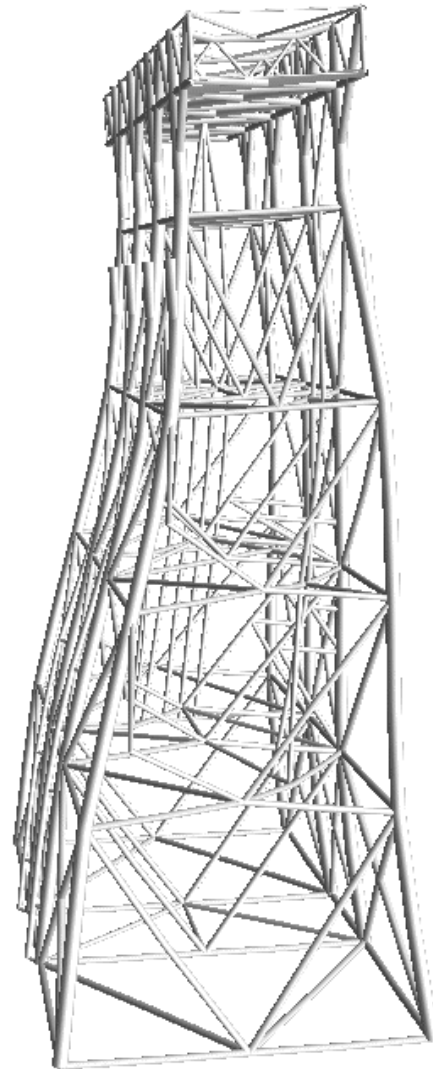


FACT
User's Manual



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1 Introduction

If Usfos is run in “batch”, it could be efficient to also include extracting results within the same “analysis loop”, (for example by creating some simple scripts).

Fact is a simple tool, which is available for free for the users of Usfos. The tool is used to extract and print some element- and node- “facts” from an Usfos analysis, and the results are taken from the “RAF” file.

Fact is a part of the standard distribution, but the tool is also found on the web (www.usfos.com under download modules). Fact is available on the following computer platforms:

- Windows
- Linux 64 bit
- Mac OSX

2 Running FACT, version 1.4-03

The most efficient way to run Fact, is from a command shell (DOS or Unix).

By just typing **fact** , the tool starts and asks for the following information:

- Raf file name (including file extension)
- Fact control file name (where “what to do” is described)
- Output file name (to print the actual data)

Fact could be run in two modes:

1. Single raf : Specify one raf file and one output
2. Multiple rafs : Specify a list of raf files

2.1 Single Raf file modus

Specify “sing” (or just hit return) to run fact 1.4 in single file modus. (same as the previous version).

The user specifies the output file name.

```

-----
-----
-----
          F A C T
-----
    Extracts Text Data from
    USFOS raf files
-----
          Version 1.4-03
          Usfos A/S 2019-03-16
-----
-----
Give Input File (commands) name : fact.ctr
Single RAF file (or many) /singl/: sin
Give Raf File Name (incl extens.) : usfos/res_01.raf
Give Output File Name             : r01.txt

```

Figure 2-1 - fact run in single file modus

2.2 Multiple Raf file modus

If “many” raf-files are processed, create a list of the actual raf-files stored on a text file, (here named “rafs”, see contents below).

All results could be collected in one file, or alternatively, one result file per processed raf-file. The generated output files get the name “prefix”_001.txt, “prefix_002.txt etc. In this example, the generated result files get names Res_001.txt, Res_002.txt.

```

-----
-----
-----
          F A C T
-----
    Extracts Text Data from
          USFOS raf files
-----
          Version 1.4-03
          Usfos A/S 2019-03-16
-----
-----
Give Input File (commands) name : fact.ctr
Single RAF file (or many) /singl/: many
File containing result prefix(s) : rafs
All results in one file ? / y / : n
Give Output File PreFix       : Res

...Number of files found :      2

=====
Now processing: usfos/res_01.raf
=====
Now processing: usfos/res_02.raf

```

Figure 2-2 - fact run in multiple raf file modus

```

usfos/res_01.raf
usfos/res_02.raf

```

Figure 2-3 – Contents of the raf file list “rafs”

Fact could also be run from the Usfos GUI (Run Utilities), and the same information is given.

