Operator `POST_USURE`

1 Goal

To calculate volume and depth of wear according to the power of wear.

The power of wear is given or calculated by the operator `DYNA_TRAN_MODAL` [U4.53.21]. It is necessary to provide a law of wear, a geometry of contact and a list of moments.

Product a structure of data of the type `table_sdaster`.

2 Syntax

```
tresu [table_sdaster] = POST_USURE (

    # definition of the Node of impact or a power of wear
        ♦ / ♦ RESU_GENE = tg,                                  [tran_gene]
            ♦ GROUP _ NO = grnoeu,                             [group_no]

          / ♦ PUIS_USURE = been able,                                 [R]

    # loading of a new tube
          / ◊ TUBE_NEUF = 'YES'
              # if TUBE_NEUF
                ♦ TABL_USURE = tresu,                     [table_sdaster]

     # if RESU_GENE or PUIS_USURE are present

        ◊ INST_INIT = / -1.0,                                  [DEFECT]
                      / t0,                                    [R]
        ◊ INST_FIN = T1,                                       [R]
        ◊ NB_BLOC  = / 1,                                      [DEFECT]
                     / Nb,                                     [I]
        ◊ COEF_INST = / 1.0                                    [DEFECT]
                      / coeff,                                 [R]

        # definition of the table to enrich calculation in the case of
    with      evolution of the games
        ◊ ETAT_INIT = _F (
          ♦ TABL_USURE = tresu,                           [table_sdaster]
          ◊ INST_INIT = all,                                   [R]
                      ),

    # definition of the law of wear except if TUBE_NEUF=' OUI'
        ♦ / ♦ LOI_USURE = 'ARCHARD',                           [KN]
            / ♦ MOBILE = _F (
                              ♦ COEF_USURE = k_t,              [R]
                         ),
            / ♦ MATER_USURE = 'mat1_mat2',                     [KN]
                # division figure of game in sectors
            / ♦ SECTOR = _F (
                  ♦ COEF_USURE_MOBILE = k_t,                   [R]
                  ♦ COEF_USURE_OBST   = k_o,                   [R]
                  ♦ ANGL_INIT         = ang_i,                 [R]
                  ♦ ANGL_FIN          = ang_f,                 [R]
                            ),

             # if MATER_USURE nonpresent
               ◊ OBSTACLE = _F (
                              ♦ COEF_USURE = k_o,              [R]
                         ),

             # so MOBILE not present
               ◊ USURE_OBST = / 'YES',                         [DEFECT]

          / ♦ LOI_USURE = 'KWU_EPRI',                          [KN]
            / ♦ MOBILE = _F (
```

```
                                      ♦   COEF_FNOR =   k1_t,  [R]
                                      ♦    COEF_VTAN    =   k2_t,  [R]
                                      ♦   COEF_USURE=  k3_t,  [R]
                                      ◊   COEF_K     =  / k_t, [R]
                                                        / 5. , [DEFECT]
                                      ◊   COEF_C     =  / c_t, [R]
                                                        / 10. ,   [DEFECT]
                                  ),

                    ◊   OBSTACLE   =   _F (
                                      ♦   COEF_FNOR =   k1_o,      [R]
                                      ♦   COEF_VTAN =   k2_o,      [R]
                                      ♦    COEF_USURE= k3_o,       [R]
                                      ◊    COEF_K       =   / k_o, [R]
                                                        / 5. ,     [DEFECT]
                                      ◊    COEF_C       =   / c_o, [R]
                                                        / 10. ,
          [DEFECT]
                                  )
                 /    ♦  MATER_USURE =   'mat1_mat2',              [KN]
                      ◊  USURE_OBST  =  /   'YES',                 [DEFECT]

                 ◊    FNOR_MAXI   =   fn,                          [R]
                 ◊    VTAN_MAXI   =   vg,                          [R]

