ModTem Tutorial.

1. Introduction

This tutorial describes main features of the Template Application, which is developed to enable the modeller to create a general model-template for a given system and use it for various modelling tasks. In the tutorial a simple model of the tank mixer is presented and put into Template Application.

2. Preparation of the model

First, what needs to be done, is preparation of the model. The model equations should be derived and composed into three sets of equations – balance, constitutive and connection equations. Also system information should be described, so the model data will be consistent and complete.

3. Example 1 – Steady State Mixer Tank.

In this example, we have mixer tank with 2 streams coming in and one stream going out (Fig. 1). We will perform both mass and energy balance.

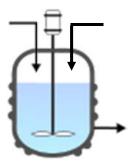


Figure 1. Tank mixer.

Step 1: Describe process system.

There is one system volume, one phase – liquid, and there is no reaction.

Step 2: Define model balances.

There are mass and energy balance equations in our model:

f3[i] = f1[i] + f2[i]

F3\*H3 = F1\*H1 + F2\*H2

Step 3: Define constitutive relations.

In our case these include equations for component enthalpies:

h1[i] =

 $ADippr103[i]*T1+BDippr103[i]/2*T1^2+CDippr103[i]/3*T1^3+DDippr103[i]/4*T1^4+EDippr103[i]/5*T1^5+DDippr103[i]/2*T1^4+EDippr103[i]/5*T1^5+DDippr103[i]/3*T1^3+DDippr103[i]/4*T1^4+EDippr103[i]/5*T1^5+DDippr103[i]/3*T1^3+DDippr103[i]/3*Dippr103[i]/3*Dippr103[i]/3*Dippr103[i]/3*T1^3+DDippr103[i]/3*Dippr103[i]/3*Dippr103[i]/3*Dippr103[i]/3*T1^3+DDippr103[i]/3*T1^3+DDippr103[i]/3*T1^3+DDippr103[i]/3*T1^3+DDippr103[i]/3*T1^3+DDippr103[i]/3*D$ 

 $ADippr103[i]*T2+BDippr103[i]/2*T2^2+CDippr103[i]/3*T2^3+DDippr103[i]/4*T2^4+EDippr103[i]/5*T2^5+Dippr103[i]=$ 

ADippr103[i]\*T1+BDippr103[i]/2\*T1^2+CDippr103[i]/3\*T1^3+DDippr103[i]/4\*T1^4+EDippr103[i]/5\*T1^5 <u>Step 4</u>: Define connection and conditional relations.

This part includes definition of closure equations, which in our case are

 $F1 = sum_i(f1[i])$   $F2 = sum_i(f2[i])$   $F3 = sum_i(f3[i])$   $H1 = sum_i(h1[i]*f1[i])/F1$   $H2 = sum_i(h2[i]*f2[i])/F2$   $H3 = sum_i(h3[i]*f3[i])/F3$  T3 = Tmix

Now we are ready to proceed to the template application. Open ICAS and find in the task manager button "ModFrame"(Fig.2). After clicking the button, the interface screen appears (Fig.3). Press the button "ModTem" to run template application.

Task Manager	
	nager to invoke the external tools o ICAS, or close it if no external uired
ProCAMD	Computer Aided Molecular Design
ProPred	Component Property Prediction
ModFrame	Modelling Framework
TMS	Thermodynamic Model Selection
ReacDef	Define Reactions in the ICAS database
TML	Thermodynamic Model Parameter Estimation
CAPSS	Process Synthesis
BRIC	Batch Records in ICAS
PDS	Process Design Studio
MoT	Modelling Testbed
ProCAFD	Process Synthesis
ConvertSmiles	Converts Smiles to groups or atom-connectivity indices
SolventPro	Solvents selection tool
	Close Manager

Figure 2. Modelling Framework button in ICAS Task Manager.

- Modelling Framewor	k			
Mod Tem	Мот	×	ModDev	<b></b>
	MoT Database			

Figure 3. Starting interface.

The starting screen of Template Applications is shown at the Figure 4. As we want to create a new template, click the button "Create new template".

- ModTem	
Welcome to the Template Application Tool for Model Reuse, Development and Maintenand Please, choose the available template from the list below or create a new template List of available templates	Xe.
Create new template	
OK Browse	

Figure 4. Starting screen of ModTem.

Next window will show the form for a new template creation (Fig. 5). As you can see, there are special layers for each part of the model that we defined before – system information, balance equations, constitutive equations, connection equations.

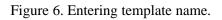
First, we will give the name for our template, using the top green block. Right click on this block – you will get a field to enter the name (Fig. 6).

Now we will start to describe our system. In the first layer of System Information click the button "Add sublayer" (Fig. 7). When new sub-layer appears, right click on it to get a field for the name (Fig. 8). This sub-layer is "Number of volumes in the system".

CreateTemplateForm		LINE LINE	AaB		
New template	ave template 🚋 ModDev transfer 🙀				
Short template description					Guideline on template creation
	System Information			*	1. Add required number of layers and blocks by using "Add layer" and "Add block" buttons.
	+				<ol><li>Right click on the layer will open the field for entering layer name.</li></ol>
	Add sub-layer				3. Right click on the Template name block will open the field for entering template name.
					4. Right click on the block will open block menu. Choose "Edit" to enter information about the block; choose "Dublicate" to add a new block identical to the current one:
Detailed template description	Balance Equations				choose "Delete" to delete current block.
	+ Add sub-laver				<ol> <li>In the form for block information provide details related to the block: name, short description and equations, if available.</li> </ol>
				=	6. Provide status of the block by checking one of the radio buttons. "Active/default" means that when template is loaded, this block will be chosen (green) and related
	Constitutive Equations				equations will be added authomatically to the model; "Active/defined" means that for this block information is provided and it is available for choosing, this block will be
	+				blue, when the template is loaded; "Non-active" means that this block cannot be chosen, but it is shown as perspective update of the template.
	Add sub-layer				7. If current block depends on some other blocks in the template, dependencies should be defined. Choose block that current block depends on by two drop-down lists, which
Upload					chosen layer. Also provide behaviour of the current block, if
Upload template description from the text file	Connection Equations				chosen block is active (green). "Active" means that the block will be available for choosing (will be blue). Note here,
	+ Add sub-laver				that if block with "active" status was green, it would stay green. "Non-active" means that block won't be available for choosing and it will become gray.
	Add sub-layer			-	8. If there are dependencies, then equations set should be

Figure 5. Window for the new template creation.





System Information	
+ Add sub-layer	
Number of volume	s in the system
+ Add block	Number of volum

CreateTemplateForm	investi investi
Save template Open template	
Short template description	
	System Information
	+ Add sub-layer

Figure 7. Adding new sub-layer.

Figure 8. Entering name of sub-layer.

Now, add two more sub-layers in System Information with names "Number of Phases" and "Presence of reaction" (Fig. 9).

