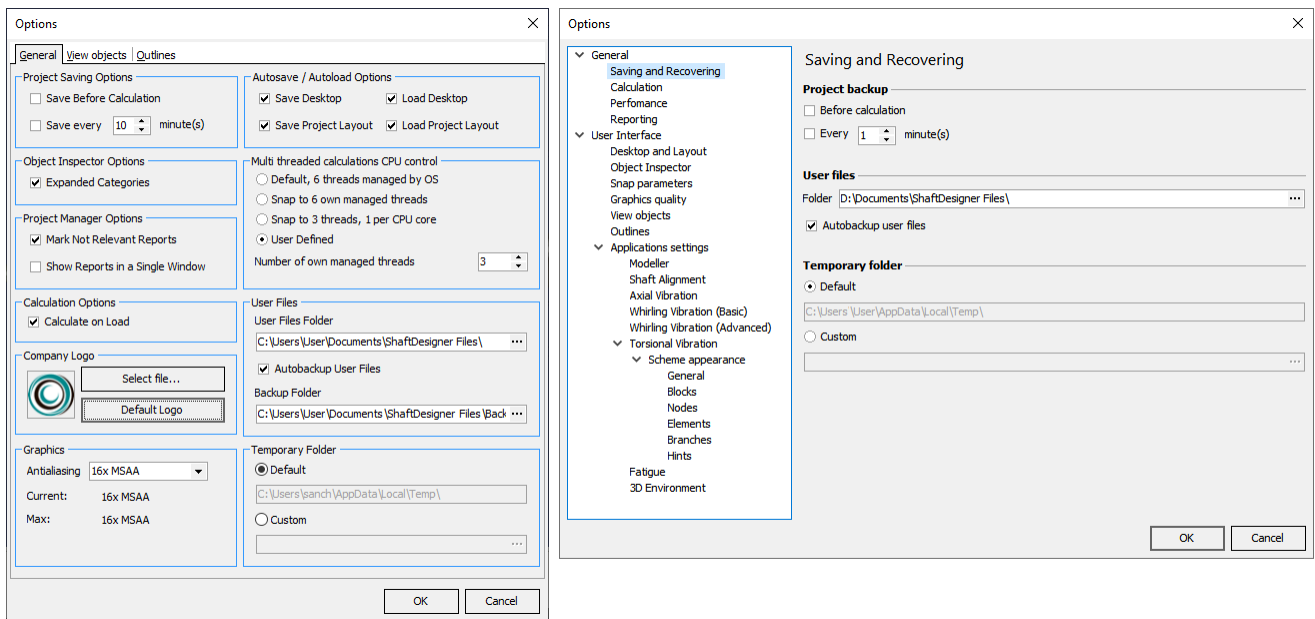
Old interface

New interface



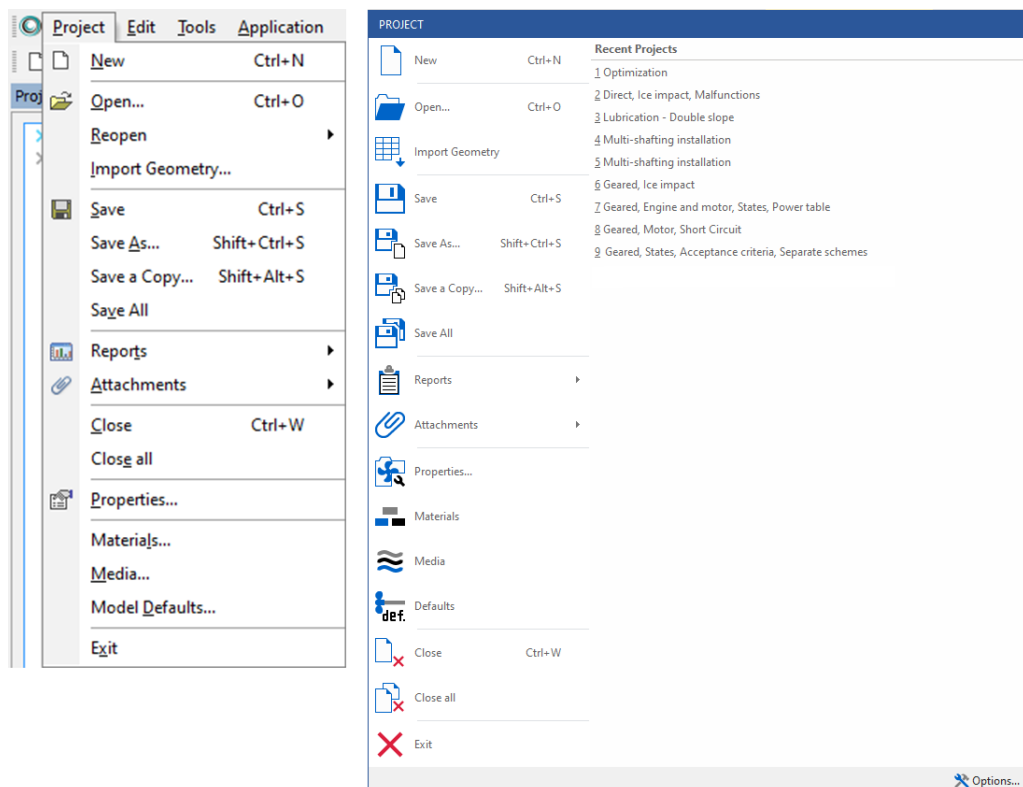
2.1. Program Options Window

Some windows are completely reworked. For example, program settings allow more convenient and structured customization of the user interface and workflow.