              /  ♦  LOI_USURE =   'EDF_MZ',                        [KN]
                 /  ♦  MOBILE =   _F (
                                      ◊   COEF_USURE=/a_t,    [R]
                                                       / 1.E-13,  [DEFECT]
                                      ◊   COEF_B     =/b_t,    [R]
                                                       / 1.2,      [DEFECT]
                                      ◊   COEF_N     =/n_t,    [R]
                                                       / 2.44E-08, [DEFECT]
                                      ◊   COEF_S     =/s_t,    [R]
                                                       / 1.14E-16, [DEFECT]
                                  ),
                    ◊   OBSTACLE   =   _F (
                                       ♦ COEF_USURE=/a_o,    [R]
                                                       / 1.E-13,  [DEFECT]
                                       ◊  COEF_B     =/b_o,       [R]
                                                       / 1.2,      [DEFECT]
                                       ◊  COEF_N     =/n_o,       [R]
                                                       / 2.44E-08, [DEFECT]
                                       ◊  COEF_S     =/s_o,       [R]
                                                       / 1.14E-16, [DEFECT]
                                  ),
                 /  ♦  MATER_USURE   =   'mat1_mat2',              [KN]
                    ◊  USURE_OBST    =  /   'YES',                 [DEFECT]


            # definition of the contact except if TUBE_NEUF=' OUI'
               ♦  /  ♦  CONTACT      =   'GRAPPE_ALESAGE',         [KN]
                     ♦  RAYON_MOBILE =   r_t,                      [R]
                     ♦  RAYON_OBST   =   r_o,                      [R]

                  /  ♦  CONTACT      =   'GRAPPE_1_ENCO',          [KN]

                  /  ♦  CONTACT      =   'GRAPPE_2_ENCO',          [KN]

                  /  ♦  CONTACT      =   'TUBE_BAV',               [KN]
                     ♦  RAYON_MOBILE =   r_t ,                     [R]
```

```
            ♦  LARGEUR_OBST =   l_o,                            [R]
            ◊  ANGL_INCLI   =   Eng,                            [R]

         /  ♦  CONTACT      =   'TUBE_ALESAGE',                 [KN]
            ♦  RAYON_MOBILE =   r_t,                            [R]
            ◊  RAYON_OBST   =   r_o,                            [R]
            ♦  LARGEUR_OBST =   l_o,                            [R]
            ◊  ANGL_INCLI   =   Eng,                            [R]

         /  ♦  CONTACT      =   'TUBE_3_ENCO',                  [KN]
            ♦  RAYON_MOBILE =   r_t,                            [R]
            ♦  RAYON_OBST   =   r_o,                            [R]
            ♦  LARGEUR_OBST =   l_o,                            [R]
            ◊  ANGL_ISTHME  =   angli,                          [R]
            ◊  ANGL_INCLI   =   Eng,                            [R]

         /  ♦  CONTACT      =   'TUBE_4_ENCO',                  [KN]
            ♦  RAYON_MOBILE =   r_t,                            [R]
            ♦  RAYON_OBST   =   r_o,                            [R]
            ♦  LARGEUR_OBST =   l_o,                            [R]
            ◊  ANGL_ISTHME  =   angli,                          [R]
            ◊  ANGL_INCLI   =   Eng,                            [R]

         /  ♦  CONTACT         =   'TUBE_TUBE',                 [KN]
            ♦  RAYON_MOBILE    =   r_t,                         [R]
            ◊  ANGL_INCLI         =   Eng,                      [R]


# if RESU_GENE or PUIS_USURE are present
   # definition of the moments of calculation depth of wear
      ♦  /  INST        =  l_inst,                              [l_R]
         /  LIST_INST   =  linst,                               [listr8]

# if TUBE_NEUF
      ◊     INST        =  inst,                                [R]


# definition of a title
      ◊  TITLE =   'montitre',                                  [l_Kn]

# impression of information
      ◊  INFORMATION  =  /  1,                                     [I]
                         /  2,                                  [DEFECT]

            )
```

