KISSsys 03/2016 – Instruction 021

KISSsys default load spectrum calculation

11/04/2016
1 Document information

1.1 Document change record

<table>
<thead>
<tr>
<th>Revision</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>10.6.2014</td>
<td>HD</td>
<td>Original document</td>
</tr>
<tr>
<td>1</td>
<td>31.3.2015</td>
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</tr>
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<td>Restructure of the buttons on the interface</td>
</tr>
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1.3 References

[1] None
2 Introduction

2.1 Load spectrum definition in KISSsoft database

Note that this function works for KISSsys models where you have simple kinematics. Models with power splits and different power paths (transmission gearboxes) can be handled better by using the load spectrum template (see documentation on the KISSsoft homepage).

3 Using the KISSsys functions

3.1 Select a load spectrum

Once some calculations are in the KISSsys file, you can select a load spectrum from using the button as shown below (general button since 2016, the other one is for the load spectrum template calculation).

![Function to select a load spectrum](image)

Then, a dialog will appear where you can select the load spectrum from a list. Note that you can select to a) use single load (then, nominal load condition is used) b) select a load spectrum from the database.

![Select load spectrum (Single stage load or load spectrum from database) from list](image)

3.1.1 Select from database

In the KISSsoft database, the user can add his own load spectra. Later, he can select these load spectra for calculation in KISSsys. To edit (e.g. to add a new load spectrum to the database) the database, use the database tool (close KISSsys and start KISSsoft as “Administrator”) in KISSsoft (not in KISSsys).
For example, add a new load spectrum “KISSsys-ANL-14-908-Example-LDD” as follows (press the button and enter).
In order to calculate the load spectrum without changing the kinematic, it has to be defined with factors and not absolute values.

Press “Ok”, “Save” and “Close” to complete and save the input.

Then, when you press the button as shown above, you can now select this new load spectrum from the database. By doing this, the load spectrum is set to all the elements in the three structure (but the flag to consider load spectrum is not set).

Then, a new window / table will be created by KISSsys, showing the load spectrum (note that you cannot edit this load spectrum in KISSsys level as it is imported from a database):

3.1.2 Use nominal load calculation

If you select “Single stage (no collective)”, the load spectrum is removed from the model and all the elements. The user can then perform a “proper” nominal calculation with this selection (see below).
3.2 Calculation with load spectrum

To run the calculations with load spectrum, simply select “Yes” in the corresponding field.

![Image](image1.png)

**Figure 3.2-1 Running the calculation**

Note that the flag “Consider load spectrum” is then only TEMPORARILY set to all calculations so that if you press the button or , then, the calculation will be done with its initial settings (if the user sets the flag manually in the calculation file, it is then calculated with load spectrum, otherwise with the nominal load).

When you run the calculation with load spectrum, the resulting gear and shaft safety factors and bearing life will be based on the load spectrum.

After running the calculation, you can actually see the load spectrum e.g. in the gear calculation.

![Image](image2.png)

**Figure 3.2-2 Definition in the gear calculation element**
Or also in the shaft calculation

Figure 3.2-3 Definition in the shaft calculation element

3.3 Single load step calculation

Like in KISSsoft, a single load step calculation can be performed with the selection below. The user can also select what bin to calculate. Once again the flag is set only temporarily in the KISSsoft file.

Figure 3.3-1 Single load step calculation
4 Example

4.1 File to start with

Open the below file to start and go to administrator mode:

![Open example file](image)

You will get:

![KISSsys file opened](image)

4.2 Adding bearing life to user interface

Let us now add the resulting bearing lifetime to the user interface (and add some text). For this, use right mouse click on “GP_2” and select “Properties”. Then, mark the target cell and select the variable “SF1” and press “Insert as expression”:
4.3 Calculation without load spectrum

To run a calculation without a load spectrum and e.g. with an input speed of 1900RpM and an input torque of 11Nm, proceed like this:

1) Enter speed and torque in the "UserInterface"

<table>
<thead>
<tr>
<th>Speed [rpm]</th>
<th>Torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>11</td>
</tr>
</tbody>
</table>

2) Run kinematic calculation by pressing

3) Run strength calculation by pressing

Then, you get the result like this:

<table>
<thead>
<tr>
<th>SF12min [-]</th>
<th>SH12min [-]</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.2349</td>
<td>1.6996</td>
</tr>
<tr>
<td>7.261</td>
<td>2.1454</td>
</tr>
</tbody>
</table>

Then, you get the life of B1 (h) as 158120.76433 hours.
4.4 Calculation with load spectrum

Now, select a load spectrum by pressing \( \sum \). Select e.g.:

![Figure 4.4-1 Spectrum selection](image)

The load spectrum is shown as below:

![Figure 4.4-2 Spectrum definition](image)

Then, run the load spectrum calculation with the corresponding button, you will get as result:

![Figure 4.4-3 Spectrum calculation results](image)

4.5 Calculation without load spectrum

Now, a load spectrum is defined. But if you again press \( \sum \), the result will again be for the nominal load.
5 Messages

5.1 Message about application factor

By default, an application factor of KA=1.25 is used in the gear calculations. When you use a load spectrum, the application factor should be set to KA=1.00 in all individual gear calculations (because we use a load spectrum instead of an application factor). KISSsys checks whether any one KISSsoft gear calculation still has an application factor KA not equal to 1.00. If so, you will get the below message. Note that the calculation will also run if the application factors are not equal to 1.00. Then, the application factor will be used together with the load spectrum.

![Message when you add a load spectrum and any one of the gear calculations still has an application factor KA not equal to 1.00.](image)

5.2 Message if you are not in administrator mode

If you want to enter your own load spectrum using "Own input" but you are not in administrator mode, you will get the below message. Activate the administrator mode to avoid this.

![Message if you are not in administrator mode but want to define your low load spectrum.](image)

Right: Symbol when administrator mode is active.