CreateTemplateForm	to serve higher state and an one of you want per and		
New template	Save template		
Short template description	System Information  System Information  Add sub-layer  Number of volumes in the system  Add block		Guideline on template creation 1. Add required number of layers and blocks by using "Add layer" and "Add block" buttons. 2. Right click on the layer will open the field for entering layer name. 3. Right click on the Template name block will open the field for entering template name. 4. Right click on the block will open block menu. Choose "Edit" to enter fromation about the block; choose "Dublicate" to add a new block dentical to the current one; choose "Dublicate" to add a new block identical to the current one; choose "Dublicate" to add a new block. 5. In the form for block information provide details related to the block; name, short description and equations, if available.
	Number of phases Add block		6: Provide status of the block by checking one of the radio buttons: "Active/default" means that when template is loaded, this block will be chosen (green) and related equations will be added authomatically to the model; "Active/default" means that for this block information is provided and it is available for choseing, this block will be blue, when the template is loaded; "Non-active" means that this block cannot be chosen, but it is shown as perspective update of the template.
Upload Upload template description from the text file	Presence of reaction Add block Balance Equations		7. If ourrent block depends on some other blocks in the template, dependencies should be defined. Choose block that ourrent block depends on by two dtog-dom blacks, which consist names of al layers and names of the blocks in the chosen layer. Also provide behaviour of the current block, if chosen block is active (green). "Active" means that the block will be available for choosing will be blue). Note here, that if block with "active" istatus was green, it would stay green. "Won-active" means that block wont be available for choosing and it will become gray.
	· · ·	•	8. If there are dependencies, then equations set should be

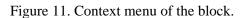
Figure 9. Template application screen after adding sub-layers to System Information.

Next step is to add blocks to the new sub-layers.

Click the button "Add block" in the first sub-layer of System Information (Fig. 10). Now, when the block appears, right click on it and choose "Edit" from the context menu (Fig. 11).

System Information + Add sub-layer		
Number of volumes in the system		×
Add block	Edit	
Add block	Duplicate	
	Delete	
Number of phases		X

Figure 10. Adding a new block to sub-layer.



A new form for block information is shown (Fig. 12). Here we should provide all information related to the block. First, we enter name of the block. Since this block is related to the number of volumes in the system and there is only one volume, so we will put the name "One". Next, provide short description, which gives some details about the role of this block in the template. At last we will define block behaviour; this shows how the block will appear in the template, when it will be used. There are three options: Active/Default – block is chosen by default, it will have green color and its equations will be added to the model, when template is called; Active/Defined – block could be chosen by user, it has blue color and its equations will be added to the model, if user will click it; Non-active – block cannot be chosen by user, it is grey, this option can be used, when there is no information for this block, so these parts are left empty (they will be explained later). Figure 13 shows the information form after being filled. Click OK to save changes and to close the form.

k Information - Number of volumes in the system	BlockInformation
Name of the block Description	Name of the block One Description There is one volume in the system
Block behavior Block dependencies	Block behavior Block dependencies Active/Default Active/Defined Non-active
Depends on (define the block by the name of its layer and and the name of the block) Layer name Block name If chosen block is Active, current block is Active Non-active Save	Depends on (define the block by the name of its layer and and the name of the block) Layer name Block name If chosen block is Active, current block is Non-active Non-active
Equations related to this block Set 1	Equations related to this block Set 1
OK Cancel	OK Cancel

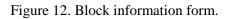


Figure 13. Filled block information form.

Now we can see changes in our template after describing the first block (Fig. 14). Add and fill out two more blocks in the sub-layers "Number of phases" and "Presence of reaction". See figures 15-18 for details.

CreateTemplateForm			
lew template	Save template ModDev transfer		
Short template description	Transition	ank mixer	Guideline on template creation 1. Add required number of layers and blocks by using "Add layer" and "Add block" buttons.
	Add sub-layer		2. Right click on the layer will open the field for entering layer name.     3. Right click on the Template name block will open the field
	Number of volumes in the system	×	for entering template name. 4. Right click on the block will open block menu. Choose "Edd" to enter information about the block; choose "Dublicate" to add a new block identical to the current one; choose "Delse" to delse current block.
Detailed template description	Add block		<ol> <li>In the form for block information provide details related to the block: name, short description and equations, if available.</li> </ol>
	Number of phases		6. Provide status of the block by checking one of the radio buttons. "Active/default" means that when template is loaded, this block will be chosen (green) and related equations will be added authomatically to the model; "Active/default" and its available for chossing, this block will be blue, when the template is added. "Non-active" (means that this block cannot be chosen, but it is shown as perspective update of the template.
	Presence of reaction	×	<ol> <li>If current block depends on some other blocks in the template, dependencies should be defined. Choose block that current block depends on by two drop-down lists, which</li> </ol>
Upload pload template description from ne text file	Add block Balance Equations		consist names of all layers and names of the blocks in the chosen layer. Also provide behaviour of the current block, if chosen block is active (green). "Active" means that the block will be available for choosing (will be blue). Note here, that if block with "active" status was green, it would stay green. "Non-active" means that block won't be available for choosing and it will become gray.
	<b>—</b>		<ul> <li>8. If there are dependencies, then equations set should be</li> </ul>

Figure 14. Template creation screen after adding and describing first block.

ew template	Save template 🚔 ModDev transfer 🙀		
Short template description	Tank	mixer	Guideline on template creation 1. Add required number of layers and blocks by using "Add
Detailed template description	System Information  Add sub-layer  Sumber of volumes in the system  Add block  Number of phases		<ul> <li>layer" and "Add block" buttons.</li> <li>2. Right click on the layer will open the field for entering layen name.</li> <li>3. Right click on the Template name block will open the field for entering template name.</li> <li>4. Right click on the block will open block menu. Choose "Dublicate" to add a new block identical to the current one; choose "Dublicate" to add a new block identical to the current one;</li> <li>5. In the form for block information provide details related to the block, name, short description and equations, f available.</li> <li>6. Provide status of the block by checking one of the radio button; "Active/default" means that when template is</li> </ul>
Upload	Add block Presence of reaction  Add block	×	I loaded, this block will be chosen (green) and related equations will be added authomatically to the model; "Active/defined" means that for this block information is provided and it is available for choosing, this block will be blue, when the template is loaded; "Non-active" means th this block cannot be chosen, but it is shown as perspectiv update of the template. 7. If current block depends on some other blocks in the template, dependencies should be defined. Choose block that current block depends on some other blocks in the template, dependencies and names of the blocks in the chosen loads is active (green). "Active" means that the chosen block is active (green). "Active" means that the
text file	Balance Equations		block will be available for choosing (will be blue). Note he that if block with "active" status was green, it would stay green. "Non-active" means that block wont be available choosing and it will become gray.