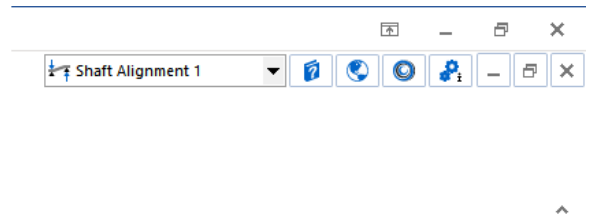
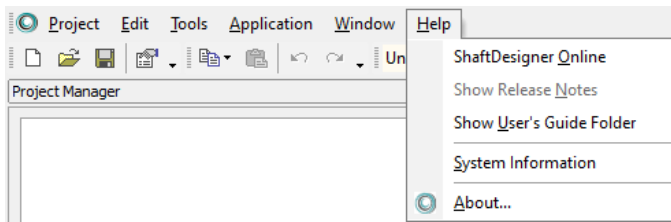
2.2. Project Menu

The Project menu was redesigned. In this menu, you can create a project, open, and save projects in different ways, close current or all projects, set up properties, materials, media, object's default parameters and attachments.



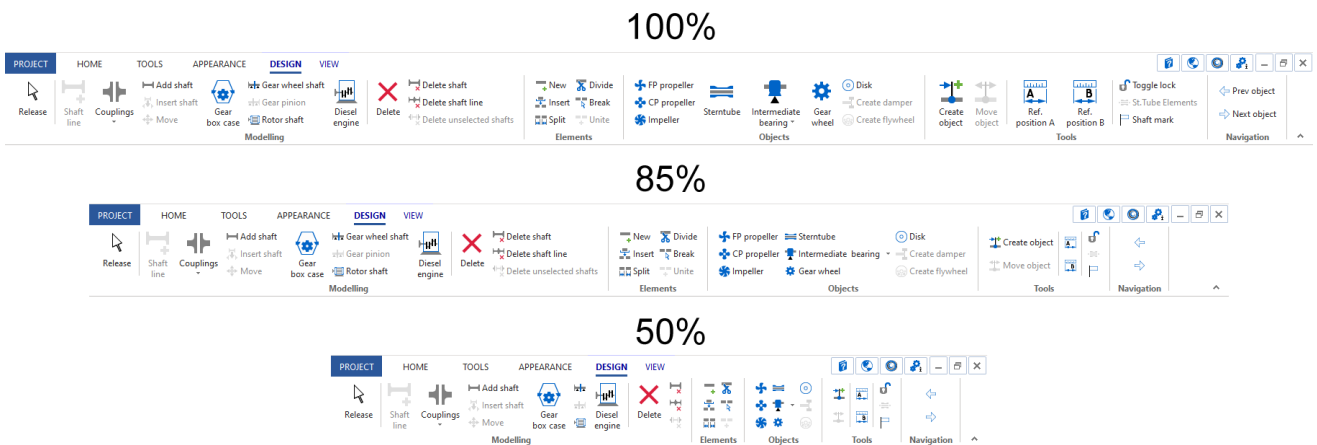
2.3. Help Toolbar

Most of the Help menu functions are moved to the upper right corner of the window and permanently available for the user. The user's guide is updated according to the interface changes and new features.

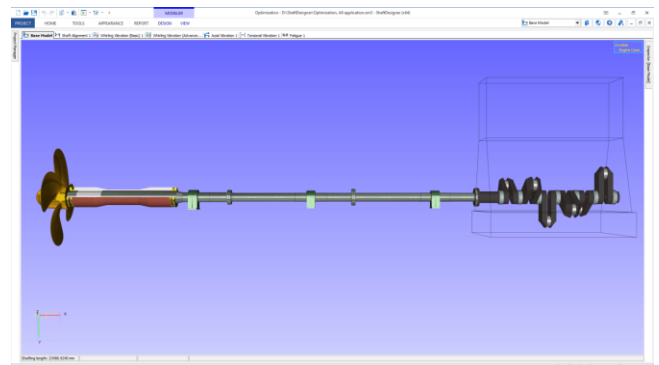


2.4. The Main Window

Almost all toolbars and menus were replaced with a modern ribbons tab in the upper part of the window. The ribbon contains several tabs designed to provide different features. Buttons are automatically collapsed depending on the window size.



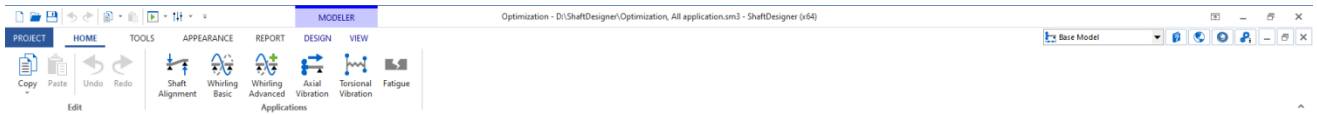
These ribbons can be hidden, as well as the Project Manager and Object Inspector. It makes ShaftDesigner convenient to use on portable laptops with small screens. For instance, it is very helpful onboard in the Engine Room. Also, we optimized the workflow for the multiscreen systems.



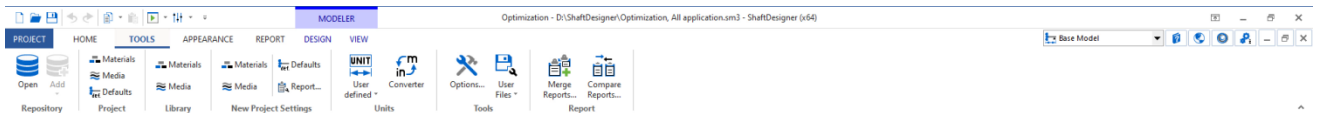
2.5. Common Ribbon Tabs

The Home, Tools and Appearance tabs contain the general software functions that are not application-specific.

