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KISSsys instruction for Power flow changes with clutch change

1 Description

1.1 General

With clutch connections it is possible to make any kind of connections between elements in KISSsys except gear or belt connections. Connections as bolt, welded, dock clutch, synchronizer, multi disc clutch, driving clutch... can be modeled with this connection type. Connection can be made active or inactive and also torque value can be fixed if needed. Inactive clutch connection allows different clutch bodies to rotate in different speeds (depending on other connections in model) as a slip speed between components.

If there will be different power flows in system by opening or closing combination of clutches it is difficult job to select new set of active clutches manually, so we need to create function or selection dialog to do that for us according to selected speed/power flow.

2 Modeling

2.1 Create a model

Create first model with all necessary components, connections, calculations and other desired things in it. Create data for shaft, gear and bearing calculations (modules). See reference model “204-Clutch-changes.ks” used in this example.

2.2 Clutches

If you have several power flow paths to be selected, but only one can be active on the time, you need to do changes for power flow manually opening every clutch connection separately from tree structure and then activate or inactivate connections according to selected power flow path.

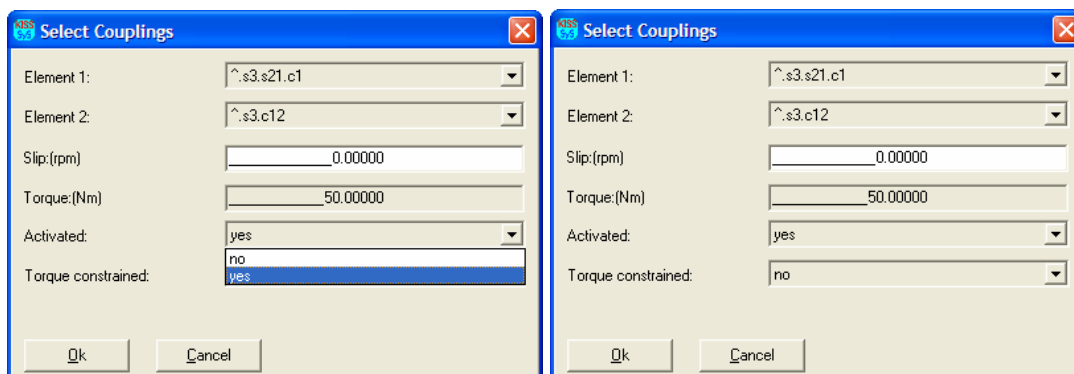


Figure 2.2-1 Connection activation via dialog

If you activate any of the connections you must also remember to put Slip: (rpm) value to be 0 (zero) if there is no speed difference between clutch bodies when clutch is engaged.

3 Changing the power flow

3.1 Model setup

Create a new function called e.g. “SetGears” in some of the elements or table e.g. in your gearbox group.

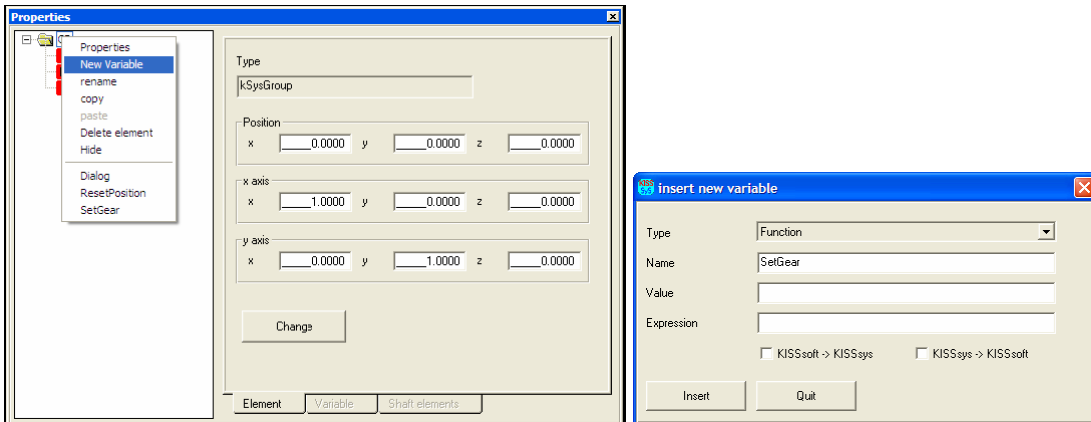


Figure 3.1-1 Create a new variable to the “Gearbox” component

After you have created this new function it is necessary to create a “code” to what it should do. To do this select “SetGear” -> “edit” and you can then start to type in function code. After it is finished you need to remember to **compile** and **save** it in edition window.

