

# User Guide of Ageing Module

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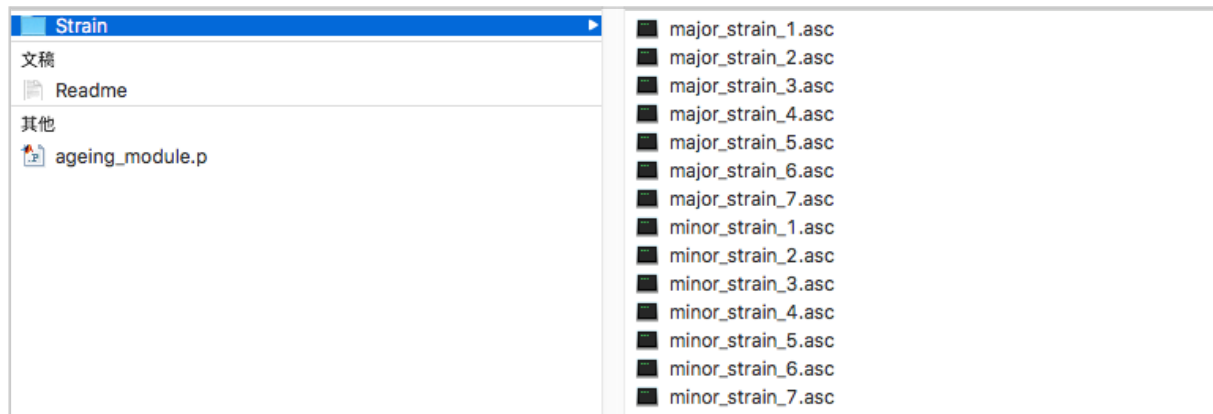
## Export and Prepare Input Data

In order to run the functional module, elemental **major strain** and **minor strain** data from the **stamping stage** need to be exported from *Pam-Stamp*.

The naming requirement for **major strain** at each stage is **major\_strain\_1**, and the naming requirement for **minor strain** is **minor\_strain\_1**. (Note: the major and minor strain at first stamping stage is used for example. For nth stage, it will simply be **minor\_strain\_n/**  
**major\_strain\_n**).



Then all the **major strain** and **minor strain** should all be saved in one folder and copied to the module directory. The folder name can be decided by users, and the example used here, **Strain**, is an arbitrary choice. (Note: user only can put a **single** data folder in the module directory !, otherwise, code will result error due to data conflict !)



## Execute the Ageing Functional Module

In order to run the module, you only have to **(1)** open *Matlab* , **(2)** change your **working directory** to where the ageing module locates, **(3)** call **ageining\_module** function in *Matlab*'s **command window**.

In order to call **ageing\_module** function, the follwoing command has to be typed in the *Matlab*'s **command window** :

```
ageing_module(STAMPING_VELOCITY,POISSON_RATIO,temperature,time,LEAN_MODE)
```

All capital case input arguments (e.g. POISSON\_RATIO) are **float** values, and the lower case input arguments are **string**.

**STAMPING\_VELOCITY** has to be in the same unit as stage **Prog.** value. Stage **Prog.** value can be found from your *Pam-Stamp* stage information or you output **asc** datafile.

```
13432Major strain 8
double_box_xy
Contour      Major strain - Membrane (true value)
Unit         NONE
Dimension    1
Type         SCALAR
Entity       ELEMENT
State        State 3/end : Prog. = -0.014197
Number       7
11729 0.36162E-03
11730 0.80599E-03
11731 0.85937E-03
```

## Time and temperature input

In order to specify multi-stage ageing setup, the temperature and time at each stage has to be given in the form of **string**. Temperature has unit of Kelvin, and time has unit of seconds

To illustrate, if the ageing process is **2-stage**, and the ageing temperatures are **500 K** and **450 K**. Then the temperature has to be defined via two methods:

```
temperature = '500,450';  
temperature = '500 450'; (equivilent to the one above)
```

Similar to the temperature, ageing times of **600 s** and **36000 s** will be defined as:

```
time = '600,36000';  
time = '600 36000'; (equivilent to the one above)
```

## Lean Mode

The module can be executed in two modes: **(1)** normal mode, and **(2)** lean mode. Lean mode is **recommended**, which executes faster than the regular mode via optimizing system memory usage. (Note: the simulation accuracies of the two modes are identical, the only difference is that more data will be saved if the code is executed in normal mode). Therefore, the default choice for lean mode is:









```
LEAN_MODE = 1;
```

Note: All details on input arguments can be found in *Readme* text file!

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## Module Results

After executing the ageing module, the **post ageing yield strength** and **yield strength** evolution information are displayed and saved to the current directory.

|   |                  |        |
|---|------------------|--------|
|  Strain                                    | 2018年3月18日 03:40 | --     |
| 文稿  |                  |        |
|  Readme                                    | 2018年3月24日 17:04 | 5 KB   |
|  Yield_Strength.csv                        | 2018年3月23日 11:05 | 307 KB |
|  Yield_Strength.txt                        | 2018年3月23日 11:05 | 307 KB |
| 其他  |                  |        |
|  ageing_module.p                           | 2018年3月23日 11:04 | 5 KB   |
|  Final_Yield_Strength_Distribution.fig     | 2018年3月23日 11:05 | 208 KB |
|  Yield_Strength_Distribution_Evolution.fig | 2018年3月23日 11:05 | 1.6 MB |
|  Yield_Strength_Evolution.fig              | 2018年3月23日 11:05 | 701 KB |