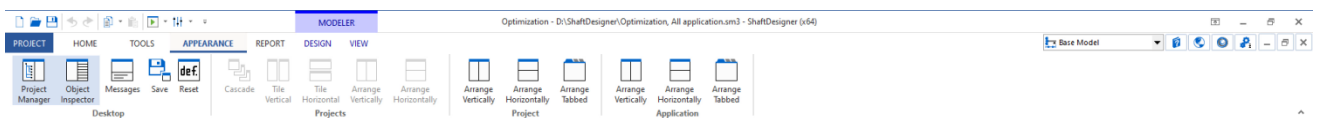
The Home tab contains the basic functions and allows creating calculation applications:



The Tools tab is responsible for the repository, project data, material and media library, new project settings, units, and other options of the software.

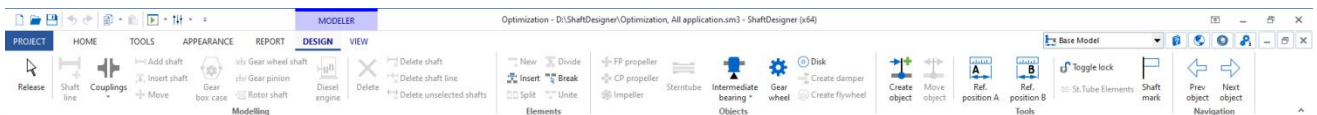


The Appearance tab allows the user to manage the desktop and arrange the windows.

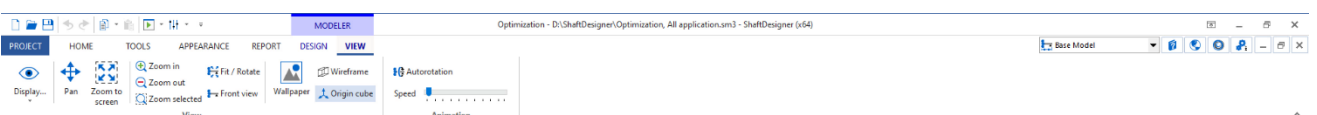


2.6. Modeler Tabs

The Modeler and application windows introduce their own tools. The Modeler's Design tab provides all tools for creating and editing the Base model.

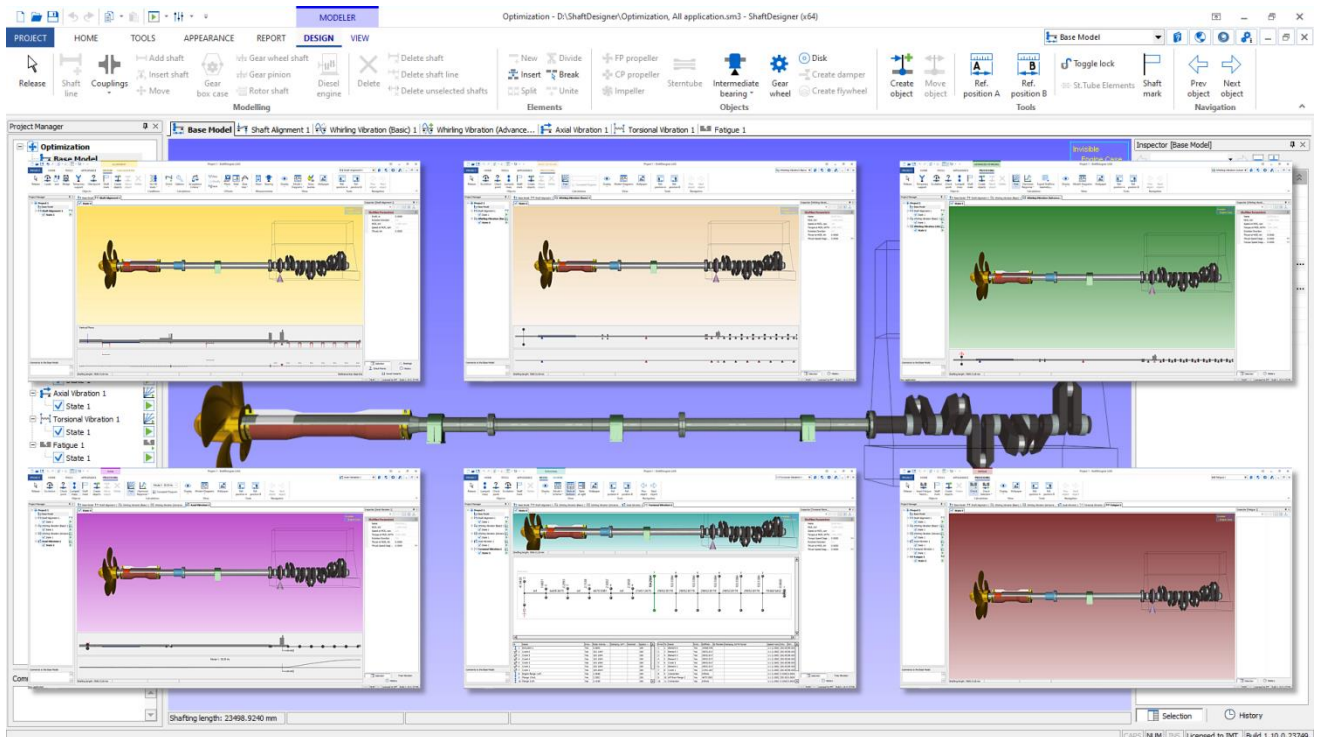


The View tab allows adjusting displayed objects, controlling the view, and changing appearance settings.



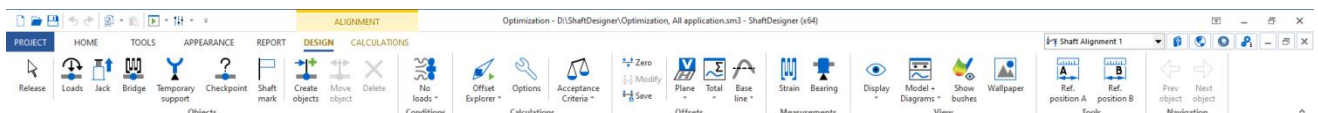
2.7. Applications' Tabs

Each module is marked by its own context color to improve the feeling of the software. The active application can be switched in the drop-down list in the upper right corner, in the Project Manager or in the window tabs. Every user can find the best way to switch between the applications.