3 Simple Analysis model

The fact examples are extracting the forces from the simple frame shown in Figure 3-1. The input files (head.fem and model.fem) are found on the Fact examples directory.

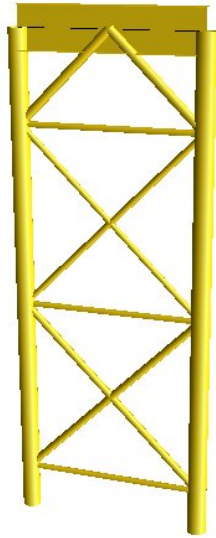


Figure 3-1 Simple Analysis model

In the following examples, the element results for the simple model are printed in different ways.

In this example, the element force for some elements (no1, 10, 11, 13, 14 and 15), are printed for steps 1 to 20. The forces are printed Step-by-step.

```

' Fact Control File for Example 01
' -----
' Identification:      Example 01. Print Element Forces StepVice
'
'      stpfst  stplst
' Steps      1    20
'
'
' PrintFormat  StepVice
'
' Element Forces  1 10 11 13 14 15
'
' ----- EOF -----

```

Table 4-1 Fact Control File

* Identification: Example 01. Print Element Forces StepVice																
Load Case/Step:	1	/	1	ElemID	Fx1	Fy1	Fz1	Rx1	My1	Mz1	-2.Fx04	Fy2	Fz2	Rx2	My2	Mz2
	1			2	-2.449E+04	0.000E+00	-2.352E+01	0.000E+00	1.804E+00	0.000E+00	2.449E+04	0.000E+00	2.352E+01	0.000E+00	2.963E+01	0.000E+00
	2			10	2.650E+04	0.000E+00	-1.351E+02	0.000E+00	3.455E+01	0.000E+00	-2.650E+04	0.000E+00	1.351E+02	0.000E+00	2.723E+02	0.000E+00
	11			11	1.230E+01	0.000E+00	-6.548E+01	0.000E+00	9.985E+01	0.000E+00	-1.230E+01	0.000E+00	6.548E+01	0.000E+00	9.974E+01	0.000E+00
	13			13	1.123E+00	0.000E+00	-2.212E+02	0.000E+00	3.371E+02	0.000E+00	-1.123E+00	0.000E+00	2.212E+02	0.000E+00	3.371E+02	0.000E+00
	14			14	3.951E+04	0.000E+00	-3.041E+02	0.000E+00	4.409E+03	0.000E+00	-3.951E+04	0.000E+00	3.041E+02	0.000E+00	-4.415E+03	0.000E+00
	15			15	1.356E+03	0.000E+00	-0.032E+02	0.000E+00	-2.692E+01	0.000E+00	-1.356E+03	0.000E+00	0.032E+02	0.000E+00	4.643E+03	0.000E+00
	21			21	8.279E+04	6.356E+03	0.000E+00	0.000E+00	0.000E+00	5.276E+03	-8.279E+04	-6.356E+03	0.000E+00	0.000E+00	0.000E+00	1.422E+04
Load Case/Step:	1	/	3	ElemID	Fx1	Fy1	Fz1	Rx1	My1	Nz1	Fx2	Fy2	Fz2	Rx2	My2	Nz2
	1			7	-7.344E+04	0.000E+00	-7.265E+01	0.000E+00	2.050E+00	0.000E+00	7.344E+04	0.000E+00	7.265E+01	0.000E+00	2.050E+00	0.000E+00
	10			10	7.950E+04	0.000E+00	-4.044E+02	0.000E+00	1.106E+02	0.000E+00	-7.950E+04	0.000E+00	4.044E+02	0.000E+00	-8.097E+02	0.000E+00
	12			12	3.882E+01	0.000E+00	-1.964E+02	0.000E+00	2.094E+02	0.000E+00	-3.882E+01	0.000E+00	1.964E+02	0.000E+00	2.093E+02	0.000E+00
	13			13	5.224E+02	0.000E+00	-6.630E+02	0.000E+00	6.000E+02	0.000E+00	-5.224E+02	0.000E+00	6.630E+02	0.000E+00	-6.000E+02	0.000E+00
	14			14	1.158E+05	0.000E+00	-9.138E+03	0.000E+00	1.408E+04	0.000E+00	-1.158E+05	0.000E+00	9.138E+03	0.000E+00	-1.219E+04	0.000E+00
	15			15	4.036E+03	0.000E+00	-0.981E+03	0.000E+00	-8.839E+01	0.000E+00	-4.036E+03	0.000E+00	0.981E+03	0.000E+00	1.193E+04	0.000E+00
	21			21	2.405E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.591E+04	-2.405E+05	-0.000E+00	-1.913E+04	0.000E+00	0.000E+00	4.271E+04
Load Case/Step:	1	/	6	ElemID	Fx1	Fy1	Fz1	Rx1	My1	Nz1	Fx2	Fy2	Fz2	Rx2	My2	Nz2
	1			1	-1.179E+05	0.000E+00	-1.154E+02	0.000E+00	-1.179E+05	0.000E+00	1.179E+05	0.000E+00	1.154E+02	0.000E+00	-1.179E+05	0.000E+00
	10			10	1.277E+05	0.000E+00	-6.504E+02	0.000E+00	1.883E+02	0.000E+00	-1.277E+05	0.000E+00	6.504E+02	0.000E+00	-1.287E+03	0.000E+00
	11			11	4.685E+01	0.000E+00	-3.155E+02	0.000E+00	4.808E+02	0.000E+00	-4.685E+01	0.000E+00	3.155E+02	0.000E+00	4.816E+02	0.000E+00
	13			13	1.635E+03	0.000E+00	-1.060E+03	0.000E+00	1.635E+03	0.000E+00	-1.635E+03	0.000E+00	1.060E+03	0.000E+00	-1.635E+03	0.000E+00
	14			14	1.899E+05	0.000E+00	-1.470E+04	0.000E+00	2.264E+04	0.000E+00	-1.899E+05	0.000E+00				

