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TriglavW - Windows Interface for TRIGLAV User's Guide

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(Beta Version)

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1. Introduction

TRIGLAV program package is developed for reactor calculations of mixed cores in TRIGA Mark II research reactor. It can be applied for fuel element burnup calculations, for power and flux distributions calculations and for critically predictions. For more information see TRIGLAV manual (document number IJS-DP-7862 - see References for more details).

TriglavW is Windows interface for TRIGLAV program. TriglavW was developed to help users in preparation of TRIGLAV input and rapid modification - shuffling elements in core configuration. TriglavW is very useful for viewing results from TRIGLAV program. TriglavW can produce 2D color schemes of different TRIGLAV output parameters (e.g. fuel burnup distribution, fission power distribution, ...) and different 3D plots (e.g. neutron flux distributions, ...).

In this user manual the files of the program package distribution are described. Program installation instructions are given for a PC under MS Windows operating system.

1.1. Important Notes to the User

This manual should not be treated as standalone document. This manual must be always read together with TRIGLAV code manual (IJS-DP-7862 - see References for more details)!

Fuel element description files and reactor core input files supplied with this package are suitable for demonstration purposes only! The user must construct new element description (ELEM.INP) and reactor core (TRIGLAV.INP) files before any serous burnup, power and flux distributions, or critically calculations are performed!

2. Installation of the program

2.1. Installation of the TRIGLAV and TriglavW program

The TRIGLAV/TriglavW program can be installed and executed on a PC under Windows-9x/2000/XP operating system.

To install the TRIGLAV/TriglavW program package:

- Copy the package distribution file (TRIGDIS.EXE) to the disk c:\.
- Run TRIGDIS.EXE.
- Click on <u>U</u>nzip

A self-extracting exe file is decompressed to default location: c:\.

It is recommended that, program is extracted to root directory (e.g.: c:\, d:\,. e:\...) or to subdirectory name "without_blanks" (c:\triga\, ...) and not in directory like "c:\document and settings\user\dir1 dir2\...".

WinZip Self-Extractor - TRIGdis	s.exe	X
To unzip all files in TRIGdis.exe to the specified folder press the Unzip button.		<u>U</u> nzip
Unzip to <u>f</u> older:		Run <u>W</u> inZip
C:\Triglav	<u>B</u> rowse	<u>C</u> lose
Qverwrite files without prompting		About
		<u>H</u> elp

Figure 1 Extracting Triglav distribution files to disk

A tree - directory TRIGLAV is created with the following subdirectories:

- Triglav main working directory with sample test cases.
- Code directory with executable programs for TRIGLAV program.
- Wims directory with executable programs and libraries for WIMS program.
- Doc directory with documentation.
- TriglavW directory with executable programs for TriglavW program.

Optional: with windows explorer create a desktop shortcut to Triglav\Triglavw\TriglavW.exe - windows interface for Triglav program.

🚞 C:\TRIGLAV\TriglavW			_ 🗆	×
File Edit View Favorites Too	ols Help		1	7
🛛 😋 Back 🔻 🕥 🔻 🏂 🔎 Searc	h 💫 Folders 🛛 😂	🏂 🗙 🍤 🔳	-	
Address 🖻 C:\TRIGLAV\TriglavW			- 20	Go
Name	Size	Туре 🔺		
Acad.000	106 KB	000 File		
avinetrs.EXE	427 K B	Application		
TriglavW man	4,294 KB	Application		
ADAC20E Open	363 KB	Application Exte	ension	
ADAC200 Run as	64 KB	Application Exte	ension	
Sector Se	80 KB	Application Exte	ension	
🔊 AsiNet10 🖳 WinZip 🔹 🕨	307 KB	Application Exte	ension	
Sand Ta		Annlication Evt	rsion	
Send To	Compressed (zip	oped) Folder	nsion	
SRDBC1 Cut	ConTEXT		sion	
Saunzip32	Desktop (create	shortcut)	nsion	
azip32.dl	Mail Recipient		ision	
Create Shortcut	Av Documents		ision	
Selete			ision	
BOELDER Rename	🔄 TextPad		ision	
	3.5 Floppy (A:)		ision	
SNITYDE Properties	DVD-RW Drive (D:)	sion	
	92 KB	Application Ext		-
	0.3 ND	ADDICATION FXI		
1				

Figure 2 Create shortcut to Triglav\Triglavw\TriglavW.

