1. Importing a HAZOP

SafeGuard Profiler[™] lets you import a HAZOP for use as input for performing a LOPA. Export the completed HAZOP as a CSV (comma-separated value) file from a HAZOP application.

1.1. HAZOP CSV Format

Ensure the HAZOP CSV file you wish to import has the following structure (column header text is suggested only):

Node	Deviation	Initiating Event Cause	Likelihood	Description Consequence	Severity	IPL / Type Safeguar	of IPL / PFD ds	Recommendations
1	1	1		-		\rightarrow 1 \rightarrow 2	FAL-1004 TAH-1003	
		2				\rightarrow 1 \rightarrow 2	PAH-1007 PSV-1001	
		3				\rightarrow 3 \rightarrow 1	PXHH-1015 TAH-1006	
						\rightarrow 1	LIC-1015	
2	1	1				> 2	FAL-1014	
		2				\rightarrow 1 \rightarrow 2	LIC-1015 TAL-1020	
	2	1				\rightarrow 1 \rightarrow 2	LAH-1028 LIC-1015	

Node	Deviation	Initiating Event Cause	Likelihood	Safeguards / MOD IPL / Type of IPL / PFD
1. LPG Splitter	1. no/low LPG flow (Loss of supply)	1. process upstream upset, loss of supply	0.125	1. FAL-1004
1. LPG Splitter	1. no/low LPG flow (Loss of supply)	1. process upstream upset, loss of supply	0.125	2. TAH-1003
1. LPG Splitter	1. no/low LPG flow (Loss of supply)	2. High pressure	0.25	1. PAH-1007
1. LPG Splitter	1. no/low LPG flow (Loss of supply)	2. High pressure	0.25	2. PSV-1001
1. LPG Splitter	1. no/low LPG flow (Loss of supply)	2. High pressure	0.25	3. PXHH-1015
1. LPG Splitter	1. no/low LPG flow (Loss of supply)	3. High butane Temperature	0.25	1. TAH-1006
2. Re-boiler	1. no/low steam flow (Loss of steam supply)	1. Control loop malfunction FIC-065	0.1	1. LIC-1015
2. Re-boiler	1. no/low steam flow (Loss of steam supply)	1. Control loop malfunction FIC-065	0.1	2. FAL-1014
2. Re-boiler	1. no/low steam flow (Loss of steam supply)	2. Offspec butane	1	1. LIC-1015
2. Re-boiler	1. no/low steam flow (Loss of steam supply)	2. Offspec butane	1	2. TAL-1020
2. Re-boiler	2. no/low condensate flow (no condensate flow)	1. Control loop malfunction LIC-1018	0.1	1. LAH-1028
2. Re-boiler	2. no/low condensate flow (no condensate flow)	1. Control loop malfunction LIC-1018	0.1	2. LIC-1015

1.2. Importing a CSV File

In Profiler, on the Event page, select View > HAZOP.

G ACM Safe	Guard Profiler - (LOPA) - Event				And the second se			
File Edit	View Font Analysis Setting	s Tools	Optimize	Help				
	Event	F2	Title	Descript	on		Intended	
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	SIL Validation	F4						
	SRS	F5	hs					SAPEGUARD PROFILER
Reference	D Maintenance		Date B	y Chk Appr Descript	on			
	Block Diagram & Summary							
	Project Summary							
	Contingency Table							
	SRS History							
	Hazop	Ctrl+H	1					
	Fonore Data	Sector 1	•					
	Reset Splitter Locations							
1	-	11	-					

In the "HAZOP" window, select File > Import from the top menu.

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File					
Import (Ctrl+I				
Print C	itrl+P				
Exit Hazop					
-					
		<< <	No Items >	>>	Go To

In the "HAZOP Settings" window, click "Browse" at the top right.

Hazop Settings					
	Import File				Browse
		Load Column Names	Take Settings From Another Proj	ject	
			LOPA	Risk Graph	
Displayed Columns					
Cause/Initiator and Consequence are required display columns. Move Up Move Down					
		Cancel		Ir	mport

Locate the HAZOP CSV file for importing, select the file and click "Open".

Once the file's path name appears in the "Import File" field, click "Load Column Names".