Table 4-2 Fact Output for example 1

4.2 Element Forces Element by Element

The same elements, and for the same analysis steps are printed, but this time the forces are printed element-by-element.

```

-----
Fact Control File for Example 02
-----

Identification:      Example 02. Print Element Forces Element Vice
Steps               1      20
PrintFormat         ElementVice
Element Forces      1 10 11 13 14 15 21
----- E O F -----

```

Table 4-3 Fact Control File for Example 2

```

-----
Identification:      Example 02. Print Element Forces Element Vice
-----
# 1
Fx1  Fy1  Fx2  Fy2  Rx1  Ry1  Rx2  Ry2
-2.449E+04  0.000E+00  -2.382E+01  0.000E+00  1.804E+00  0.000E+00  2.449E+04  0.000E+00  2.382E+01  0.000E+00  1.804E+00  0.000E+00
-7.344E+04  0.000E+00  -7.260E+01  0.000E+00  2.050E+00  0.000E+00  7.344E+04  0.000E+00  7.260E+01  0.000E+00  2.050E+00  0.000E+00
-1.179E+05  0.000E+00  -1.154E+02  0.000E+00  -1.673E+00  0.000E+00  1.179E+05  0.000E+00  1.154E+02  0.000E+00  1.673E+00  0.000E+00
-1.224E+05  0.000E+00  -1.187E+02  0.000E+00  -2.239E+00  0.000E+00  1.224E+05  0.000E+00  1.187E+02  0.000E+00  2.239E+00  0.000E+00
-1.264E+05  0.000E+00  -1.215E+02  0.000E+00  -2.643E+00  0.000E+00  1.264E+05  0.000E+00  1.215E+02  0.000E+00  2.643E+00  0.000E+00
-1.292E+05  0.000E+00  -1.185E+02  0.000E+00  -5.233E+00  0.000E+00  1.292E+05  0.000E+00  1.185E+02  0.000E+00  5.233E+00  0.000E+00
-1.290E+05  0.000E+00  -1.162E+02  0.000E+00  -6.472E+00  0.000E+00  1.290E+05  0.000E+00  1.162E+02  0.000E+00  6.472E+00  0.000E+00
-1.401E+05  0.000E+00  -6.109E+01  0.000E+00  -2.946E+01  0.000E+00  1.401E+05  0.000E+00  6.109E+01  0.000E+00  2.946E+01  0.000E+00
# 10
Fx1  Fy1  Fx2  Fy2  Rx1  Ry1  Rx2  Ry2
2.650E+04  0.000E+00  -1.351E+02  0.000E+00  3.455E+01  0.000E+00  -2.650E+04  0.000E+00  1.351E+02  0.000E+00  -3.455E+01  0.000E+00
7.950E+04  0.000E+00  -4.044E+02  0.000E+00  1.106E+02  0.000E+00  -7.950E+04  0.000E+00  4.044E+02  0.000E+00  -1.106E+02  0.000E+00
1.277E+05  0.000E+00  -6.504E+02  0.000E+00  1.883E+02  0.000E+00  -1.277E+05  0.000E+00  6.504E+02  0.000E+00  -1.883E+02  0.000E+00
1.325E+05  0.000E+00  -6.755E+02  0.000E+00  1.964E+02  0.000E+00  -1.325E+05  0.000E+00  6.755E+02  0.000E+00  -1.964E+02  0.000E+00
1.368E+05  0.000E+00  -6.982E+02  0.000E+00  2.038E+02  0.000E+00  -1.368E+05  0.000E+00  6.982E+02  0.000E+00  -2.038E+02  0.000E+00
1.388E+05  0.000E+00  -7.080E+02  0.000E+00  2.074E+02  0.000E+00  -1.388E+05  0.000E+00  7.080E+02  0.000E+00  -2.074E+02  0.000E+00