2.2. Testing TRIGLAV program

To run all test cases start the command prompt and go to main \Triglav directory (c:, cd \triglav). Run prepared batch file RUNALLTE.BAT.

The RUNALLTE test procedure automatically runs all four test cases and compares new outputs (*.out files) with reference output files (*.tou files). Procedure stores the differences between new and reference output files in *.dif files.

Compare the differences in the output files (which are saved in *.dif files e.g. bM133.dif). If the installation is successful, there should be only differences in the time of execution.

📧 Command Promp	ot			_ 🗆 🗙
D:\>c:				
C:\≻cd triglav				
C:\TRIGLAU>dir b× Volume in drive Volume Serial Nu Directory of C:\	.inp /w C has no label. mber is 44A1-6E05 TRIGLAV			
bM133.inp bMb1331.inp BMP139.INP 10 0	bM133elem.inp bMb1331elem.inp bMp139elem.inp File(s) 34 Dir(s) 9,520,930	bM134.inp bMb1341.inp ,260 bytes ,816 bytes free	bM134elem.inp bMb1341elem.inp	
C:\TRIGLAU>runall	te			-

Figure 3 Run all test cases in a command prompt (type the command "RUNALLTE").

Typical running time is about 2 minutes for sample test case on Celeron 2 GHz.

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3. Running TriglavW program

Start the TriglavW program with shortcut or run Triglav\triglavW\TriglavW.exe.

3.1. Description of the TriglavW program menu

Main menu of the TriglavW contains following menus:

- TRIGLAV main menu for preparing input data and running the program TRIGLAV
- Setup menu for defining colors and initial editing input files
- Help help (not yet available)
- Quit exit program

🌞 Triglav, Version 0.0.5, 23.11.2005			<u> </u>	
Trigla∨	Setup	Help	Quit	
ļ				

Figure 4 Main menu in TriglavW program.

3.2. Tutorial with sample problem

3.2.1. Prepare input parameters and running program

Click to the main Triglav menu and you will get the following main Triglav input/running window:

🚰 Triglav		×
Procedure parameters		
Directory\Procedure name:	c:\triglav\TriglavW.bat	
TRIGLAV code directory:	c:\triglav\code\	
Wims EXE:	c:\triglav\wims\wimsd5b.exe	
Wims Library:	c:\triglav\wims\iaea.bin	
Working directory:	c:\triglav\	
Element data input:	TWelem.inp	Edit
Element data output:	TWelem.out	
Reactor core input:	TW.inp	Edit 🔛
Reactor core output:	TW.out	
Prepare View	/ Run	
-Triglav output:		
Plot/Print	Selection TRIGLAV.OUT	View
	Ring Circle ELEM.OUT	View
Current Core	Milestones Triglav.LOG	View
	Colors	
O Burnup	Display FA label	Plot
O Burnup Increment	Pause after Run	Print
🔿 Burnup Total		3D-Plot
		Close

Figure 5 TRIGLAV input/running window

Window contains following items:

- Directory/Procedure name defines working directory where are a TRIGLAV input files and defines file name of a batch run (e.g. TriglavW.bat, DO NOT use the name triglav.bat it will be overwritten).
- TRIGLAV Code Directory directory with executable programs for TRIGLAV program.
- Wims EXE directory with executable programs.
- Wims library file name of the library for WIMS program.
- Element data input file name of "ELEMENT.INP" (all elements data base, see TRIGLAV manual).
- Element data output file name of "ELEMENT.OUT" (elements data base after computation).
- Reactor core input file name of "TRIGLAV.INP" (current core, see TRIGLAV manual).
- Reactor core output file name of "TRIGLAV.OUT" (main results of computation).

Review and possibly change/edit any of the parameters. After this, first click on Prepare, then on View and finally on Run button to start the TRIGLAV code. Click on Prepare button instructs the TriglavW to prepare the procedure for running TRIGLAV according to your selection of parameters. Click on View will display the prepared TRIGLAV procedure. And finally click on Run button will start the actual calculation.

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3.2.2. Viewing results

TriglavW program offers two types of output display. First type is to display output file as a text. Second type of output is to plot the results. Box "Triglav output" contains different items to control a display of output.

Click on View buttons next to "TRIGLAV.OUT, ELEM.OUT and Triglav.LOG" to display output files on screen as text files.