Figure 15. Two more blocks are added to other sub-layers.

ock Information - Number of phases 🛛 💌	Block Information - Presence of reaction
Name of the block One Description There is only one phase present in the system	Name of the block No Description There is no reaction taken place in the system
Block behavior Block dependencies Active/Default Active/Defined Non-active	Block behavior Block dependencies
Depends on (define the block by the name of its layer and and the name of the block) Layer name Block name If chosen block is Active, current block is Non-active Save	Depends on (define the block by the name of its layer and and the name of the block) Layer name Block name If chosen block is Active, current block is O Active Non-active Save
Equations related to this block           Set 1	Equations related to this block Set 1
OK Cancel	OK Cancel

Figure 16. Block information of the second block.

Figure	17.	Block	inform	nation	of the	third	block.

CreateTemplateForm	Save template		
Short template description		k mixer	Guideline on template creation 1. Add required number of layers and blocks by using "Add layer" and "Add block" buttons.
Detailed template description	Add sub-layer	×	2. Right click on the layer will open the field for entering layer name.     3. Right click on the Template name block will open the field for entering template name.     4. Right click on the block will open block menu. Choose "Edit" to enter information about the block, choose "Dublicate" to add a new block identical to the current one; choose "Delete" to dedta current block.     5. In the form for block information provide details related to
	Add block	×	the block: name, short description and equations, if available. 6. Provide status of the block by checking one of the radio buttons. "Active/default" means that when template is loaded, this block will be chosen green; and related equations will be added authomatically to the model; "Active/defned" means that for this block information is provided and it is available for chossing, this block will be blue, when the template is loaded. "Non-active" means that
Upload Jpload template description from he text file	Presence of reaction		this block cannot be chosen, but it is shown as perspective update of the template. 7. If current block depends on some other blocks in the template, dependencies should be defined. Choose block that current block depends on by two drop down lists, which consist names of all layers and names of the blocks in the chosen layer. Also provide behaviour of the current block, if chosen block is active (green). "Active" means that the block will available for choosing will be bue). Note here, that if block with "active" status was green, it would stay green. "Non-active" means that block wont be available for the available for choosing will be the available for the available for the available for choosing will be bue). Note here, that if block with "active" status was green, it would stay
	Balance Equations		S. If there are dependencies, then equations set should be

Figure 18. Template creation screen after adding and describing all blocks in System Information layer.

Now we are moving further to the Balance Equations layer. Add two sub-layers and name them "Mass balance" and "Energy balance" (Fig. 19).

- CreateTemplateForm	
New template 💏 Open template 🚮 Save template 🌆 ModDev transfer 🙀	
Short template description Tank mixer	Guideline on template creation
System Information	1. Add required number of layers and blocks by using "Add layer" and "Add block" buttons.
+	<ol><li>Right click on the layer will open the field for entering layer name.</li></ol>
Add sub-layer	<ol><li>Right click on the Template name block will open the field for entering template name.</li></ol>
4	<ol> <li>Right click on the block will open block menu. Choose "Edit" to enter information about the block; choose "Dublicate" to add a new block identical to the current one:</li> </ol>
Balance Equations	"Dublicate" to add a new block identical to the current one; choose "Delete" to delete current block.
Add sub-laver	5. In the form for block information provide details related to the block: name, short description and equations, if available.
	6. Provide status of the block by checking one of the radio buttons. "Active /default" means that when template is loaded. It his block will be chosen (oreen) and related
Mass balance	equations will be added authomatically to the model; "Active/defined" means that for this block information is provided and it is available for choosing, this block will be
+ Add block	blue, when the template is loaded; "Non-active" means that this block cannot be chosen, but it is shown as perspective update of the template.
Energy balance	<ol><li>fi current block depends on some other blocks in the template, dependencies should be defined. Choose block</li></ol>
Upload	that current block depends on by two drop-down lists, which consist names of all layers and names of the blocks in the chosen layer. Also provide behaviour of the current block, if
Upload template description from Add block the text file	chosen block is active (green), "Active" means that the block will be available for choosing (will be blue). Note here, that if block with "active" status was green, it would stay
	green. "Non-active" means that block won't be available for choosing and it will become gray.
Constitutive Equations	✓ 8. If there are dependencies, then equations set should be

Figure 19. Template creation screen after adding sub-layers for balance relations.

Add new block to the "Mass balance" sub-layer and open the information form. Apart from the name, description and block behaviour, we will provide mass balance equation, which we defined previously. Put this equation in the text window at the bottom of the information form. After providing all information click OK to save result. See figure 20 for details.

Name of the block				
Steady State				
Description				
This block provide	es steasy state mass bal	ance of the system		_
Block behavior Active/Det Active/Det Non-active	fined	Block dependenc	ies	
Depends on (define the block Layer name	by the name of its layer	and and the name of	the block)	
Block name		•		
If chosen block	is Active, current block	is C Active	Save	
quations related t	to this block			
Set 1				
[3[i] = f1[i] + f2[i]				

Figure 20. Information form for the block describing mass balance.

Now we will add one more block to "Mass balance" sub-layer. We will define it as "Dynamic State". Although we don't have equations for dynamic state mass balance, but it is very likely that we might describe it later. For now this block will have "non-active" status (see fig. 21, 22).

As a next step we will add block to "Energy balance" sub-layer. It will be block, describing steady state energy balance of our system, we can as well provide equations from our model (see fig. 23, 24).

Block Information - N	lass balance		
Name of the block	¢		
Dynamic State			
Description			
This block provid	es dynamic state mass ba	lance	
Block behavior		Block dependencies	
Active/D			
Active/D			
Non-activ	re		
Depends on (define the block	k by the name of its layer	and and the name of the I	block)
Layer name	1	•	
Block name		•	
If chosen block	k is Active, current block i	is O Active	Save
Equations related	to this block		
Set 1			
	ОК	Cancel	

Figure 21. Information form for non-active block.

- CreateTemplateForm	100		
New template	template 📰 ModDev transfer 🙀		
Short template description Syd Ad Detailed template description Ad Upload Iblic description fees	Tank mixer	E	Guideline on template creation 1. Add required number of layers and blocks by using "Add layer" and "Add block" buttons. 2. Right click on the layer will open the field for entering layer name. 3. Right click on the Template name block will open the field for entering template name. 4. Right click on the block will open block menu. Choose "Edi" to enter information about the block: choose "Edi" to enter information provide details related to the block. mane. short description and equations, if available. 5. In the form for block information provide details related to the block. mane. short description and equations, if available. 6. Provide status of the block by checking one of the radio buttons. "Active/default" means that when template is loaded, this block cannot be chosen (green) and related equations will be added authomaticably to the model; "Active/default" means that for this block will be butte when the template is loaded; "Non-extive" means that this block cannot be chosen, but is shown as perspective update of the template. 7. If current block depends on some ather blocks in the template, dependencies should be defined. Choose block thorasin mames of all layers and names of the blocks in the template, dependencies that when template is block will be adder authomation. Will be blue, when the template is loaded. "Non-extive" means that the block means that for this block in the template, dependencies that block horose block in the template, dependencies that are the thocks in the template, dependencies that block will be the when the template is loaded authomation of the blocks in the template, dependencies that block the block is in the template, dependencies that block will be thosen have, the provide basing of the blocks in the template, dependencies that block the block is a short the thosen have, the provide basing of the blocks in the template, dependencies that block the block is a short the thosen have, the active (remen). Note here, that if block will "active" items that block will be availab
Cor	nstitutive Equations	-	choosing and it will become gray. 8. If there are dependencies, then equations set should be

Figure 22. Template creation screen after adding and describing block for "Mass balance" sub-layer.