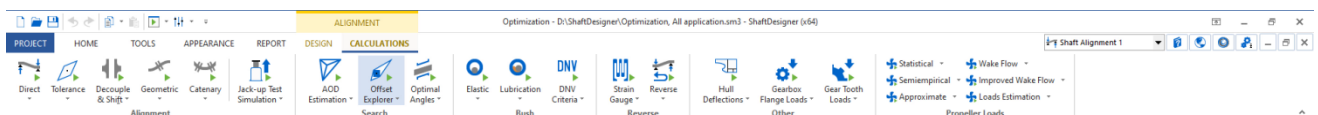


2.7.1. Alignment Application

The Shaft Alignment application operates with 2 own tabs: Design and Calculations. The Design tab allows adding specific objects, setting up propeller hydrodynamic loads, calculation options, acceptance criteria, bearings' offsets, measurements and adjusting view settings.

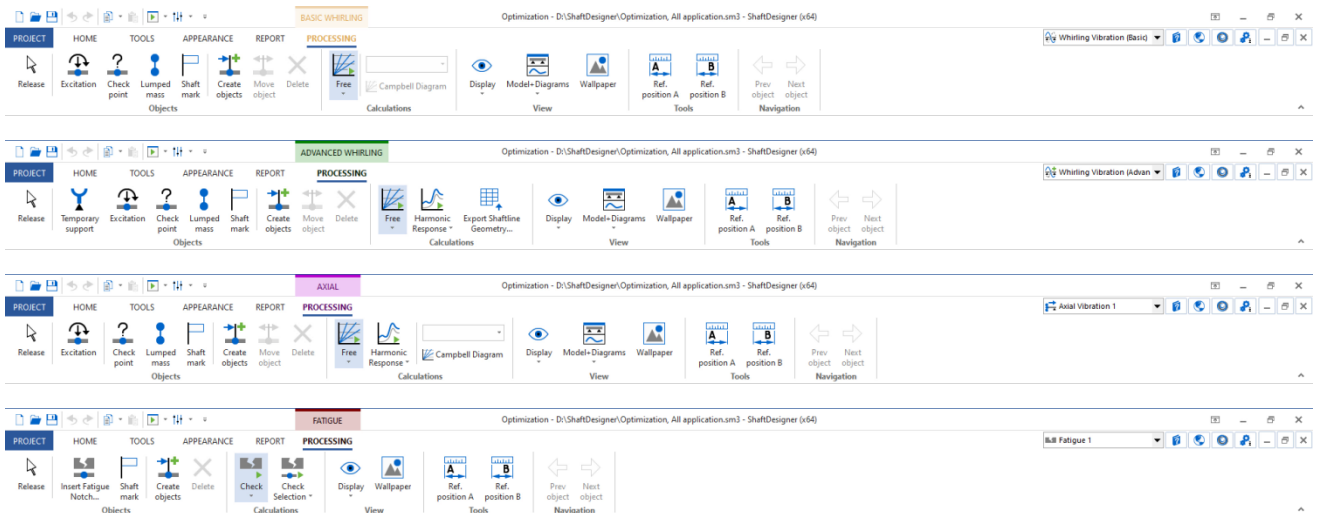


The Calculations tab contains all functions related to the Shaft Alignment. This allows the user to find, set up and run the specific task easily. However, all the calculations are also accessible from the Design tab by the special drop-down menu.



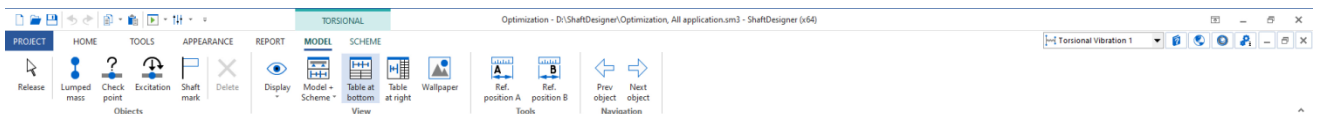
2.7.2. Whirling, Axial Vibration and Fatigue Applications

The Whirling Basic and Advanced, Axial vibration and Fatigue applications operate with the single Processing tab. It provides buttons to create the additional objects, tune and run the calculation, change the view.

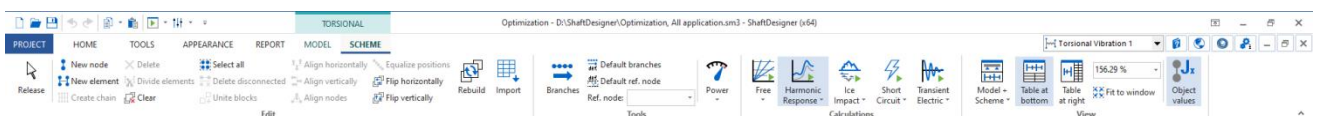


2.7.3. Torsional Vibration Application

The Torsional vibration application uses the Model and Scheme tabs. The first one is intended for shafting model operations.