Click on Plot button to plot picture (results) on screen and click on Print button to send picture (results) to printer.

Boxes "Plot/Print" and "Selection" control the output generated after pressing the Plot/Print button Print/Plot - defines what to print/plot (power, burnup, ...) Selection - defines how to print/plot (milestones, circle, ...)



Figure 6 Core description

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Figure 7 Current core configuration



Figure 8 Elements by fuel type the current core



Figure 9 Power distribution in the core



Figure 10 Computed burnup by element in the core

To produce a 3D perspective plot of neutron flux distribution click on 3D-Plot button. Note, that you need to activate a flag for TRIGLAV 2D diffusion code to save neutron flux data in special output file TRIGA2D.FLU. This flag is the fourth flag situated in Reactor core input file (see TRIGLAV manual for more details) and the next section of this manual.

\$* FLAGS ! print control flags: 1 ! (0-no, 1-yes) flux data printout in plot file TRIGA2D.FLU).

Sample picture:



Figure 11 Sample flux picture.

3.2.3. Modifying input parameters

Modifying TRIGLAV code input parameters is activated with Edit button next to "Reactor core input" line in main Triglav window. Or by clicking on

next to Edit button. You will get Triglav/ Reactor core input window:

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🚰 Setup/Triglav Input/ TW.inp		×
-Input parameters:		Core
Comment	Test core No:139 (New Shuffle
Comment	First two rows are f	
Cross sections printout flag	0	B-01 6094
Inner iterations data printout flag	0	B-02 8536
Elux data printout flag	0	B-03 6189
They date printed thay	1	B-04 6100
Hux data printout hag		B-05 8537
Inner iterations	900	C = 01 7255
Outer iterations	900	C-02 7212
Convergence criteria for inner iterations	0.0000001	▼
Convergence criteria for outer iterations	0.001	Rack On/Off 🔽 Upender On/Off 🗹
Convergence criteria for multiplications factor	0.00001	Rack Capacity 100
Squared axial buckling [1/cm2]	0.0048	Window Size 1110 x 600
Thermal reactor power [kW]	250.0	Poflector type G
Water temperature [K]	311.3	
Xenon correction flag	1	ELEM, INP
Burnup interval [day]	47.87	Shuffle.LOG View
Number of rings in reactor	6	
Finite difference mesh type	3	Open Save Save as
		Close

Figure 12 Triglav input window

Triglav input window contains two main boxes (Input parameters and Core) In "Input parameters" box following items can be modify:

- Cross sections printout flag for TRIGLAV.OUT.
- Inner iterations data printout flag for TRIGLAV.OUT.
- Group flux distribution printout flag for TRIGLAV.OUT.
- Group flux distribution printout on file TRIGA2D.FLU (this option must be set to 1 for 3D plots).
- Inner iterations allowed number of inner iterations for diffusion calculation.
- Outer iterations allowed number of outer iterations for diffusion calculation.
- Convergence criterias for diffusion calculation (see TRIGLAV manual)
- Squared axial buckling equal for all four groups in [cm⁻²].
- Total thermal power of the reactor in [kW].
- Temperature of water [°K].
- Number of fuel rings in reactor core (6 or 7).
- Finite differences mesh used in calculation

3.2.4. Shuffling elements

Shuffling elements in the core is activated with TRIGLAV/ Procedure parameters/ Reactor core input/ Edit graphically icon in main Triglav window:

and then click on the Shuffle button (in the "Core" parameters box). It is important to note, that the user can move/shuffle only those elements listed in element description file (ELEM.INP). To add new elements the user has to edit the ELEM.INP file.



Figure 13 Shuffle window

To move element from core to the rack mark (click on the element):



Figure 14 Mark desired element

and than mark (click with mouse) to the new location in the rack:

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Figure 15 Put element in rack

All moves are recorded in shuffle log window:



Figure 16 Shuffle log window

3.3. Starting user's new calculations

It is necessary to create new fuel element description file (called ELEM.INP) for all users to do real calculations on their fuel elements. Fuel element description files supplied with this code are suitable for demonstration purposes only. See TRIGLAV manual for more details on ELEM.INP file.

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4. References

A. Peršič, M. Ravnik, S. Slavič and T. Žagar:TRIGLAV, A Program Package for Research Reactor Calculations, IJS-DP-7862, Version 1 (March 28, 2000)