The window will update with a list of column headings loaded from the CSV file.

azop Settings			
	Import File HazopImportTest5.csv		
	Load Column Names	Take Settings From Another Proj	ect
		LOPA	Risk Graph
	Guideword	▼	▼
Displayed	Deviation	_	•
Columns	Causes of deviations	•	•
	Undesired Consequences	•	•
Cause/Initiator	Severity without SPLs	•	•
and	Likelihood without SPLs	•	•
Consequence	Risk without SPLs	▼	•
display columns	Safeguards	▼	•
alopidy columns.	Severity with Safeguards	▼	•
MoveUp	Likelihood with SPLs	▼	•
	Risk with SafetyProtectionLayers	▼	•
Move Down	Recommendations	▼	•
NOVE DOWN	Ву	•	•
	Completion Due Date	▼	•
	Comments	▼	•
	Company	▼	•
	Location	▼	•
	Facility	•	•
	File Description	▼	•
	Session Number	▼	•
	Session Date	▼	•
	Revision Number	▼	•
	Revision Date		•
	Drawings	•	•
	Node Number	▼	•
	Node	▼	•
	Node Intention	▼	•
	Parameter		•

1.3. HAZOP Display Setup

Link the column names from the HAZOP CSV file to existing LOPA fields as follows:

HAZOP	LOPA
Node	Node
Deviation	Scenario (Deviation)
Causes	Cause / Initiating Event
Consequences	Consequence
S [first instance]	Severity [i.e. Severity before Safeguards]
L [first instance]	Likelihood [i.e. Likelihood before Safeguards]
RR [first instance]	Risk Ranking [i.e. RR before Safeguards]
Exist. Safeguards	Protection Layer (Safeguard)
S [second instance]	Severity with SPLs [i.e. Severity after Safeguards]

L [second instance]	Likelihood with SPLs [i.e. Likelihood after Safeguards]
RR [second instance]	Risk Ranking with SPLs [i.e. RR after Safeguards]
Recommendations	Recommendation
Remarks	Notes

If you do not require all the HAZOP columns to perform a LOPA, SafeGuard Profiler[™] allows you to select a subset of HAZOP data for import into the HAZOP display window.

For each desired HAZOP column name, right click on the name and select "Display Column".

The name, along with its linked LOPA and Risk Graph fields, will be highlighted.

Note: At a minimum, SafeGuard Profiler[™] requires you to link the "Cause / Initiating Event" and "Consequence" fields under "LOPA" with column names loaded from the HAZOP CSV file.

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	Import File C:	Users\gpacanins\D	esktop\Dr Pasq	uale\Invensys\ButanePas	q.csv	Browse
	,	Load Column Nar	nes	Take Settings From Anothe	Project	
				LOPA	Risk Graph	-
	Node		\rightarrow	<node></node>	<node></node>	
Displayed	Deviation		\longrightarrow	Scenario (Deviation)	 Cause of Demand 	1
Columns	Consequences	• -	\longrightarrow	Consequence	 Consequence of Failure 	
	Causes		\longrightarrow	Cause/Initiating Event	 Initiator Tag 	
	S	<u> </u>	\longrightarrow	Severity	 Severity 	1
	L	<u> </u>	\longrightarrow	Likelihood	 Likelihood 	1
	RR	<u> </u>	\longrightarrow	Risk Ranking	 Risk Ranking 	
	Safeguards	<u> </u>	\longrightarrow	Protection Layer (Safeg	 Additional Safeguard 	
Move Up	Recommendat	ions –	\longrightarrow	Recommendation	 Recommendation 	
	Loop Number				•	
Move Down						
		1				
		Cancel			li li	nport

Click "Import".

The import process may take a few seconds.

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Node	1.12 storage drum liquids	tank + Depenta to condensate s	nizer reboiler liquids to cr torage tank	ondensate storage + Cor	ndensal	te line 1	to drair	i pump 18-P-103 + Con	densate	feed	^	Loop Type		0 Ro	w(s) Selecte	d	
Parameter Deviation											^	C Risk Graph	1atrix			E	
	SAFEGUARD PROFLER Next Previous																
	1		1-						-								
Loop	Guidewor More	Deviation More Flow	Causes More feed flow from depentenizer 14-C-104.	Consequences Vent vapour to atmosphere, loss of production, potential vapour cloud fire.	Sev	Like	Ris	Safeguards Flame detection.	Sev	Like	Ris	Recommendations To be analyzed further under global fire & gas node.	1.12	Node storage tank + Depentanizer reboiler liquids to condensate storage + Condensate line to drain pump 18-P-	Parameter		_
	Asphyxiation. None identified. Provide gas detection around tank & roof 21-T- 101. 1.12 begenatizer reboiler liquids to condensate storage + Condensate ine to drain pump 18-P-																
		Higher Pressure	More feed flow from depentenizer 14-C-104.	Vent vapour to atmosphere, loss of production, potential vapour cloud fire.				Flame detection.				To be analyzed further under global fire & gas node.	1.12	storage tank + Depentanizer reboiler liquids to condensate storage + Condensate line to drain pump 18-P- 103 + Condensate feed drum liquids to condensate storage tank			
				la i tr	1	1		an an an a				<	< <	3 of 33	>>	Go To	0

Prior to commencing the LOPA process, check the imported HAZOP against the original, to ensure all the relevant data was imported successfully.

2. Creating LOPA Loops from an Imported HAZOP

2.1. Locating and Highlighting Consequences

The process of creating LOPA loops for analysis begins with the imported HAZOP display window.