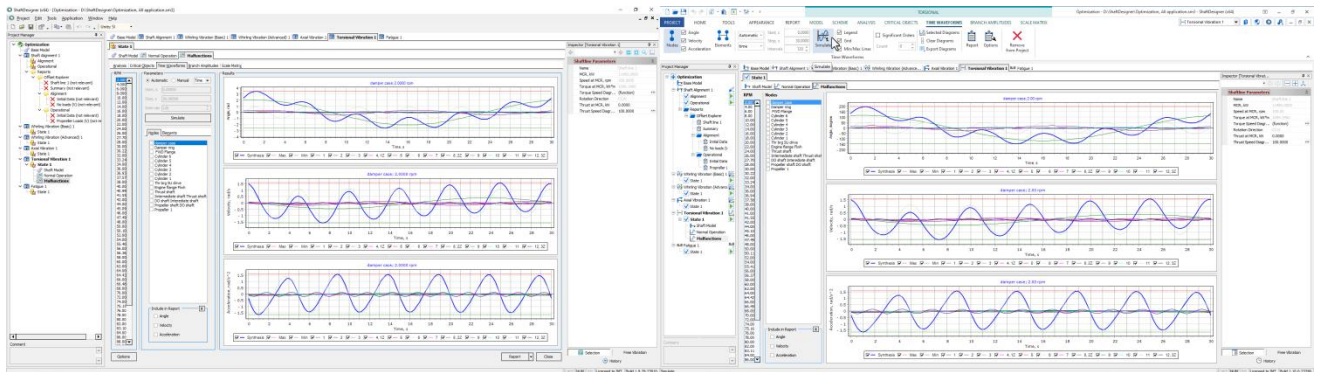


The second one is designed for creating and editing the Mass-Elastic system, scheme branches, the Power Table and changing the view. The Scheme tab also contains the buttons to run the Torsional Vibration Analysis.



2.7.4. Vibration Calculation Results Tabs

After the vibration analysis calculation was carried out, the various results are shown as a special Browser which has its tabs. In contrast to the previous version, all parameters, view and reporting functionality is moved to these tabs to simplify the reports' generation. This approach gives an additional screen space for the plots and diagrams.

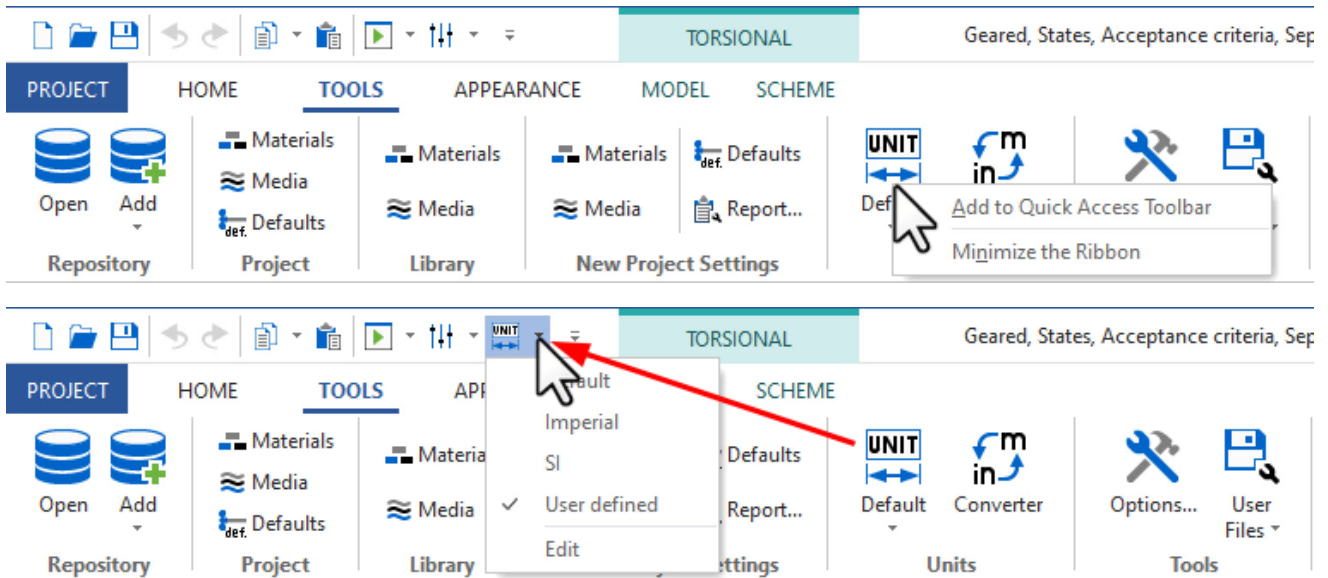


3. New Features

Now let's review the most important new features of ShaftDesigner.

3.1. Quick Access Toolbar

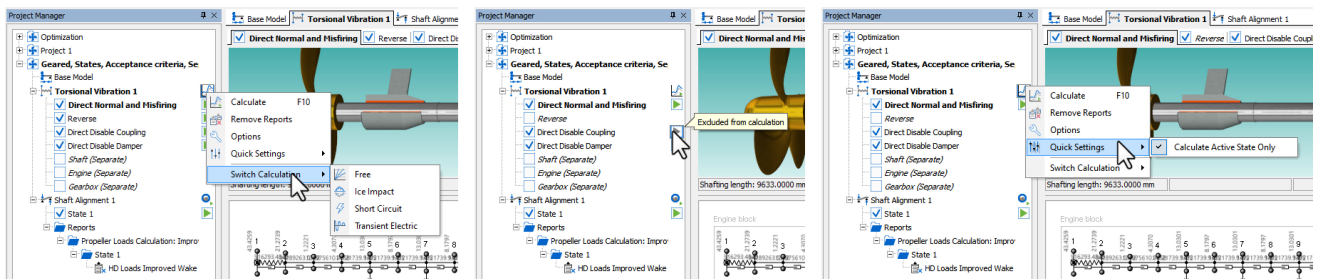
It is possible now to add the most frequently used commands to the Quick access toolbar to activate them at any time.