Block Information - Energy balance	×
Name of the block	
Steady State	
Description	
This block provides steady state energy balance of the system	
Block behavior Block dependencies	
<ul> <li>Active/Defined</li> </ul>	
Non-active	
Depends on	
(define the block by the name of its layer and and the name of the block	ock)
Layer name 👻	
Block name 👻	
If chosen block is Active, current block is O Active Non-active	ave
Equations related to this block	
Set 1	
F3*H3 = F1*H1 + F2*H2	
OK Cancel	

Figure 23. Information form for energy balance block.

CreateTemplateForm	Save template		
	Save template	lixer	Guideline on template creation
Short template description           Detailed template description	Balance Equations  Add sub-layer  Mass balance  H Steady State Dynam  Add block  Energy balance	c State	1. Add required number of layers and blocks by using "Ad layer" and "Add block" buttons.     2. Flight click on the layer will open the field for entering la name.     3. Flight click on the layer will open block will open the fi for entering template name block will open block menu. Choose "Edit" to enter information about the block: choose "Dublicate" to add a new block identicat to the current of choose "Delete" to delete current block.     5. In the form for block: information provide details related the block:maes. short description and equations, if available.     6. Provide status of the block by checking one of the rad buttons. "Active/default" means that when emplate is equations will be added autibutonaticably to the model;     ended, this block will be chosen (green) and related equations will be added autibutons.
Upload oad template description from text file	Add block  Constitutive Equations  Add sub-layer  b		<ul> <li>"Active /defined" means that for this block information is provided and it is available for choosing, this block will be blue, when the template is loaded. "Non-active" means it this block carrand be chosen, but it is shown as perspectiupdate of the template.</li> <li>7. If current block depends on some other blocks in the template, dependencies should be defined. Those block that current block depends on any to drop-down lats, with consen layer. Also provide behaviour of the current block chosen blocks is active (green). "Active" means that the block will be available for choosing (will be blue). Note he that If block will be available for choosing the would stay green. "Non-active" means that block won't be available choosing and t will become grey.</li> <li>S. If there are dependencies, then equations set should be</li> </ul>

Figure 24. Template creation screen after filling out layer "Balance Equations".

Now we are moving to "Constitutive equations" layer. Here we are adding one sub-layer named "Enthalpies", where we also add one block – "Enthalpy correlations". See Figures 23 and 24 for details.

Block Information - Enthalpies
Name of the block
Enthalpy correlations
Description
This block provides correlation equations for components enthalpies
Block behavior Block dependencies
Active/Default
C Active/Defined
Non-active
Depends on (define the block by the name of its layer and and the name of the block)
Layer name 🗸
Block name 👻
If chosen block is Active, current block is O Active Non-active
Equations related to this block
Set 1
h1[i] = ADippr103[i]*T1+BDippr103[i]/2*T1^2+CDippr103[i]/3 ^ *T1^3+DDippr103[i]/4*T1^4+EDippr103[i]/5*T1^5
h2[i] = ADippr103[i]*T2+BDippr103[i]/2*T2^2+CDippr103[i]/3
*T2^3+DDippr103[i]/4*T2^4+EDippr103[i]/5*T2^5
h3[i] = ADippr103[i]*T1+BDippr103[i]/2*T1^2+CDippr103[i]/3
OK Cancel
UK Cancei

Figure 25. Information form for block related to constitutive equations.

- CreateTemplateForm	
New template 🊋 Open template 🚋 Save template 🚋 ModDev transfer 🙀	
Short template description	Guideline on template creation
Balance Equations	1. Add required number of layers and blocks by using "Add aver" and "Add block" buttons.
+	<ol> <li>Right click on the layer will open the field for entering layer name.</li> </ol>
Add sub-layer	<ol><li>Right click on the Template name block will open the field for entering template name.</li></ol>
Constitutive Equations	4. Right click on the block will open block menu. Choose "Edit" to enter information about the block: choose "Dublicate" to add a new block identical to the current one: choose "Delete" to delete current block.
Detailed template description Add sub-layer	<ol> <li>In the form for block information provide details related to the block: name, short description and equations, if available.</li> </ol>
Enthalpies  Enthalpy correlations  Add block	6. Provide status of the block by checking one of the radio buttons. "Active/ofefault" means that when template is loaded, this block will be chosen (green) and related equations will be added authomatically to the model: a "Active offened" means that for this block will be chosen but it is shown as perspective update of the template.
Upload Upload template description from the text file Add sub-layer	7. If current block depends on some other blocks in the template, dependencies should be defined. Choose block that current block depends on by two drop-down lists, which consist names of all layers and names of the blocks in the chosen layer. Also provide behaviour of the current block, if chosen block is active (green). "Active" means that the block will be available for choosing (will be blue). Note here, that f block with "active" status was green, it would stay green. "Non-active" means that block won't be available for choosing and it will become gray.
	<ul> <li>8. If there are dependencies, then equations set should be</li> </ul>

Figure 26. Template creation screen after filling out layer "Constitutive Equations".

And the last layer we need to fill is "Connection Equations". In our case we have only closure equations to add. Create new sub-layer and block in it to describe our closure equations (see fig. 27, 28).

Block Information - Closure equations	x
Name of the block Closure relations Description This block will provide closure equations to the model	
Block behavior Block dependencies Active/Default Active/Defined Non-active	
Depends on (define the block by the name of its layer and and the name of the block) Layer name Block name If chosen block is Active, current block is O Active O Non-active	
Equations related to this block Set 1 H1 = sum_i(h1[i]*f1[i])/F1 H2 = sum_i(h2[i]*f2[i])/F2 H3 = sum_i(h3[i]*f3[i])/F3 T3 = Tmix $\downarrow$	
OK Cancel	

Figure 27. Information form of the block for closure equations.