3 Operands

We draw here attention to some delicate points of the use of POST_USURE.

1) The result of POST_USURE does not depend on the final mechanical state of calculation but of all the history of the shocks. It is thus very important to take into account **all** moments of calculations, i.e. not to ask selective filing in DYNA_TRAN_MODAL.
2) The result of POST_USURE is very sensitive to the parameters of calculations, in particular to the wealth of the modal base, and the step of time. It is thus strongly advised to test various modal bases (increasingly rich) and various steps of time (increasingly small). For example, for the step of time, one will be able to test various spaced values of a factor 10, then 2, in order to determine a beach of step of time over which the result is stable.
3) In the case of a vibratory calculation, one can have a result which is not representative of real wear if the experiment is not long enough. In the same way, in the case of excitations generated by chance, it is advised to carry out several pullings before drawing the conclusions of dimensioning.

3.1 Case PUIS_USURE or RESU_GENE

3.1.1 Operand PUIS_USURE

♦ PUIS_USURE = been able

The power of wear is:

- exit of the result of a transitory calculation by modal recombination, produced by the operator DYNA_TRAN_MODAL [U4.53.21] (operands following),
- or given by the user who uses the operand then PUIS_USURE.

3.1.2 Operand RESU_GENE

♦ RESU_GENE = tg

Result of a transitory calculation by modal recombination, produced by the operator DYNA_TRAN_MODAL [U4.53.21].

3.1.3 Operand GROUP _ NO

♦ GROUP _ NO = grnoeu,

Definition of the node of shock post-to be treated.

3.1.4 Operand INST_INIT

◊ INST_INIT = t0

Moment of beginning of the average of the signals (cf [§4]).
(T_0 = 0. value by default).

3.1.5 Operand INST_FIN

◊ INST_FIN = T1

Moment of end of the average of the signals.

3.1.6 Operand NB_BLOC

◊ NB_BLOC = Nb

Many temporal blocks of division interval [T_0, T_1] for the average of the signals (1 by default).

3.2 Case TUBE_NEUF

For the treatment of the wear of the control rods, the user has the possibility of taking into account the change of a tube by a new tube by informing the keyword TUBE_NEUF = 'YES'

3.2.1 Operand TUBE_NEUF

◊ TUBE_NEUF = 'YES'

If the user informs this keyword, the operator modifies the values of wear of the tube (V_USUR_TUBE, P_USUR_TUBE, V_USUR_TUBE_SECT, P_USUR_TUBE_SECT, V_USUR_TUBE_CUMU = 0) in the table resulting from POST_USURE for the posterior moments at the moment of loading of the new tube.

3.2.2 Operand TABL_USURE

♦ TABL_USURE = Tresu

If the user informs LE keyword TUBE_NEUF = 'YES', one must seize the name of the table to be reactualized. This table is same that which is at exit of the operator. The moment of the change of the tube by a new tube is seized in the keyword INST.

3.3 Law of wear 'ARCHARD'

3.3.1 Operand LOI_USURE

♦ LOI_USURE = 'ARCHARD'

Defines the law of wear in order to calculate worn volume.

The coefficient of wear of the law of Archard is provided by the user or is taken in a database.

3.3.2 Keyword MOBILE

♦ MOBILE

Definition of the coefficient of wear of the mobile.

3.3.2.1 Operand COEF_USURE

♦ COEF_USURE = k_t

Value of the coefficient of wear of the mobile.

3.3.3 Keyword OBSTACLE

◊ OBSTACLE

Definition of the coefficient of wear of the obstacle.

3.3.3.1 Operand COEF_USURE

♦ COEF_USURE = k_o

Value of the coefficient of wear of the obstacle.

3.3.4 Operand MATER_USURE

♦ MATER_USURE = 'mat1_mat2'

Recovery of the coefficients in a data bank:

mat1: being the material of the bunch or tube (the mobile), mat2: being the material of the obstacle.

3.3.5 Operand USURE_OBST

◊ `USURE_OBST = / 'YES' [DEFECT]`

Indicate if one wants to take into account the wear of the obstacle.

3.3.6 Operand SECTOR

◊ `SECTOR =`

Definition of the various quantities necessary to cut out the figure of game in angular sectors.

3.3.6.1 Keyword COEF_USURE_MOBILE

♦ `COEF_USURE_MOBILE = K_t [R]`

Definition of the coefficient of wear of the mobile within the meaning of the law of Archard for the sector.

3.3.6.2 Keyword COEF_USURE_OBST

♦ `COEF_USURE_OBST = K_o [R]`

Definition of the coefficient of wear of the obstacle within the meaning of the law of Archard for the sector.

3.3.6.3 Keyword ANGL_INIT

◊ `ANGL_INIT = ang_i [R]`

Definition of the initial angular value of the sector.

3.3.6.4 Keyword ANGL_FIN

♦ `ANGL_FIN = ang_f [R]`

Definition of the final angular value of the sector.