3.2. Project Manager Tools

The Project Manager got the new feature, making it a powerful and rapid control center. Now, the operating state can be easily disabled or excluded from the specific calculation. There is also an option to run the computation for the active state only. It is available from the calculation menu or quick access toolbar. You don't have to open the Calculation Options window to manage operating states to run.

Also, you can run the computation, open the options window or switch between the calculation types just in a couple of mouse clicks without seeking the appropriate buttons in the User's Interface.



3.3. Propeller Mass, Inertia and Buoyancy Approximate Methods

The default propeller mass and inertia calculation were updated and extended. Now each parameter has several approximate methods with a clear formula. It allows estimating the absent initial data in a more reasonable way. Mass properties are automatically recalculated with the changed propeller parameters if the approximate formula is chosen.

Mass

Method Rumb's formula

Mass, kg 6725.315

$$M = \rho \left[(1.4 + 15.3D) \frac{A_E}{A_0} \frac{\pi D^2}{4 \cdot 1000} + \frac{\pi L_H (D_{H0}^2 - D_{H1}^2)}{4} \right]$$

OK Cancel

Polar Inertia

Method Kutuzov's formula

Polar Inertia, kg*m^2 3813.376

$$I_x = 0.00028 \rho D^5 \frac{A_E}{A_0} \left[\frac{A_E}{A_0} + 3 \right]$$

OK Cancel

Also, the propeller buoyancy can be determined by a new approximate formula for a partially submerged propeller, depending on propeller immersion level. It was created by our research and development department based on a statistical approach, see [our article for more information](#).

Buoyancy

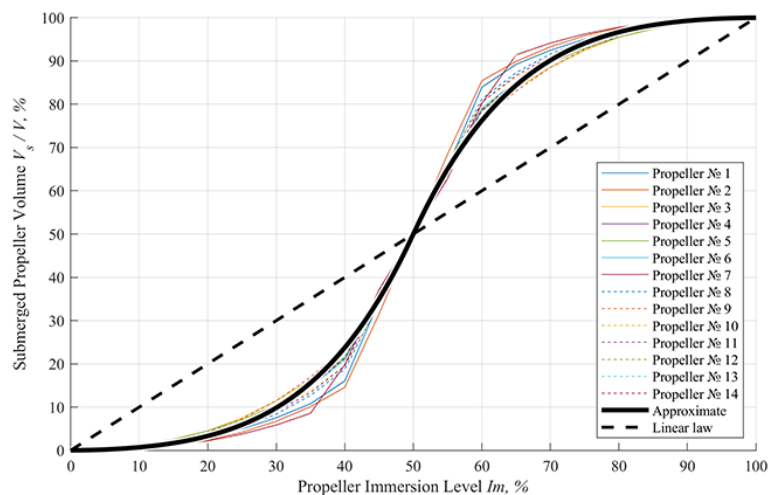
Method Approximate formula

Buoyancy, kN 15.871

Buoyancy Percent, % 100.000

$$F_B = F_{BFull} \left[0.5 + \text{sign } Im \left(3.441 |Im| - 9.302 |Im|^2 + 11.89 |Im|^3 - 6.103 |Im|^4 \right) \right]$$

OK Cancel



3.4. Strain Gauge Measurements

We introduce the absolutely new tool for strain gauge measurements processing. The practical engineering work is the base for this new tool. All measurements can be stored directly in the project.

The screenshot shows the 'Strain Gauge Measurements' software window. It contains two sessions of data. Each session has a form for session details and a table of measurements.

Session 1 Details:

- Session Name: Session 1
- Date: 22.06.2022 14:05:16
- Shaft Turning: CW
- Measurement Assignment: Strain gauge Alignment
- Readings Validity Check: OK
- Edit Session... button with a red X icon.

Session 1 Data Table:

Channel	Unit	T	S	B	P	Vert., MPa	Hor., MPa
Fwd sterntub	μStr	267.010	255.080	242.190	253.960	-1.217	0.055
SG loc 4	μStr	395.080	396.870	412.070	410.290	0.833	-0.658
SG loc 3	μStr	-85.340	-48.510	1.630	-35.190	4.266	-0.653
SG loc 2	μStr	-31.330	-20.980	-63.520	-73.840	-1.579	2.593
SG loc 1	μStr	-48.720	-39.320	-5.180	-14.590	2.136	-1.213
Aft Motor DE	μStr	285.680	282.920	283.260	285.920	-0.119	-0.147

Session 2 Details:

- Session Name: Session 2
- Date: 22.06.2022 14:05:16
- Shaft Turning: CW
- Measurement Assignment: Reverse Calculation
- Readings Validity Check: OK
- Edit Session... button with a red X icon.

Session 2 Data Table:

Channel	Unit	T	S	B	P	Vert., MPa	Hor., MPa
Fwd sterntub	μStr	-466.520	-530.150	-518.830	-455.270	-2.566	-3.673
SG loc 4	μStr	37.920	33.850	45.530	49.590	0.373	-0.772
SG loc 3	μStr	-65.670	-44.390	-39.720	-61.110	1.273	0.820
SG loc 2	μStr	-79.540	-46.640	-22.290	-54.740	2.808	0.397
SG loc 1	μStr	285.420	289.220	209.780	205.640	-3.710	4.099
Aft Motor DE	μStr	-380.060	-341.430	-336.010	-374.620	2.161	1.628

At the bottom of the window, there are buttons for '+ Add Session', 'X Clear', a 'Show' dropdown menu set to 'All', 'Readings Validity Eps, %' set to '3.0%', and 'OK' and 'Cancel' buttons.

Moreover, measured strains or millivolts can be converted to stresses automatically, taking into account the bridge's configuration. We eliminated any kind of hand calculations to prevent errors. Calculated stresses can be used in reverse calculation and strain gauge alignment. However, it is still possible to enter stress manually.

The two screenshots show the detailed configuration and measurement results for Session 1.