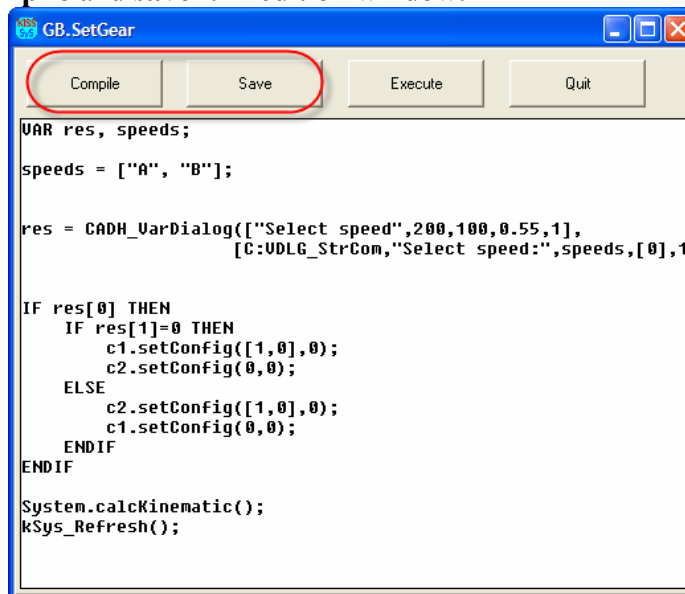


Figure 3.1-2 Create a function code in edition window

The following code will explain how this function should look like

<pre> VAR res, speeds; speeds = ["A", "B"]; res = CADH_VarDialog(["Selectspeed",200,100,0.55,1], [C:VDLG_StrCom,"Select speed:",speeds,[0],1]); IF res[0] THEN IF res[1]=0 THEN </pre>	<p>Define first all variables that will be in the function It is possible to create speed selection possibilities in separate array as made in here. You will see these names A and B in dialog.</p> <p>Create popup dialog to show selection possibilities and to make speed selection. All selections are then saved in array called “res”. Numbers in the last indicates the size of the dialog box in pixels.</p> <p>Create line with list selection in the dialog box. If you want to made several selections you may add as many lines as necessary.</p> <p>This line with res[0] means that if “OK” is pressed for accepting dialog selections following lines will be</p>
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<pre> c1.setConfig([1,0],0); c2.setConfig(0,0); ELSE c2.setConfig([1,0],0); c1.setConfig(0,0); ENDIF ENDIF System.calcKinematic(); kSys_Refresh(); </pre>	<p>executed. If "A" was selected (res[1] gets value 0, because A is the first value in speeds array) do lines to activate c1 connection and inactivate c2 connection. In case of "B" selected do vice versa.</p> <p>Last things to do after selections calculate kinematics again with new power flow.</p>
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Then you may use that function to operate clutch changing, that you don't have to do it manually for all clutches separately. In this example this function is created to "GB" and can be operated from "tree structure".

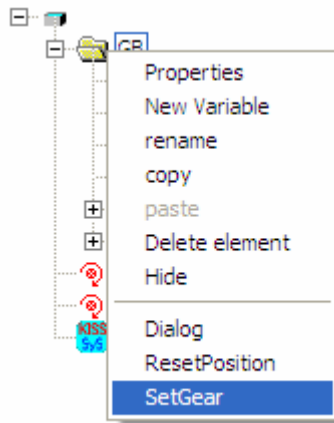


Figure 3.1-3 Operate function from the tree structure

Now different selections for power flows will give directly new results and that can be also seen from schematics.