1.397E+05  0.000E+00  -7.138E+02  0.000E+00  2.092E+02  0.000E+00  -1.397E+05  0.000E+00  7.138E+02  0.000E+00  -2.092E+02  0.000E+00
1.525E+05  0.000E+00  -7.903E+02  0.000E+00  2.389E+02  0.000E+00  -1.525E+05  0.000E+00  7.903E+02  0.000E+00  -2.389E+02  0.000E+00
# 11
Fx1  Fy1  Fx2  Fy2  Rx1  Ry1  Rx2  Ry2
1.230E+01  0.000E+00  -6.548E+01  0.000E+00  9.955E+01  0.000E+00  -1.230E+01  0.000E+00  6.548E+01  0.000E+00  -9.955E+01  0.000E+00
3.282E+01  0.000E+00  -1.964E+02  0.000E+00  2.994E+02  0.000E+00  -3.282E+01  0.000E+00  1.964E+02  0.000E+00  -2.994E+02  0.000E+00
4.658E+01  0.000E+00  -3.155E+02  0.000E+00  4.888E+02  0.000E+00  -4.658E+01  0.000E+00  3.155E+02  0.000E+00  -4.888E+02  0.000E+00
4.889E+01  0.000E+00  -3.274E+02  0.000E+00  4.989E+02  0.000E+00  -4.889E+01  0.000E+00  3.274E+02  0.000E+00  -4.989E+02  0.000E+00
6.029E+01  0.000E+00  -3.381E+02  0.000E+00  5.151E+02  0.000E+00  -6.029E+01  0.000E+00  3.381E+02  0.000E+00  -5.151E+02  0.000E+00
5.021E+01  0.000E+00  -3.430E+02  0.000E+00  5.226E+02  0.000E+00  -5.021E+01  0.000E+00  3.430E+02  0.000E+00  -5.226E+02  0.000E+00
5.123E+01  0.000E+00  -3.452E+02  0.000E+00  5.260E+02  0.000E+00  -5.123E+01  0.000E+00  3.452E+02  0.000E+00  -5.260E+02  0.000E+00
4.985E+01  0.000E+00  -3.789E+02  0.000E+00  5.773E+02  0.000E+00  -4.985E+01  0.000E+00  3.789E+02  0.000E+00  -5.773E+02  0.000E+00
# 13
Fx1  Fy1  Fx2  Fy2  Rx1  Ry1  Rx2  Ry2
1.123E+00  0.000E+00  -2.212E+02  0.000E+00  3.371E+02  0.000E+00  -1.123E+00  0.000E+00  2.212E+02  0.000E+00  -3.371E+02  0.000E+00
-5.224E+02  0.000E+00  -6.639E+02  0.000E+00  1.011E+03  0.000E+00  5.224E+02  0.000E+00  6.639E+02  0.000E+00  -1.011E+03  0.000E+00
-1.635E+03  0.000E+00  -1.905E+03  0.000E+00  1.625E+03  0.000E+00  1.635E+03  0.000E+00  1.905E+03  0.000E+00  -1.625E+03  0.000E+00
-1.821E+03  0.000E+00  -1.109E+03  0.000E+00  1.688E+03  0.000E+00  1.821E+03  0.000E+00  1.109E+03  0.000E+00  -1.688E+03  0.000E+00
-1.979E+03  0.000E+00  -1.149E+03  0.000E+00  1.749E+03  0.000E+00  1.979E+03  0.000E+00  1.149E+03  0.000E+00  -1.749E+03  0.000E+00
-2.051E+03  0.000E+00  -1.168E+03  0.000E+00  1.777E+03  0.000E+00  2.051E+03  0.000E+00  1.168E+03  0.000E+00  -1.777E+03  0.000E+00
-2.084E+03  0.000E+00  -1.176E+03  0.000E+00  1.790E+03  0.000E+00  2.084E+03  0.000E+00  1.176E+03  0.000E+00  -1.790E+03  0.000E+00
-2.553E+03  0.000E+00  -1.295E+03  0.000E+00  1.970E+03  0.000E+00  2.553E+03  0.000E+00  1.295E+03  0.000E+00  -1.970E+03  0.000E+00