3.4 Law of wear 'KWU_EPRI'

3.4.1 Operand LOI_USURE

♦ `LOI_USURE = 'KWU_EPRI'`

Defines the law of wear in order to calculate worn volume.

3.4.2 Keyword MOBILE

♦ `MOBILE`

Definition of the coefficient of wear of the mobile (provided by the user or taken in the database).

3.4.2.1 Operands `COEF_*`

♦ `COEF_FNOR = k1_t`

Definition of the dimensional coefficient of correction in the case of pure impacts.

♦ `COEF_VTAN = k2_t`

Definition of the dimensional coefficient of correction in the case as of slips.

♦ `COEF_USURE= k3_t`

Definition of the coefficient of wear of reference.

◊
```
COEF_K = /  k_t
         /  5.        [DEFECT]
```

Definition of the constant.

◊
```
COEF_C = /  c_t
         /  10.       [DEFECT]
```

Definition of the constant.

3.4.3 Keyword **OBSTACLE**

◊ `OBSTACLE`

Definition of the coefficient of wear of the obstacle (provided by the user or taken in the database).

3.4.3.1 Operands `COEF_*`

♦ `COEF_FNOR = k1_o`

Definition of the dimensional coefficient of correction in the case of pure impacts.

♦ `COEF_VTAN = k2_o`

Definition of the dimensional coefficient of correction in the case of slips.

♦ `COEF_USURE= k3_o`

Definition of the coefficient of wear of reference.

◊
```
COEF_K = /  k_o
         /  5.        [DEFECT]
```

Definition of the constant.

◊
```
COEF_C = /  c_o
         /  10.       [DEFECT]
```

Definition of the constant.

3.4.4 Operand **MATER_USURE**

♦ `MATER_USURE = 'mat1_mat2'`

Recovery of the coefficients in a data bank =

mat1 = being the material of the bunch or the tube (the mobile),
mat2 = being the material of the obstacle.

3.4.5 Operand USURE_OBST

◊ USURE_OBST = / 'YES' [DEFECT]

Indicate if one wants to take into account the wear of the obstacle.

3.4.6 Operands FNOR_MAXI/VTAN_MAXI

◊ FNOR_MAXI = fn

Definition of the maximum normal force to take into account for the distribution of the 5 classes for the law of wear KWU_EPRI.

◊ VTAN_MAXI = vg

Definition the speed of slip maximum to take into account for the distribution of the 5 classes for the law of wear KWU_EPRI.

3.5 Law of wear 'EDF_MZ'

3.5.1 Operand LOI_USURE

♦ LOI_USURE = 'EDF_MZ'

Defines the law of wear in order to calculate worn volume.

3.5.2 Keyword MOBILE

♦ MOBILE

Definition of the coefficient of wear of the mobile (provided by the user or taken in the database).

3.5.2.1 Operands COEF_*

```
♦ COEF_USURE = / a_t
               / 1.E-13      [DEFECT]
```

Definition of the coefficient of wear A.

```
◊ COEF_B = / b_t
           / 1.2             [DEFECT]
```

Definition of the exhibitor of the power of wear B.

```
◊ COEF_N = / n_t
           / 2.44E-08        [DEFECT]
```

Definition of the rate of deceleration N.

```
◊ COEF_S = / S_t
           / 1.14E-16        [DEFECT]
```

Definition of the threshold S.

3.5.3 Keyword OBSTACLE

◊ OBSTACLE

Definition of the coefficient of wear of the obstacle (provided by the user or taken in the database).

3.5.3.1 Operands COEF_*

```
♦  COEF_USURE =     /  a_o
                    /  1.E-13    [DEFECT]
```

Definition of the coefficient of wear A.

```
◊  COEF_B =  /  b_o
             /  1.2              [DEFECT]
```

Definition of the exhibitor of the power of wear B.

```
◊  COEF_N =  /  n_o
             /  2.44E-08         [DEFECT]
```

Definition of the rate of deceleration N.

```
◊  COEF_S =  /  s_o
             /  1.14E-16         [DEFECT]
```

Definition of the threshold S.

3.5.4 Operand MATER_USURE

♦ MATER_USURE = ‘mat1_mat2’

Recovery of the coefficients in a data bank =

mat1 = being the material of the bunch or the tube (the mobile),

mat2 = being the material of the obstacle.

