DeepLines User Defined Keyword Example



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TABLE OF CONTENTS

1	INTRODUCTION4	ł
2	BUILDING THE MODEL	;
2.1	Model component: fpso1 and 25	;
2.2	Model component: UserdefKeyword_15	;
2.3	Model component: UserdefKeyword_2)
2.4	Model component: EnvironementSet_110)
3	ANALYSES AND ANALYSIS SETS	}
3.1	basecase_single13	}
3.2	with_env13	;
3.3	basecase_set14	ŀ
3.4	with_external_udk14	ŀ



1 INTRODUCTION

This document presents some examples of User Defined Keywords (UDK) and their setup in Deeplines from version 5.7.

The model is shown below.



Figure 1-1 : Model used in this example



2 BUILDING THE MODEL

The main elements of the model UDK.dsk are presented in these sections.

2.1 MODEL COMPONENT: FPSO1 AND 2

It has been chosen to use vessels for this example. UDK can also be used with other types of objects: lines, springs...

2.2 MODEL COMPONENT: USERDEFKEYWORD_1

UDK has been added using the following tool bar icon:

Help on UDK can be found in Home > Model Components > User Defined Keywords.

The following data form can then be edited to define the user defined keyword.

🗾 Edit user defin	ed keyword UserDefKeyword_0	\times
Object	UserDefKeyword_0 v	OK
Name UserDeft	eyword_0	Save
Rows number 0	Selected row Delete Copy Check	Cancel
Sub-type	Keyword content Keyword configu	
	New Copy Delete	
	Name	
	Object / location or position	
	Rows number 0 🜩	
	Sidabi Object Sidloc Locati Sidnos Point Curvabsci	
Keyword content		
New	Copy Delete	
Name	v	
	Variation table Env table	
	Rows number 0 🜩 Rows number 0 💠	
	Sidvar, Variation table Serv. Env. table P. Col	
<	>	

Figure 2-1 : User Defined Keyword setup

For this example, two rows have been added



Obj	Object: UserDefKeyword_1 ~									
Name UserDefKeyword_1										
Row	/s number 🙎 🌲]	Selected row De	elete Copy						
	Sub-type	Keyword content	Keyword configu							
1	SubUserDefKeyw									
2	SubUserDefKeyw									

Figure 2-2 : First step: adding rows to have 2 subtypes

The name of the subtype can then be changed. Each subtype should be associated with a keyword content or a keyword configuration. A keyword content or configuration can be added by clicking on the new button in the relevant section.

The keyword configuration is first defined since it will provide names that will be used for the definition of the keyword content.

In this example, **two rows number are selected for the object/location or position.** Objects are associated to each line then location can be selected. It can be noted that an id will be associated with the object and with its location. This id can then be used in keyword content.

Keyword configuration										
Name	Name Config_1 ~									
- Object Rows i	Object / location or position Rows number 2									
\$ido	bj	Object	\$idloc	Locati	\$idpos	Point	Curv. absci			
\$idol	\$idobj1 FPSO_1 \$idloc1 COG \$idpos1									
\$idol	\$idobj2 FPSO_2 \$idloc2 COG \$idpos2									

Figure 2-3 : Second step: defining the keyword configuration

If required, variations tables can be added to the keyword configuration and an id will also be associated with the variation table. The format of the table needs to be consistent to its use in keyword content.

bject	VarTable_1	*
ame	VarTable_1	
	1 million 1 mill	
ows nu	mber 3	Columns number 2
Name	mber 3 🔹	Columns number 2 🔹
Name	x 0 5	Columns number 2 🔶 y 0 1

Figure 2-4 : Third step: defining a variation table (outside of UDK editor)

uws nun	iber 3
\$idvar	Variation table
\$idvar1	VarTable_1
\$idvar2	VarTable_2
Sidvar3	VarTable 3

Figure 2-5 : Fourth step: defining variation tables used in UDK

Then the keyword content can be added. Two keyword contents are created in this example. (by clicking twice on the new button of the subsection).

This example used a very simple keyword but any keywords can be used here. The id then replaces node numbers or variation table numbers.

Keywor	d content	
Name	Content_1 v	
*INCD \$idloc	≺ I 2 2.5 \$idvar1	^
<		>
leyword d Name	Content_2	
*INCDX \$idloc2 1	10 \$idvar3	^
<		>

Figure 2-6 : Fifth step: defining keyword contents

Then the keyword contents and keyword configurations are associated with the sub-type.

Ro	ws number 2	•	Selected row	Delete	Сору
	Sub-type	Keyword content	Keyword config	gu	
1	Def1	Content_1	Config_1		
2	Def2	Content_2	Config_1		

Figure 2-7 : Associating sub-type to keyword contents and configurations

To summarise, this User Defined Keyword asks:

- To move the COG of FPSO_1 (config_1, 1st object) in the Y direction by 2.5 m (2 and 2.5 in keyword content) linearly between step 0 and 5 (VarTable_1)

- To move the COG of FPSO_2 (config_1, 2nd object) in the X direction by 10 m (1 and 10 in keyword content) linearly between step 15 and 20 (VarTable_3)

2.3 MODEL COMPONENT: USERDEFKEYWORD_2

USERDEFKEYWORD_2 is an example using an EnvTable:

Л	Edit Variation table								
I	Object EnvTable_1 ~								
I	Name EnvTable_1								
I	Rows number 3 🖨 Columns number 3								
	NI								
	Name	Index	Distance	Direction					
	Name 1	Index 1	Distance 1.2	Direction 1					
	Name 1 2	Index 1 2	Distance 1.2 4.8	Direction 1 2					
	1 2 3	Index 1 2 3	Distance 1.2 4.8 5	Direction 1 2 3					

Figure 2-8 : Environment table used in this example

The keyword content and keyword configuration can be used in all user defined keyword.