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<u>F</u> ile																		
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LOPA is a consequence-based analysis. Therefore the emphasis is on the consequence column of the HAZOP.

Right click on the desired "Consequence" field and select "Smart Select for Create Loop."

This consequence and its associated causes and safeguards will be highlighted in blue, as shown.

Note the "Row(s) Selected" message in the top right of the window. If it reports greater than one "Consequence the same," then there are at least two instances of the same consequence that need to be located and included in this loop.

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Node	1.13											Loop Туре			1 Row(s) Selecte	d
Hode												LOPA			1 Conseq	uences the	e same.
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Parameter		Jilected										Safety Laver N	latrix			A	F
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Next Previous																	
Loop	Guidewor	Deviation	Causes	Consequences	Sev	Like	Ris	Safeguards	Sev	Like	Ris	Recommendations	Node	Node	F	Parameter	
	Reverse/	Reverse/Mis	Manual valve left	Loss of				None identified.				Confirm with	1.13				
	Misdirecte	directed Flow	open on inlet line.	containment,								previous dispersion study if a VCF is					
	ŭ			cloud, explosion								possible.					
				(need to be													
								None identified.				Consider use of	1.13				
												reviewed under fire					
	Less	Lower	Chiller failure 15-	Exceeding low				Safeguards to be				Review the	1.13				
		Temperature	E-101/102, ie spec	temp spec of piping				evaluated outside				requirement of a					
			of 15-E-102	(check off line				this node.				spec break location					
			0110 2 102.	previous nouces).				Safeguards to be				Consider using the	1 13				
								evaluated outside				existing high temp					
								this node.				alarm transmitter					
												<-	< <	4 of 33	>	>>	Go To

Note: Because HAZOP consequence descriptions may not always be copied verbatim by the facilitator, take care to identify similarly worded consequence descriptions. For a selected consequence, the number of instances reported by SafeGuard Profiler[™] are those with descriptions which match verbatim.

Ensure only consequences with matching categories (i.e. H&S, ENV, ASSET, Reputation) and matching Severity are grouped.

Similar consequences with different Severity/Category must not be grouped.

2.2. LOPA Loop Creation

Once the desired "Consequence" fields have been Smart Selected, select "LOPA" for "Loop Type," then click "Create Loop".

The Smart Selected cells will be highlighted yellow to reflect that their contents have used in a generated loop. The generated loop's number will appear in the "Loop Number" column.

ACM SafeGuar	d Profiler - H	azop		_													. D . X
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Node	1.13										^	Loop Type			1 Row 1 Conse	(s) Selecter quences the	d same.
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Loop	Guidewor	Deviation	Causes	Consequences	Sev	Like	Ris	Safeguards	Sev	Like	Ris	Recommendations	Node	Node		Parameter	
105	Reverse/ Misdirecte d	Reverse/Mis directed Flow	Manual valve left open on inlet line.	Loss of containment, potential for vapour cloud, explosion (need to be				None identified.				Confirm with previous dispersion study if a VCE is possible.	1.13				
105								None identified.				Consider use of gas detection (to be reviewed under fire	1.13				
	Less	Lower Temperature	Chiller failure 15- E-101/102, ie spec break down stream of 15-E-102.	Exceeding low temp spec of piping (check off line previous nodes).				Safeguards to be evaluated outside this node.				Review the requirement of a spec break location downstream of 15	1.13				
								Safeguards to be evaluated outside this node.				Consider using the existing high temp alarm transmitter	1.13				
						<u></u>			1				<u> </u>				
												<	< <	4 of 33	>	>>	Go To

Note: In the context of SafeGuard Profiler[™], a LOPA "loop" refers to a LOPA scenario, based on a defined consequence.

Minimize the HAZOP display window. The Event page will reflect the HAZOP data used to create the newly generated loop.

Project # Document Description Intended Provide Example Example Loss of containment, potential for vapour cloud, explosion (need to be confirmed with dispurtion study).			1	p	<u>Iools Optimize H</u> elp	Analysis Settings	Edit View For
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We recommend copying the key words of the consequence into the blank "Description" field at the top of the page to identify the scenario being analyzed.

2.3. Tolerable Frequency Criterion

Enter the tolerable frequency criterion against which this scenario will be evaluated. Recall the HAZOP display window and note the severity rating for the selected consequence. From the "Consequence Rating" dropdown list, select the matching severity. (This is why only consequences with the same level of severity can be grouped.)

	# Doc	ument Title	Description	Intended	
→ Example	Examp	e Document	Loss of containment, potential for vapour cloud, explosion (need to be confirmed with dispurtion study)).	
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ce Doc		Rev Date By C	Appr Description		
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cenario		Reve	Misdirected Flow		
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This completes the creation and setup of a LOPA scenario for detailed analysis.