

SZLZ102 - Tire with various methods of Summarized

counting:

This test relates to the methods of countings of cycles (RAINFLOW, RCCM) from a load history in stresses. From a simple load history defined by `DEFI_FONCTION`, one extracts the elementary cycles by the method of counting of cycles of the RAINFLOW [R7.04.01], then by the method of counting of cycles RCCM [R7.04.01].

One also tests the taking into account of the coefficient of stress concentration K_T .

This example is a test of validation of software POSTDAM developed by Department REME, provided in the Handbook of Validation of version 1.0 of this software.

Results provided by the operator `POST_FATIGUE` are completely identical to those provided by software POSTDAM.

1 Problem of reference

1.1 Geometry

the analysis consists in extracting the elementary cycles from a load history in stresses.

- First call to POST_FATIGUE :

One extracts the elementary cycles by the method of counting of cycles RAINFLOW, on the load history $\sigma_1(t)$.

- Second call to POST_FATIGUE :

One extracts the elementary cycles by the method of counting of cycles RCCM, on the load history $\sigma_1(t)$.

- Third call to POST_FATIGUE :

One extracts the elementary cycles by the method of counting of cycles RAINFLOW, on the load history $\sigma_2(t)$ and one uses a coefficient of stress concentration $K_T=2$.

- Fourth call to POST_FATIGUE :

One extracts the elementary cycles by the method of counting of cycles RCCM, on the load history $\sigma_2(t)$ and one uses a coefficient of stress concentration $K_T=2$.

History of the loading

t	0.	1.	2.	3.	4.	5.	6.	7.	8.
$\sigma_1(t)$	0.	500.	200.	400.	300.	500.	-300.	200.	-500.
t	0.	1.	2.	3.	4.	5.	6.	7.	8.
$\sigma_2(t)$	0.	250.	100.	200.	150.	250.	-150.	100.	-250.

2 Reference solution

2.1 Method of calculating used for the reference solution

This test is resulting from the handbook of validation of software POSTDAM version 1.0. The reference solutions are given in this document.

2.2 Results of reference

- **First call** to POST_FATIGUE : method RAINFLOW from $\sigma_1(t)$

Nb_Cycl = 4	Cycle 1	Vale_Min:	300.	Vale_Max:	400.
	Cycle 2	Vale_Min:	200.	Vale_Max:	500.
	Cycle 3	Vale_Min:	- 300.	Vale_Max:	200.
	Cycle 4	Vale_Min:	- 500.	Vale_Max:	500.

- **Second call** to POST_FATIGUE : method RCCM from $\sigma_1(t)$

Nb_Cycl = 5	Cycle 1	Vale_Min:	- 500.	Vale_Max:	500.
	Cycle 2	Vale_Min:	- 300.	Vale_Max:	500.
	Cycle 3	Vale_Min:	0.	Vale_Max:	400.
	Cycle 4	Vale_Min:	200.	Vale_Max:	300.
	Cycle 5	Vale_Min:	88.8889	Vale_Max:	200.

- **Third call** to POST_FATIGUE : method RAINFLOW from $\sigma_2(t)$ with $K_T=2$.

(Results identical to the first call to POST_FATIGUE since a loading is taken $\sigma_2(t)=1/2 \sigma_1(t)$, then one multiplies the load history by a coefficient of stress concentration $K_T=2$).

Nb_Cycl = 4	Cycle 1	Vale_Min:	300.	Vale_Max:	400.
	Cycle 2	Vale_Min:	200.	Vale_Max:	500.
	Cycle 3	Vale_Min:	- 300.	Vale_Max:	200.
	Cycle 4	Vale_Min:	- 500.	Vale_Max:	500.

- **Fourth call** to POST_FATIGUE : method RCCM from $\sigma_2(t)$ with $K_T=2$.

(Results identical to the second call to POST_FATIGUE since a loading is taken $\sigma_2(t)=1/2 \sigma_1(t)$, then one multiplies the load history by a coefficient of stress concentration $K_T=2$).

Nb_Cycl = 5	Cycle 1	Vale_Min:	- 500.	Vale_Max:	500.
	Cycle 2	Vale_Min:	- 300.	Vale_Max:	500.
	Cycle 3	Vale_Min:	0.	Vale_Max:	400.
	Cycle 4	Vale_Min:	200.	Vale_Max:	300.
	Cycle 5	Vale_Min:	88.8889	Vale_Max:	200.

2.3 Uncertainty on the analytical

solution Solution.

2.4 Bibliographical references

1.Handbook of validation of POSTDAM version 1.0. Baker I., Vatin E. HP - 14/93/016B

3 Modelization A

3.1 Quantities tested and results

Identification		Reference
First call to POST_FATIGUE		
and Third call to POST_FATIGUE		
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NB_CYCL		4.
Cycle 1	VALE_MIN	300.
	VALE_MAX	400.
Cycle 2	VALE_MIN	200.
	VALE_MAX	500.
Cycle 3	VALE_MIN	-300.
	VALE_MAX	200.
Cycle 4	VALE_MIN	-500.
	VALE_MAX	500.
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Second call to POST_FATIGUE		
and Fourth call to POST_FATIGUE		
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NB_CYCL		5.
Cycle 1	VALE_MIN	-500.
	VALE_MAX	500.
Cycle 1	VALE_MIN	-300.
	VALE_MAX	500.
Cycle 1	VALE_MIN	0.
	VALE_MAX	400.
Cycle 1	VALE_MIN	200.
	VALE_MAX	300.
Cycle 1	VALE_MIN	88.8889
	VALE_MAX	200.

4 Summary of the results

the results of *Code_Aster* are identical to the values of reference provided in the handbook of validation of version 1.0 of POSTDAM.