To summarise, this User Defined Keyword asks:

- To move the COG of FPSO_2 (config_2, 1st object) in the direction and with the amplitude defined in EnvTable_1 (Figure 2-8) linearly between step 0 and 5 (as defined in VarTable_1, see Figure 2-4). The first line of the environment table will be used for an analysis and the line corresponding to the analysis for an analysis set. For example, in an analysis set, the second analysis will move the floater of 4.8m in the Y direction.



Object:	UserDefKeyword_2		~										
ame UserDef	Keyword_2											[ļ
ws number 1	÷	Selected row Delete	e Copy]			Ch	eck					С
Sub-type	Keyword content	Keyword configu		Keyword confi	iguration								
Def3	Content_3	Config_2		New		Сору	De	lete					
				Name Co	nfig_2					~			
				Object/loc	ation or po	osition							
				Rows num	ber 1	-							
				\$idobj	Object	\$idloc	Locati	\$idpos	Point	Curv. absci			
word content				\$idobj1	FPSO_2	\$idloc1	COG	\$idpos1					
New	Copy Delete												
ame Content_	3		~										
NCDX			~		A1001								
idloc1 \$env2 \$er	v1 \$idvar1			Variation ta	uble			E	nv table		1		
				Rows num	iber [lows nun	iber 🗠 🔽			
				\$idvar	Variation	table			\$env	Env table	R	Col	
				\$idvar1	VarTable	1			\$env1	EnvTable_1	1	2	
										Table 1	5		

Figure 2-9 : Definition of UserDefKeyword_2

2.4 MODEL COMPONENT: ENVIRONEMENTSET_1

In the general sheet, the User Defined Keyword should be ticked to be applied in the analysis set. Main swell has also been selected in this example.

General Combination matrix Main Swell UserDefinedKeywords	3
Environment Components	Floater Motion
Main Swell	Number of Floaters 1
Secondary Swells	
Local Sea	Offset
Wind	Low Frequency imposed Motion
Current With rotation	Floater Motion
Prescribed Motions Number of Quasi-Static Motions 1 Number of Dynamic Motions 1	Turbine Options Turbine Number of Turbines 1
Prescribed Loadings	User Defined Keyword
Number of Quasi-Static Loadings	User Defined Keyword
Number of Dynamic Loadings	Number of User Defined Keywords

Figure 2-10 : Selection of User Defined Keyword on Environment set

In this example, there is only one main swell defined.

General	General Combination matrix Main Swell UserDefinedKeywords							
Туре		Regular-	Airy	\sim				
Single wave heading 0 deg.								
O Multiple wave heading								
	Wave name	Heig	ht (m)	Period (s)	Initial phase			
1	Airy	1.000	00	10.0000	0.0000			

Figure 2-11 : Selection of main swell in environment set for this example

The User defined keywords sheet looks like the sheet outside of an environment set. Keyword configuration and content outside of the environment set can be used and reciprocally. In this example, existing configuration and content have been used.

The floater FPSO_2 should move by the direction and amplitude specified in the line of EnvTable_1 corresponding to the analysis between step 0 and 5.

Edit environment set EnvironmentSet_1	×
Object EnvironmentSet_1	ОК
	Save
Name EnvironmentSet_1	Cancel
General Combination matrix Main Swell UserDefinedKeywords Rows number 1 Selected row Delete Copy	
Sub-type Keyword configuration	
1 UK1 Content 3 Config 2 New Copy Delete	
Name Confid 2	
Bows number 1	
Sidobj Object Sidloc Locati Sidpos Point Curv. absci Keyword content Sidphil ESC.2 Sidloct COC Sidpost	
New Conv Delete	
*INCDX \$idloc1 \$env2 \$env1 \$idvar1	
Rows number 1 🖨 Rows number 2 🖨	
\$idvar Variation table \$env table R Col	
\$idvar1 VarTable_1 \$env1 EnvTable_1 2	
\$env2 EnvTable_1 3	
✓	

Figure 2-12 : Definition of User Defined Keyword in the environment set

The combination matrix is then filled as usual but the line to be used in the environment table is defined in this table in the user defined keyword column. In this case, the floater FPSO_2 will move by 1.2 m in the X direction between step 0 and 5

for the first analysis of the set and will not move for the second analysis and will move by 5 m in the Z direction between step 0 and 5 in the last analysis.

G	enera	al Combination ma	trix Main Swell	UserDefinedKeywords				
Number of environments								
		Name	Main Swell	UserDefinedK				
	1	EnvSet_1	Airy	UK1				
	2	EnvSet_2	Airy					
	3	EnvSet_3	Airy	UK1				

Figure 2-13 : Combination matrix used in this example



3 ANALYSES AND ANALYSIS SETS

3.1 BASECASE_SINGLE

This analysis contains UserDefKeyword_1, FPSO_1 and FPSO_2.





3.2 WITH_ENV

This analysis contains UserDefKeyword_2, FPSO_1 and FPSO_2.



Figure 3-2 : with_env results



3.3 BASECASE_SET

This analysis set contains FPSO_1, FPSO_2 and EnvironmentSet_1. A user defined keyword is defined in this Environment Set.



Figure 3-3 : Basecase_set results

3.4 WITH_EXTERNAL_UDK

This case is similar to the previous one, but UserDeKeyword_1 has been added and is used in addition with the user defined keyword defined in the environment set.



Figure 3-4 : With_external_UDK results