```

Table 4-4 Fact Output for example 2

4.3 Element Forces at given load case / level

In this example, the element forces for the listed elements are printed for only one step. The load case number and the load level identify the step. The first stored load step where the actual load level is reached will be used.

```

'
' -----
' Fact Control File for Example 03
' -----
'
' Identification: Example 03. Print Element Forces at given LoadCase / Level
'
'      LCase LoadLevel
' LoadCase      1      6.0
'
'      ElemId's .....
' Element      Forces  1 10 11 13 14 15 21
'
' ----- E O F -----

```

Table 4-5 Fact Control File

```

'
' Identification: Example 03. Print Element Forces at given LoadCase / Level
' Load Case/Step: 1 / 23
'
'      ElemID      Fx1      Fy1      Fz1      Mx1      My1      Mz1      Fx2      Fy2      Fz2      Mx2      My2      Mz2
' 1 -1.458E+05 0.000E+00 1.442E+00 0.000E+00 -3.586E+01 0.000E+00 1.458E+05 0.000E+00 -1.442E+00 0.000E+00 -6.254E+01 0.000E+00
' 10 1.615E+05 0.000E+00 0.807E+02 0.000E+00 2.062E+02 0.000E+00 -1.615E+05 0.000E+00 0.807E+02 0.000E+00 1.609E+03 0.000E+00
' 11 9.024E+01 0.000E+00 -4.098E+02 0.000E+00 6.242E+02 0.000E+00 -9.024E+01 0.000E+00 4.098E+02 0.000E+00 6.249E+02 0.000E+00
' 13 -2.806E+03 0.000E+00 -1.357E+03 0.000E+00 2.065E+03 0.000E+00 2.806E+03 0.000E+00 1.357E+03 0.000E+00 2.073E+03 0.000E+00
' 14 2.331E+05 0.000E+00 -1.813E+04 0.000E+00 2.759E+04 0.000E+00 -2.331E+05 0.000E+00 1.813E+04 0.000E+00 -2.052E+02 0.000E+00
' 15 6.284E+03 0.000E+00 -1.785E+04 0.000E+00 -2.977E+02 0.000E+00 -6.284E+03 0.000E+00 1.785E+04 0.000E+00 2.750E+04 0.000E+00
' 21 4.974E+05 3.936E+04 0.000E+00 0.000E+00 0.000E+00 3.339E+04 -4.974E+05 -3.936E+04 0.000E+00 0.000E+00 0.000E+00 0.703E+04