CreateTemplateForm	No.	
New template 💏 Open template 💏 Save template 💏 ModDev transfer 🙀		
Short template description Tank m	iver	Guideline on template creation
		1. Add required number of layers and blocks by using "Add a layer" and "Add block" buttons.
Constitutive Equations		<ol><li>Right click on the layer will open the field for entering layer name.</li></ol>
•		<ol><li>Right click on the Template name block will open the field for entering template name.</li></ol>
Add sub-łayer           Image: State Stat	X	<ol> <li>Right click on the block will open block menu. Choose "Edit" to enter information about the block; choose "Dublicate" to add a new block identical to the current one; choose "Delete" to delete current block.</li> </ol>
Detailed template description		<ol> <li>In the form for block information provide details related to the block: name, short description and equations, if available.</li> </ol>
Connection Equations		6 Provide status of the block by checking one of the radio buttons. "Active/default" means that when template is loaded, this block will be chosen (green) and related equations will be added authomatically to the model. "Active/defined" means that for this block information is provided and it is available for choseing, this block will be blue, when the template is loaded. "Non-active" means that this block cannot be chosen, but it is shown as perspective E update of the template.
Add sub-layer		7. If current block depends on some other blocks in the template, dependencies should be defined. Choose block that current block depends on by two dong-down lists, which consist names of all layers and names of the blocks in the chosen block is active (green). "Active" means that the block will be available for choosing (will be blue). Note here, that if block with "active" reasts that block won't be available for choosing and it will become gray.
		▼ 8. If there are dependencies, then equations set should be

Figure 28. Template creation screen after filling out layer "Connection Equations".

Now in order to finish our template, provide template description in the test field on the left side of the screen. Click "Save template" (Fig. 29).

CreateTemplateForm	100	
New template 🚮 Open template 🚮 Save template 🚮 ModDev transfer 🙀		
Short template description	Tank mixer	Guideline on template creation
Template describing simple tank mixer with two inlet and one outlet streams. System Information		1. Add required number of layers and blocks by using "Add a layer" and "Add block" buttons.
		<ol><li>Right click on the layer will open the field for entering layer name.</li></ol>
Add sub-layer		<ol> <li>Right click on the Template name block will open the field for entering template name.</li> </ol>
Number of volumes in the system		4. Right click on the block will open block menu. Choose "Edit" to enter information about the block; choose "Dublocate" to add a new block identical to the current one; choose "Delete" to delete current block.
Detailed template description Add block		<ol> <li>In the form for block information provide details related to the block: name, short description and equations, if available.</li> </ol>
Number of phases	X	6. Provide status of the block by checking one of the radio buttons. "Active /default" means that when template is loaded, this block will be chosen (green) and related equations will be added authomatically to the model: "Active /defined" means that for this block information is provided and it is available for choceing, this block will be blue, when the template is loaded, "Non-active" means that this block carmot be chosen, but it is shown as perspective
Presence of reaction Upload Upload template description from the text file		update of the template. 7. If current block depends on some other blocks in the template, dependencies should be defined. Choose block that current block depends on by two drop down lists, which consist names of all layers and names of the blocks in the chosen layer. Also provide behaviour of the current block, if chosen block is adfuer (green). "Active" means that the block will be available for choosing (will be blue). Note here, that f block with "out" status was green, it would stay
Balance Equations		green. "Non-active" means that block won't be available for choosing and it will become gray.
		▼ 8. If there are dependencies, then equations set should be ▼

Figure 29. Template creation screen after filling template description.

Provide the name of the file and a folder (Fig. 30). Then our template will be saved.

CreateTemplateForm				
- Save As	law ang an 🔬 tindae anata 🚮		X	
C Visual Studio 2010 >	Projects ▶ TemplateApp ▶ TemplateApp ▶ bin ▶ Release ▶ Tem	nplates 👻 🍕 🖇	Search Templates	leline on template creation
Organize 🔻 New folder			= - 0	required number of layers and blocks by using "Add and "Add block" buttons
🔆 Favorites 📃 Desktop	Documents library Templates		Arrange by: Folder 🔻	It click on the layer will open the field for entering layer
〕 Downloads 😻 Dropbox	Name		ype Size	enng template name.
🖳 Recent Places	Cxidation of unsaturated fatty acid with hydrogen peroxide     Tank mixer.tempapp		EMPAPP File	It click on the block will open block menu. Choose to enter information about the block; choose ate" to add a new block identical to the current one; a "Delete" to delete current block.
Contractions Libraries				e form for block information provide details related to ck: name, short description and equations, if le.
📄 Pictures 📰 Videos				ide status of the block by checking one of the radio . "Active/default" means that when template is this block will be chosen (green) and related ons will be added authomatically to the model;
🐏 Computer 🏜 Local Disk (C:) 🕳 Removable Disk (F:)	▼ €Ⅲ		•	It is win be added automatically to the model, i/defined" means that for this block information is ad and it is available for choosing, this block will be hen the template is loaded; "Non-active" means that ck cannot be chosen, but it is shown as perspective of the template.
File name: Tank mixer.tempa			•	ment block depends on some other blocks in the te, dependencies should be defined. Choose block
Save as type: Template file (*ter	(babb)		Save Cancel	The Upper Carlos Statula be called a United Buck irrent block depends on by two dro-dwn lists, which names of all layers and names of the blocks in the layer. Also provide behaviour of the current block, if block is active (green). "Active" means that the will be available for choosing (will be blue). Note here, abock with "active" status was green, it would stay
	Balance Equations		cho	en. "Non-active" means that block won't be available for osing and it will become gray.
			▼ 8. lf	there are dependencies, then equations set should be

Figure 30. Saving of the template.

4. Example 2 – Open created template.

Now close template creation screen and go to the starting form of Template Application. Click "Browse..." to open file dialog and find the template file of our tank mixer (Fig 31, 32).

- ModTem	
Welcome to the Template Application Tool for Model Reuse, Development and Maintena Please, choose the available template from the list below or create a new template	ince.
List of available templates	_
Create new template	
OK Browse	

Figure 31. Opening existing template.

Open	ial St	udio 2010 + Projects + TemplateApp + TemplateApp + bin +	Debug 👻		× , 1 0
🔆 Favorites 💻 Desktop	Â	Documents library Debug		Arrange by: Fold	ler 🔻
🚺 Downloads		Name	Date modified	Туре	Size
Dropbox Recent Places		Oxidation of unsaturated fatty acid with hydrogen peroxide	31-03-2014 00:39	TEMPAPP File	
Necent Places		Tank mixer.tempapp	07-04-2014 12:41	TEMPAPP File	
🥽 Libraries	=	test.tempapp	03-04-2014 10:25	TEMPAPP File	
Documents		📄 aa.tempapp	03-04-2014 15:03	TEMPAPP File	
J Music					
Pictures					
Videos					
🜉 Computer					
🚢 Local Disk (C:)					
🖵 Personal Drive (H:)					
🖵 CAPEC Department Share (K:)					
KT Applications (0:)	-	۲. III III III III III III III III III I			
File name: Tanl	k mix	ertempapp		<ul> <li>Template file (*tempapp)</li> </ul>	-

Figure 32. Opening existing template.

The screen with template will be opened. Note, that all equations from default blocks are already added to the text field on the right side (Fig. 33).