3.5.5 Operand USURE_OBST

```
◊  USURE_OBST =     /  ‘YES’     [DEFECT]
```

Indicate if one wants to take into account the wear of the obstacle.

3.6 Operand CONTACT

♦ CONTACT = géom

Definition of the geometry of contact.

According to the type of contact, various geometrical relations between worn volumes and worn depths.

3.6.1 Operand CONTACT = 'GRAPPE_ALESAGE'

The bunch is centered in a boring. The trace of wear has a section in the shape of lunule. Worn volume is brought back to a surface used in a section.

3.6.2 Operand CONTACT = 'GRAPPE_1_ENCO'

The bunch is centered compared to the obstacle.

The map of guidance is made of a notch. Worn volume is brought back to a surface used in a section.

The coefficients are founded at the same time on the experimental results and those of the experience feedback. They apply only to the control rods.

3.6.3 Operand CONTACT = 'GRAPPE_2_ENCO'

The bunch is centered compared to the obstacle.

The map of guidance is made of two notches diametrically opposite. Worn volume is brought back to a surface used in a section.

The coefficients are founded at the same time on the experimental results and those of the experience feedback. They apply only to the control rods.

3.6.4 Operand CONTACT = 'TUBE_BAV'

Case 1:

The tube is presented vertically, the bar impacts perpendicular to the tube, one supposes that the bar does not wear.

Case 2:

The bar is presented tilted (operand ANGL_INCLI) compared to the tube, the bar impacts perpendicular to the tube, one supposes that the bar does not wear.

Case 3:

The tube is presented vertically, the bar impacts perpendicular to the tube, one takes into account the wear of the bar.

Case 4:

The bar is presented tilted (operand ANGL_INCLI) compared to the tube, the bar impacts perpendicular to the tube, one takes into account the wear of the bar.

3.6.5 Operand CONTACT = 'TUBE_ALESAGE'

Case 1:

The tube is centered perfectly in an animated boring of a pure orbital movement and wears in a uniform way on all the periphery in contact with the obstacle.

Case 2:

The tube is centered in an animated boring of a movement of impact-slips of the elliptic type which leads to the formation of traces of wear of the cylindrical type diametrically opposite on the tube and having a section in the shape of lunule.

Case 3:

The tube, animated of a movement of impact-slips, presents this time a slope compared to the support (operand ANGL_INCLI). One obtains two symmetrical traces of wear in the shape of V on the tube.

3.6.6 Operand CONTACT = 'TUBE_3_ENCO'

Case 1:

The initial contact is carried out against an edge of one of the isthmuses of a trifoliate boring. One supposes the tube perfectly centered compared to his obstacle. The trace of wear does not extend to the entire isthmus. One does not take into account the wear of the obstacle.

Case 2:

Same assumptions as for case 1 except the position of the tube compared to the obstacle. One supposes this time that the tube presents an angle of inclination (operand ANGL_INCLI).

3.6.7 Operand CONTACT = 'TUBE_4_ENCO'

Case 1:

The initial contact is carried out against an edge of one of the isthmuses of quadrifoliate boring. One supposes the tube perfectly centered compared to his obstacle. The trace of wear does not extend to the entire isthmus. One does not take into account the wear of the obstacle.

Case 2:

Same assumptions as for case 1 except the position of the tube compared to the obstacle. One supposes this time that the tube presents an angle of inclination (operand ANGL_INCLI).

3.6.8 Operand CONTACT = 'TUBE_TUBE'

Following the rupture of a stopped tube, there can be contact between this tube and one of its neighbors. The wear of the two tubes by accommodation of surfaces in contact led to the creation of two plane surfaces.

3.7 Description of the obstacle

3.7.1 Operand RAYON_MOBILE

♦ RAYON_MOBILE = r_t

Definition of the ray of the mobile (obligatory parameter).

3.7.2 Operand RAYON_OBST

♦ RAYON_OBST = r_o

Definition of the ray of the obstacle (obligatory parameter if the wear of the obstacle is taken into account).

3.7.3 Operand LARGEUR_OBST

♦ LARGEUR_OBST = l_o

Definition of the width of the obstacle (parameter obligatory for the operands TUBE_*).

3.7.4 Operand ANGL_INCLI

◊ ANGL_INCLI = Eng

Definition of the angle of inclination mobile/obstacle (optional parameter = value 0. is taken by default).