Left Screenshot: Parameters and Circuit Configuration

Parameters:

- Strain gauge: Fwd sterntube
- Position, mm: 7520.000
- Make: Vishay
- Type: CEA-06-250UT-350
- Resistance (Rg), Ω: 0.000
- Gage Factor (GF): 2.100
- Bridge Type: Full Bridge
- Sense Connection: Yes
- Lead Wire Resistance (RL), Ω: 0.000
- Units: μStr
- Excitation Voltage (Eex), V: 10.000
- Apply to All Channels: [X]
- Shaft material: Steel 1
- Elasticity Modulus (E), MPa: 206000.000
- Poisson's Ratio (μ): 0.300

Circuit Configuration: A diagram of a Wheatstone bridge with resistors R1, R2, R3, R4 and a central resistor RL. A diagram of a shaft with strain gauges at positions 1, 2, 3, and 4 is also shown.

Measurements:

#	Position	Angle, deg	Reading (V), μStr
1	Top (T)	0	267.010
2	Starboard Side (S)	90	255.080
3	Bottom (B)	180	242.190
4	Port Side (P)	270	253.960

Right Screenshot: Detailed Measurement Results

This screenshot shows the detailed measurement results for each channel, including the readings and the calculated vertical and horizontal stresses.

Channel: Fwd sterntube at 7520.000 mm, μStr

Channel	Unit	T	S	B	P	Vertical Stress (T), MPa	Horizontal Stress (P), MPa
Fwd sterntube	μStr	267.010	255.080	242.190	253.960	-1.217	0.055

Channel: SG loc 4 at 9682.000 mm, μStr

Channel	Unit	T	S	B	P	Vertical Stress (T), MPa	Horizontal Stress (P), MPa
SG loc 4	μStr	395.080	396.870	412.070	410.290	0.833	-0.658

Channel: SG loc 3 at 14861.600 mm, μStr

Channel	Unit	T	S	B	P	Vertical Stress (T), MPa	Horizontal Stress (P), MPa
SG loc 3	μStr	-85.340	-48.510	1.630	-35.190	4.266	-0.653

Channel: SG loc 2 at 20916.000 mm, μStr

Channel	Unit	T	S	B	P	Vertical Stress (T), MPa	Horizontal Stress (P), MPa
SG loc 2	μStr	-31.330	-20.980	-63.520	-73.840	-1.579	2.593

Channel: SG loc 1 at 23744.800 mm, μStr

Channel	Unit	T	S	B	P	Vertical Stress (T), MPa	Horizontal Stress (P), MPa
SG loc 1	μStr	-48.720	-39.320	-5.180	-14.590	2.136	-1.213

Channel: Aft Motor DE at 29835.200 mm, μStr

Channel	Unit	T	S	B	P	Vertical Stress (T), MPa	Horizontal Stress (P), MPa
Aft Motor DE	μStr	285.680	282.920	283.260	285.920	-0.119	-0.147

3.5. Reverse Calculations

The reverse calculation is significantly improved. In addition to the updated window with more convenient and structured buttons, the calculation algorithm became more efficient in searching for actual bearings' offsets based on the different kinds of measurements.

Reverse Calculations

Profiles Add Profile Reset Measurements Calculate Options Explore Deviations Acceptance Criteria

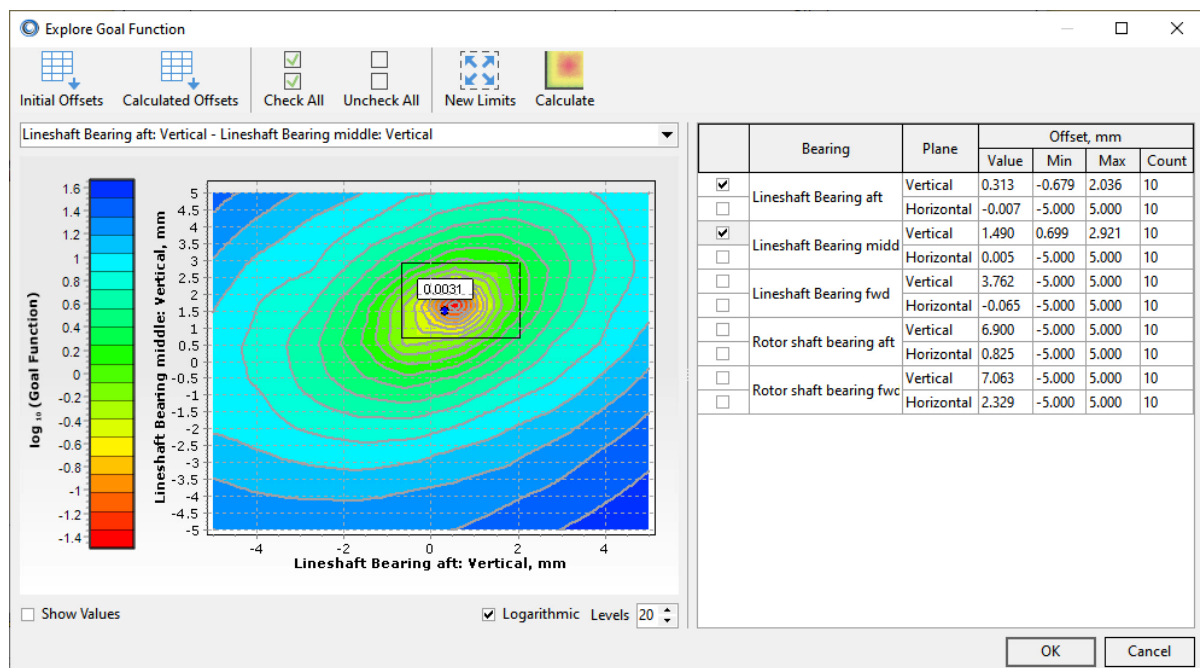
Adjust	Bearing	Offset, mm	
		Vertical Plane	Horizontal Plane
		Initial	Initial
<input type="checkbox"/>	Stern tube bearing aft	0.0000	0.0000
<input type="checkbox"/>	Stern tube bearing fwd	0.0000	0.0000
<input checked="" type="checkbox"/>	Lineshaft Bearing aft	0.0000	0.0000
<input checked="" type="checkbox"/>	Lineshaft Bearing middle	0.0000	0.0000
<input checked="" type="checkbox"/>	Lineshaft Bearing fwd	0.0000	0.0000
<input checked="" type="checkbox"/>	Rotor shaft bearing aft	0.0000	0.0000
<input checked="" type="checkbox"/>	Rotor shaft bearing fwd	0.0000	0.0000