```

Table 4-6 Fact Output for example

4.4 Element Forces at given Time. Dynamic analysis

In this example, the element forces for the listed elements are printed for only one step. The step is identified by the **Time** The first stored load step after the specified time will be used.

NOTE: Load Case 1 has to be specified always for dynamic analysis

```

'
' -----
'      Fact Control File for Example 04
' -----
'
' Identification:   Example 04. Print Element Forces at given Time
'
'      LCase  Time
' LoadCase    1  123.2
'
'      ElemId's .....
' Element      Forces  1 10 11 13 14 15 21
'
' ----- E O F -----

```

Table 4-7 Fact Control File for Dynamic analysis

4.5 *Element Plastic Utilization*

In this example, the element utilization for some elements (no 1, 10, 11, 13, 14 and 15), are printed for steps 1 to 20. The utilizations are printed Element-by-element.

```

,
  Identification:      Print Element Forces Element Vice
,
,      stpfst  stplst
Steps      1      20
,
  PrintFormat  ElementVice
,
,
  Element Utiliz Plast   1 10 11 13 14 15 21
,

```

Table 4-8 Fact Control File

5 Extracting Nodal Results

In the following examples, the nodal results for the simple model are printed in different ways.

5.1 Node Displacements

In this example, the node displacements of node 40, 42 and 45 are printed.

The output print could be either StepVice or NodeVice

```

/
/ -----
/      Fact Control File
/ -----
/
/ Identification:      Example 05. Print Node Disp Stepvice
/
/      stpfst  stplst
/ Steps      1    20
/
/ PrintFormat  NodeVice
/
/
/ Node   Displacement   40   42   45
/
/ ----- E O F -----

```

Table 5-1 Fact Control File. Node Displacements.

5.2 Node Velocity

In this example, the node displacements of node 40, 42 and 45 are printed.

The output print could be either StepVice or NodeVice

```

/
/ Identification:      Example 06. Print Node Velo Nodevice
/
/      stpfst  stplst
/ Steps      1    20
/
/ PrintFormat  NodeVice
/
/
/ Node   Velocity      40   42   45
/

```

Table 5-2 Fact Control File. Node Velocity.

5.3 Node Acceleration

In this example, the node displacements of node 40, 42 and 45 are printed.

The output print could be either StepVice or NodeVice

```

'
  Identification:      Example 07. Print Node Acc  Nodevice
'
      stpfst  stplst
Steps      1    20
'
  PrintFormat  NodeVice
'
'
  Node      Acceleration   40   42   45

```

Table 5-3 Fact Control File. Node Acceleration.

5.4 Number of decimals for node-results.

By default, 4 decimals are printed.

The user may increase this to 5, 6, or 8 by the command “Decimals” followed by the number of decimals.

```

'
  Decimals 5

```

Table 5-4 Specifying 5 decimals in the node result output.

6 Limitations

Fact is a (very) limited tool and covers only the following:

- Element forces for 2-node beam elements only
- Element Steps are Analysis Steps. Fact will search for *nearest stored steps*
- For Dynamic Simulations, load level is replaced by time. Load Case has to be specified = 1 always for dynamic analysis.
- Element forces are printed for all 12 degrees of freedom following normal finite element sign convention, (forces are acting **on** the actual element end)
- Element plastic utilization
- Nodal results : displacements, velocities and accelerations.