Tank mixer		
Save model as XML file XML Save mod	el as text file 📷 Model transfer to MoT 💓 Update template 🚋	
Template Description Template describing simple tank mixer with two inlet and one outlet streams. Detailed Description Current Block Description	Tank moder       System Information       Number of volumes in the system       One       Number of phases       One   Presence of reaction       No	Model Equations [3]] =f1]] +72]] [3]] =f1]] = ADupr103)T1+8Dupr103)/2T1'2+CDupr103)/3 T1'3+ODupr103)/4T1'4+EDupr103)/5T1'5 h2]] = ADupr103)/4T1'4+EDupr103)/5T1'5 h3]] = ADupr103)/4T1'4+EDupr103)/5T1'5 F1 =sum_{1}f1]] E [3] =sum_{1}f1]] F3 =sum_{1}f2]] F3 =sum_{1}f2]]/F1 H2 =sum_{1}f2]]/F2 H3 =sum_{1}f2]]/F3 T3 = Tmk
	Balance Equations Mass balance Steady State Dynamic State	

Figure 33. Template use screen with tank mixer template.

For the further use of model there are three options: save model to xml file, txt file or transfer directly to MoT. To save model to the file, click the corresponding button from the tool menu (Fig. 34). Afterwards provide the name of the file and click "Save", so the model will be saved (Fig. 35).

Tank mixer					
Save model as XML file	Save mo	del as text file	Model transfer to MoT	×	Update template
Template Description					Tank mixer
Template describing simple tank mit two inlet and one outlet streams.	xer with	- System Information			
		-Number of volum	nes in the system		
Detailed Description		O	ne		
Current Block Description	n				
		Number of phase	es		

Figure 34. Tool menu of the template screen.

Tank mixer		1.1.1.1.1.1.1		
Save As	energi 🚔 manuale energi 👅 sum	Å		<b></b>
🔾 🗸 🖓 🗸 Visual Studio 2010 🕨 Proj	ects + TemplateApp + TemplateApp + bin + Release	► Templates 👻 🐓	Search Templates	2
Organize 👻 New folder			8== -	el Equations
Favorites	Documents library Templates		Arrange by: Folder	ADippr103[i]*T1+BDippr103[i]/2*T1^2+CDippr103[i 8+DDippr103[i]/4*T1^4+EDippr103[i]/5*T1^5
Downloads Oropbox	Name	Date modified	Туре	Size ADippr103[] <sup>+</sup> T2+BDippr103[]/2 <sup>+</sup> T2 <sup>+</sup> 2+CDippr103[] 3+DDippr103[]/4 <sup>+</sup> T2 <sup>+</sup> 4+EDippr103[]/5 <sup>+</sup> T2 <sup>+</sup> 5
E Recent Places	Tank mixer.xml	06-06-2014 14:02	XML File	ADippr103[i]*T1+BDippr103[i]/2*T1^2+CDippr103[i 3+DDippr103[i]/4*T1^4+EDippr103[i]/5*T1^5 sum_[f1[i])
Libraries     Documents     Music     Pictures     Videos				ստ[42]]) ստ[4][]] ստ[4][][1][]/F1 ստ[4][7][2][/F2 ստ][43][73][]/F3 Tmx
🖳 Computer 🚨 Local Disk (C:)				
	•	"		
File name: Tank mixer.xml				
Save as type: XML file (*xml)				<b>-</b>
) Hide Folders			Save Cancel	
	Steady State Dynamic State			Ţ

Figure 35. Saving template as xml file.

Another option is to transfer model directly to MoT. After clicking at the button, MoT will be open with already translated model of our tank mixer (Fig 36, 37).

- Tank mixer	
Save model as XML file XML Save mo	odel as text file 🔤 Model transfer to MoT 💓 Update template 📰
Template Description	Tank mixer
Template describing simple tank mixer with two inlet and one outlet streams.	System Information
Detailed Description	Number of volumes in the system
Current Block Description	Number of phases

Figure 36. Button to transfer model to MoT.

🙀 File Edit View Window Help	
※●母 <b>母</b> 戸 曲址!	ia ha ma mu ci
System information/docume     Model Construction     Wew Original Model     Wew Translated Model     World Model     Define Rolationships     Submodels/Caustion C     Model Analysis (Numeral)     Classify Variables     Relate d'/4 to t y     Relate d'/4 to t y	<pre>#Imported from XML format # filmported from XML format f f f3[1] = f1[1] + f2[1] f f f3[1] = ADippri03[1]*T1+BDippri03[1]/2*T1^2+CDippri03[1]/3*T1^3+DDippri03[1]/4*T1^4+EDippri03[ f f f f1[] = ADippri03[1]*T1+BDippri03[1]/2*T1^2+CDippri03[1]/3*T1^3+DDippri03[1]/4*T1^4+EDippri03[ h3[1] = ADippri03[1]*T1+BDippri03[1]/2*T1^2+CDippri03[1]/3*T1^3+DDippri03[1]/4*T1^4+EDippri03[ f f1[] = sum_i(f1[1]) f f2 = sum_i(f2[1]) f f3 = sum_i(f3[1]) f H1 = sum_i(h1[1*f1[1])/F1 f H2 = sum_i(h2[1*f2[1])/F2 f H3 = sum_i(h3[1]*f3[1])/F3 f T3 = Tmix</pre>

Figure 37. MoT screen with transferred model.

5. Example 3 – Update the template; use of dependencies.

Now we will make updates in our tank mixer template. Originally we had two streams coming into tank, now we will consider the situation, when there are three streams entering tank.

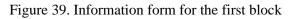
To go again to the template creation screen, click "Update template" button in the tool menu (Fig 38).

ſ	Tank mixer
	Save model as XML file xML Save model as text file xML Model transfer to MoT Vpdate template
l	Template Description Tank mixer
	Template describing simple tank mixer with two inlet and one outlet streams. System Information
l	Number of volumes in the system
	Detailed Description One
	Current Block Description
	Number of phases

Figure 38. Update template button on the template screen.

Add new sub-layer in "System Information" layer – "Number of inlet streams" and add two blocks to it. First block will be for two streams and it will be default one, second block will be for three streams (See Fig. 39, 40, 41).