Speed selection "A"

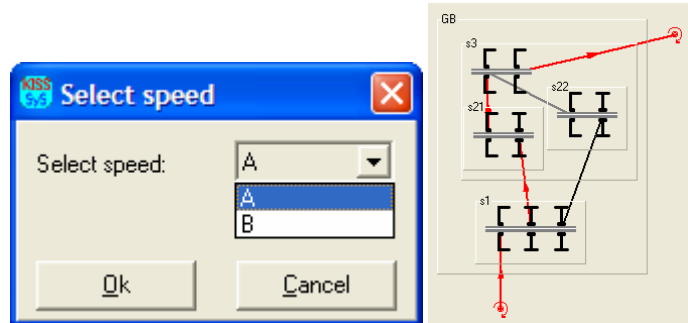


Figure 3.1-4 Select speed "A"

Speed selection "B"

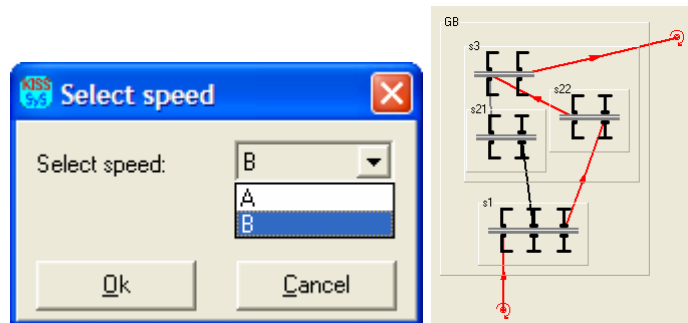


Figure 3.1-5 Select speed "B"

It is of course possible to add any number of possible selections in the list. And also to make several clutch configuration settings when speed selected (number of clutches to activate and number of clutches to inactivate).

3.2 Calculation setup

In case when gear pair are inactive, but calculation module is added gear sees no load and when “kSoftCalculation“ is performed an error message appears because of no power in gears.

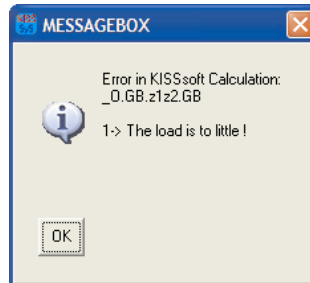


Figure 3.2-1 Error in gear calculation without load

To get rid of this message user needs to modify default settings for the power definition. Select gear calculation from the tree select “properties” and look for the variable “P” defining the power in the gears. Modify default expression to take maximum power calculated form the sped and torque or minimum value e.g. 0.001kW (depending the size of the gearbox). Now if gear pair is inactive instead of using zero power, very small value is used. This has no effect for the strength calculation, but error message is disappeared.

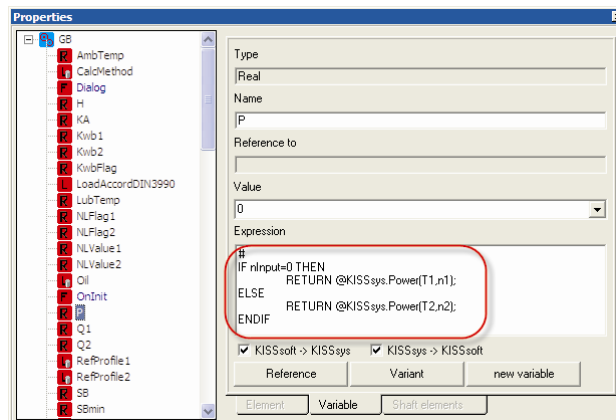


Figure 3.2-2 Initial definition for the calculation power

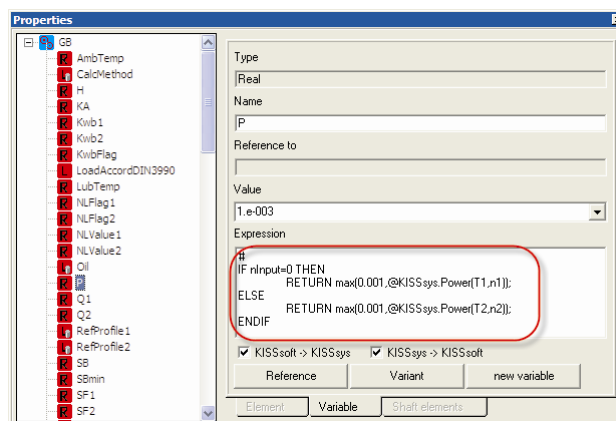


Figure 3.2-3 Modified expression to take maximum value of the threshold or calculated value