Strain Gauge Measurements <Custom Stress Variant>

Parameter	Use	Object Name	Vertical Plane	Horizontal Plane
			Measured	Measured
Load, kN	<input type="checkbox"/>	Rotor shaft bearing fwd	77.627	0.000
	<input checked="" type="checkbox"/>	Jack 3 aft	22.747	0.000
	<input checked="" type="checkbox"/>	Jack 2 mid	20.245	0.000
	<input checked="" type="checkbox"/>	Jack 1 fwd	22.679	0.000
Bending Stress, MPa	<input checked="" type="checkbox"/>	Fwd sterntube	-0.143	0.000
	<input checked="" type="checkbox"/>	SG loc 4	-3.316	0.000
	<input checked="" type="checkbox"/>	SG loc 3	-0.744	0.000
	<input checked="" type="checkbox"/>	SG loc 2	-0.425	-0.225
	<input checked="" type="checkbox"/>	SG loc 1	2.844	0.084
	<input checked="" type="checkbox"/>	Aft Motor DE	3.483	3.962

OK Cancel

Also, a new explore goal tool allows researching or adjusting the solution manually in case of advanced projects.



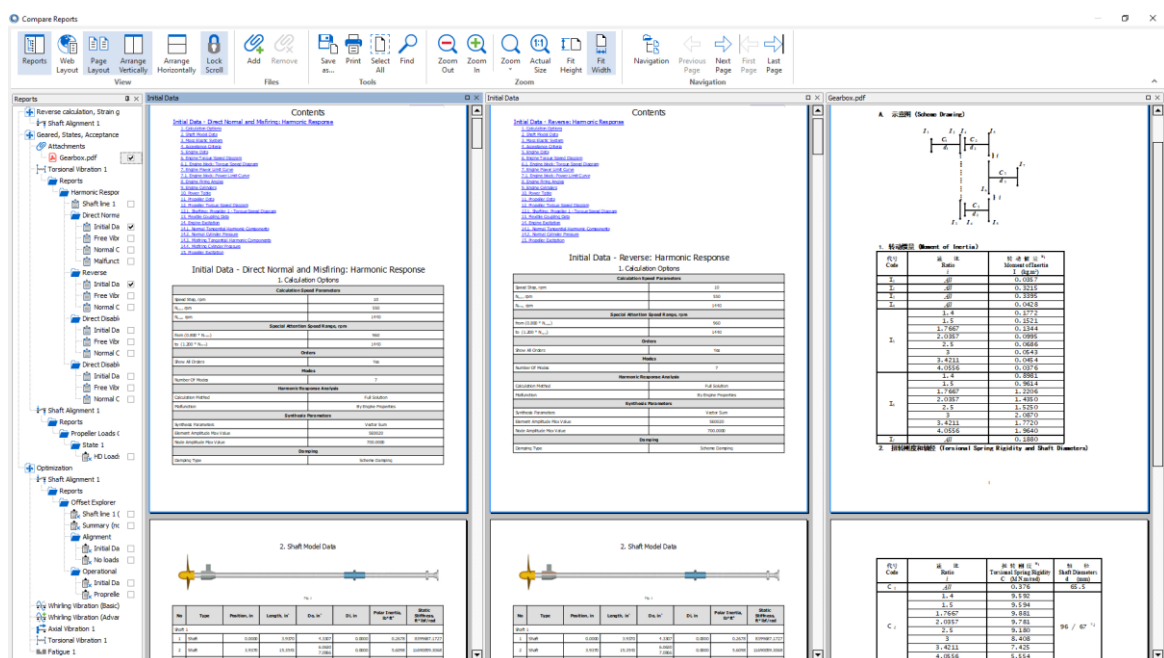
3.6. Selected Diagrams

The analysis of the forced vibration results now is more convenient with a new selected diagrams window. It shows preview of all diagrams that will be included in the report, allows comparing diagrams for different elements or nodes, parameters and calculation states. The report can be generated directly from the window.



3.7. Compare reports

The next great new tool is the reports' comparison. It is easy to open several reports in a single window, scroll them synchronously (if necessary) and compare in a convenient way. This tool also supports PDF files attached to the project and even external PDF files. This tool is brilliant if you need to check the reports made from the different states, projects or even 3rd party documents.



4. Conclusion

There is a summary of main changes in the new version:

- Enhanced ribbon user's interface
- Program options window redesign
- Project manager calculation control
- Approximate propeller methods
- Strain gauge measurement tool
- Reverse calculation improvements
- Selected diagrams window
- Compare reports tool

At last, there are some important final notes. The main features of the ShaftDesigner software is the same as you got used to. The projects created in the previous version are fully compatible with ShaftDesigner 1.10. The new update is now available for all subscribed customers with active service contract, the new customers and the users with temporary license. Also, you can try the new version in a free trial full-functional version from our website www.shaftdesigner.software. We encourage you to try the new updated ShaftDesigner software now and contact us if you have any questions or suggestions.