Two	
Description	
Two streams are entering tank mixer	
Block behavior	Block dependencies
Active/Default	
Active/Defined	
Non-active	
Depends on	
(define the block by the name of its la	yer and and the name of the block)
Layer name	<b>•</b>
Block name	
If chosen block is Active, current blo	ock is O Active
	Non-active     Save
Equations related to this block	
Equations related to this block Set 1	
-	]
-	
-	
-	
-	
-	



Name of the block Three	_			
mee				
Description				
Three streams are enterin	ng tank mixer			
Block behavior		Block dependence	cies	
Active/Default				
Active/Defined				
Non-active				
Depends on (define the block by the	name of its layer	and and the name of	f the block)	
Layer name		•		
Block name		•		
If chosen block is Activ	ve, current block i	is O Active	Save	
Equations related to this b	lock			
Set 1				
	ОК	Cancel		

## Figure 40. Information form for the second block

nort template description	T	ank mixer	Guideline on template creation
mplate describing simple tank mixer h two inlet and one outlet streams.	Add block	×	1. Add required number of layers and blocks by using "Add layer" and "Add block" buttons.     2. Right click on the layer will open the field for entering laye name.     3. Right click on the Template name block will open the field for entering template name.
stailed template description	Number of phases	X	<ol> <li>Right click on the block will open block menu. Choose "Edit" to enter information about the block; choose "Dublicate" to add a new block identical to the current one choose" Delete" to delete current block.</li> <li>In the form for block information provide details related to</li> </ol>
	Presence of reaction		<ul> <li>the block: name, short description and equations, if available.</li> <li>6. Provide status of the block by checking one of the radic buttons. "Active/default" means that when template is loaded, this block will be chosen (green) and related equations will be added authomatically to the model; "Active/defined" means that for this block information is provided and it is available for chosens, this block.</li> </ul>
Upload load template description from text file	Number of inlet streams	Three	blue, when the template is loaded: "Non-active" means th this block cannot be chosen, but it is shown as perspectiv update of the template. 7. If current block depends on some other blocks in the template, dependencies should be defined. Choose block that current block depends on by two drop-down lists, whit consist names of all layers and names of the blocks in the chosen layer. Also provide behaviour of the current block, chosen block is active (green). "Active" means that the block will be available for choosing (will be blue). Note hen that if block with "active" status was agreen, at would status

Figure 41. Template creation screen after adding new sub-layer for inlet streams.

Now we need to update equations in our template. Go to the "Steady State" block in "Mass balance" sub-layer and open its information form. Whether there are two inlet streams or more, we will still have steady state mass balance, but the equations should depend on the number of streams.

Therefore, we will define dependencies for this block. In the part of dependencies in the information form fill the name of sub-layer and the name of block from on which current block depends (Fig. 40). In our case – "Number of inlet streams" and "Two".

lock Information - Mass balance	Block Information - Mass balance
Name of the block Steady State Description This block provides steasy state mass balance of the system	Name of the block         Steady State         Description         This block provides steasy state mass balance of the system
Block behavior Block dependencies Active/Default Active/Defined Non-active	Block behavior    Block dependencies    Block dependencies
Depends on (define the block by the name of its layer and and the name of the block) Layer name Number of inlet streams Block name Two If chosen block is Active, current block is Number of inlet streams Save Non-active Save	Depends on (define the block by the name of its layer and and the name of the block) Layer name Block name if chosen block is Active, current block is  Active Non-active
Equations related to this block           Set 1           [f3[j] = f1[j] + f2[j]	Equations related to this block       Set 1     Set 2
OK Cancel	OK Cancel

Figure 42. Describing dependencies.

Figure 43. Saved dependency.

If chosen block is Active (green on the template use screen), then current block will be also active. Equations in Set 1 will be related to this dependency. Click "Save" button and dependency will be saved (Fig. 43).

Now we will add Set 2 of equations, which will be changed to describe three inlet streams. Also we will describe dependency of "Number of inlet streams"/"Three" block (Fig. 44). Close information form by clicking OK.

Similarly provide changes and dependencies for other block in layers "Balance Equations", "Constitutive Equations", "Connection Equations". See Figures 45-47 for details.

Then we also need to correct template description, as it was related only to two inlet streams. After changing that we can save template (Fig. 48).

Block Information - Ma	balance	
BIOCK Information - Ma	ass balance	
Name of the block		
Steady State		
Description		
This block provide	s steasy state mass bala	nce of the system
Block behavior		Block dependencies
Active/Det	fault	
Active/Det		X 1. Number of inlet streams/Two
Non-active		
- Non Beave		4 III >>>
Depends on		
(define the block	by the name of its layer a	and and the name of the block)
Layer name	Number of inlet streams	-
Block name	Three	•
If chosen block	is Active, current block i	
		Non-active
Equations related to	o this block	
Set 1 Set 2		1
f4[i] = f1[i] + f2[i]+	f3[j]	
<u> </u>		
	ОК	Cancel

Figure 44. Describing second dependency.

Block Information - Enthalpies	×
Name of the block Enthaloy correlations	
Description	
This block provides correlation equations for components enthalpies	
Block behavior Active/Default Active/Defined Non-active     Solution	
Depends on (define the block by the name of its layer and and the name of the block) Layer name	
Block name  If chosen block is Active, current block is  Active Non-active Save	
Equations related to this block Set 1 Set 2 Set 3	
$ \begin{array}{l} h1[i] = ADippr103[i]^*T1+BDippr103[i]/2*T1^2+CDippr103[i]/3*T1^3+DDippr103[i]/4*T1 \\ r^4+EDippr103[i]/5*T1^5 \\ h2[i] = ADippr103[i]/5*T2^5 \\ h3[i] = ADippr103[i]/5*T2^5 \\ h3[i] = ADippr103[i]/5*T2^5 \\ h3[i] = ADippr103[i]/5*T2^5 \\ h3[i] = ADippr103[i]/5*T3^5 \\ h4[i] = ADippr103[i]/3*T4^*ADippr103[i]/2*T3^2+CDippr103[i]/3*T3^3+DDippr103[i]/4*T3 \\ r^4+EDippr103[i]/5*T3^5 \\ h4[i] = ADippr103[i]^*T4+BDippr103[i]/2*T4^*2+CDippr103[i]/3*T4^*3+DDippr103[i]/4*T4 \\ r^4+EDippr103[i]/5*T4^*5 \\ \end{array}$	
OK Cancel	

Figure 46. Dependencies for the enthalpies.

Name of the block	t	
Steady State		
Description		
	es steady state energy bala	ance of the system
Block behavior		Block dependencies
Active/De	efault	X 1. Number of inlet streams/
Active/De	efined	
Non-activ	e	X     2. Number of inlet streams/ ▼       ✓     III
Depends on (define the block	by the name of its layer ar	nd and the name of the block)
Layer name		
Block name		• •
	t is Active, current block is	Active     Non-active
		Save
If chosen block		Save
If chosen block Equations related Set 1 Set 2	to this block	Save
If chosen block Equations related Set 1 Set 2	to this block Set 3	Save
If chosen block Equations related Set 1 Set 2	to this block Set 3	Save
If chosen block Equations related Set 1 Set 2	to this block Set 3	Save
If chosen block Equations related Set 1 Set 2	to this block Set 3	Save
If chosen block Equations related Set 1 Set 2	to this block Set 3	Save

Figure 45. Dependencies for the energy balance.

Information - Clo	sure equations	to tomes Photo
Name of the block		
Closure relations		
Description		
· · · · · · · · · · · · · · · · · · ·	ide closure equations to	the model
This block will provi		
Block behavior		Block dependencies
Active/Default	ault	·
Active/Defi	ned	X 1. Number of inlet streams
Non-active		X 2. Number of inlet streams/ -
Nonactive		III     III     III
Depends on		
	by the name of its layer	and and the name of the block)
Layer name		•
Block name		•
If chosen block i	s Active, current block i	
		Non-active     Save
Equations related to	this block	
	Set 3	
F2 = sum_i(f2[i])		A
F3 = sum_i(f3[i]) F4 = sum_i(f4[i])		
H1 = sum_i(h1[i]*f1	[j])/F1	E
H2 = sum_i(h2[i]*f2 H3 = sum_i(h3[i]*f3	2[i])/F2 861)/F3	
H4 = sum_i(h4[i]#4		
T4 = Tmix		•
		Control
	OK	Cancel

Figure 47. Dependencies for closure equations.

- CreateTemplateForm			
New template	ave template 📰 ModDev transfer 🙀		
Short template description		Tank mixer	Guideline on template creation
Template describing simple tank mixer with two or three inlet and one outlet streams			Add required number of layers and blocks by using "Add     layer" and "Add block" buttons.
argana.	Number of volumes in the system    Add block  One	×	2. Right click on the layer will open the field for entering layer name.     3. Right click on the Template name block will open the field for entering template name.
	Number of phases	X	<ol> <li>Right click on the block will open block menu. Choose "Edit" to enter information about the block; choose</li> <li>"Dublicate" to add a new block identical to the current one; choose "Delet": to deleta current block</li> </ol>
Detailed template description	Add block		<ol> <li>In the form for block information provide details related to the block: name, short description and equations, if available.</li> </ol>
	Presence of reaction           No           Add block		6. Provide status of the block by checking one of the radio buttons. "Active /deauk!" means that when template is loaded, the block will be chosen (green) and related equations will be added authomatically to the model, "Active /defined' means that for the block information and the block will be chosen but a state of the block will be chosen but a state of the block will be block will be chosen. Use the block will be block and be chosen, but it is shown as perspective update of the template is loaded.
Upload Upload template description from the text file	Number of inlet streams	Three	7. If current block depends on some other blocks in the template, dependencies should be defined. Choose block that current block depends on by two dong-down biss, which consist names of al layers and names of the blocks in the chosen layer. Also provide behaviour of the current block, if chosen block is active (green). "Active" means that the block will be available for choosing (will be blue). Note here, that if block will be available for choosing (will be blue). Note here, that if block will be been sens that block wort be available for choosing and it will become gray.
	Balance Equations		▼ 8. If there are dependencies, then equations set should be

Figure 48. Template creations screen after updating template.

Now we will open our template from the starting screen again in order to check changes and dependencies (Fig. 49).

- Tank mixer		10 C	
Save model as XML file XML Save model	as text file 🏬 Model transfer to MoT 💓 Update template 🚟		
Template Description Template describing simple tank mixer with two or three inlet and one outlet streams.	System Information Number of volumes in the system	-	Model Equations [3]] = f1]] + f2]] [3]H = f1H + F2H2 h1]] = ADper103[]71H 0[0][2711"2+CDppr103]]/3 11"3+ODper103]]/71H 2+EDppr103]]/5"11"5 h2]] = ADper103]/71"2+EDppr103]]/5"11"5 h2]] = ADper103]/71"3+EDppr103]/5"13"2+CDppr103]/3" h3]] = ADper103]/71"3+EDppr103]/5"13"5 h3]] = ADper103]/71"3+EDppr103]/5"13"5
Detailed Description	One	=	'T2'3+DDipr103()/4'T2'4+EDipr103()/5'T2'5 h3() = ADipr103()/T3+BDipr103()/2'T3'2+CDipr103()/3 'T3'3+DDipr103()/4'T3'4+EDipr103()/5'T3'5 F1 = sum_i(F1()) F2 = sum_i(F2())
Current Block Description	Number of phases One		r2 = sun_ij*2(µ) H1 = sum_ij*1[[11][]/F1 H2 = sum_ij*1[[12][]/F2 H3 = sum_i]/h3[[12]]/F3 T3 = Tmix
	Presence of reaction		
	Number of inlet streams Two Three		
	Balance Equations		- · · ·

Figure 49. Template use screen of tank mixer template after updates.

Now we click on the blue block "Three" to show that we want to have three inlet streams in our model. It will become green and model equations will change accordingly. That means that our dependencies work fine.

Template Description Template describing simple tank mixer with two or three inlet and one outlet streams.	text file  Model transfer to MoT Update template  Tank mixer  System Information  Number of volumes in the system  Number of phases	Model Equations           [40] = 10] + 120] + 131           F414 = 5111 + 12714 + 57143           F414 = 5111 + 12714 + 57143           h10] = ADopr103[J1714-BDopr103]/27112-CDopr103]/3           T13-3-DDopr103]/47114+274+EDopr103]/27122-CDopr103]/3           T12-3-DDopr103]/47114+274+EDopr103]/27122-CDopr103]/3           T12-3-DDopr103]/4712*4-EDopr103]/27122-CDopr103]/3           T12-3-DDopr103]/174-BDopr103]/2712*2-CDopr103]/3           T12-3-DDopr103]/174-EDopr103]/2712*2-CDopr103]/3           T13-3-DDopr103]/174-BDopr103]/2713*2-CDopr103]/3           T13-3-DDopr103]/174-BDopr103]/2713*2-CDopr103]/3           T13-3-DDopr103]/174-BDopr103]/2713*2-CDopr103]/3           T13-3-DDopr103]/174-BDopr103]/2713*2-CDopr103]/3
Template describing simple tank mixer with two or three inlet and one outlet streams.	System Information Number of volumes in the system One Number of phases	[4]] = f1[] + f2[] + f3[] F4 + H = F1 + H = F2 + F3 + H3 h1[] = ADjepr103[J1 + BDjepr103]J2 + T1 ^2 + CDjepr103[J3 + T1 ^3 + DDjepr103[J2 + T1 ^4 + EDjepr103]J5 + T1 ^5 h2[] = ADjepr103[J2 + T1 ^4 + EDjepr103]J5 + T2 + CDjepr103[J2 + T2 + DDjepr103]J2 + T2 + DDjepr103[J2 + T3 + DDjepr103]J2 + T3 + Djepr103[J2 + T3 + Djepr103]J2 + Djepr103[J2 + Djepr
	One	■ "T4^3+DDippr103[i)/4"T4^4+EDippr103[i)/5"T4^5 F1 = sum_[f1]) F2 = sum_[f2]) F3 = sum_[f3]) F4 = sum_[f4]) F4 = sum_[f4]) H1 = sum_[f4]) H1 = sum_[f4]) H2 = sum_[f4]) H3 = sum_[f4]) H4 = sum_[f4]] T4 = Tmix
	Presence of reaction No	
	Number of inlet streams Two Three	

Figure 50. Template use screen of tank mixer template after updates.