3.7.5 Operand ANGL_ISTHME

♦ ANGL_ISTHME = angli

Definition of the angle of the isthmus of the geometry of contact (parameter obligatory for the operands TUBE_3_ENCO and TUBE_4_ENCO).

3.8 Definition of the moments of analysis

3.8.1 Case PUIS_USURE or RESU_GENE

3.8.1.1 Operands INST/LIST_INST/COEF_INST

♦ INST = l_inst

Definition of the moments of calculation in the shape of a list of values.

♦ LIST_INST = linst

Definition of the moments of calculation in the form of a concept of the type listr8.

◊ COEF_INST = coeff

The moments given are to be multiplied by a coefficient coeff given, which makes it possible to pass easily from the units SO to the natural units for a calculation of wear (the month of the year).

3.8.2 Case TUBE_NEUF

If TUBE_NEUF = 'YES', one can seize the moment of loading.

3.8.2.1 Operand INST

◊ INST = inst

Moment of loading of a new tube.

Values of wear of the tube (V_USUR_TUBE, P_USUR_TUBE, V_USUR_TUBE_SECT, P_USUR_TUBE_SECT, V_USUR_TUBE_CUMU) are put at 0 for the posterior moments at the moment of loading of the new tube. By default, one puts at 0 the values of wear of the last moment of the table if TUBE_NEUF = 'YES'.

3.9 Operand ETAT_INIT

3.9.1 Keyword TABL_USURE

♦ TABL_USURE = tresu [table_sdaster]

Definition of the table which one wishes to reactualize.

3.9.2 Keyword INST_INIT

◊ INST_INIT = all [R]

Definition of the moment from which one wishes to reactualize the table.

3.10 Operands TITLE/INFORMATION

◊ TITLE = 'montitre'

Title which one wants to give to the result [U4.03.01].

```
◊ INFORMATION =    /  1
                   /  2
```

Level of impression

1 pas d' impression.
2 impression volumes and depths of wear at the specified moments

3.11 Produced table

The order POST_USURE generate a concept of the type counts, whose contents are:

INST: moments to which the user wishes to know the volume and the depth of wear,

V_usur_tube: volume used on the level of the tube (for each moment specified by the user),

V_usur_obst: volume used on the level of the obstacle (for each moment specified by the user),

P_usur_tube: depth of wear on the level of the tube (for each moment specified by the user).

The order IMPR_TABLE [U4.91.03] allows to print the results.

4 Checking - Execution

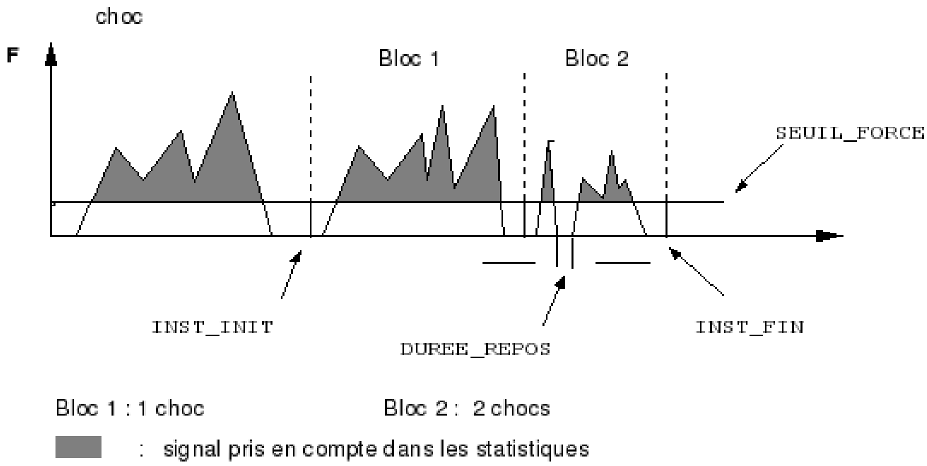
4.1 Operand MATER_USURE

It is checked that the material couple provided by the user is in the database.

4.2 Operands RESU_GENE / INST_INIT / INST_FIN / NB_BLOC

The value of INST_FIN is compared with the final moment t_f result tran_gene. The value of INST_FIN reserve is $min(t_f, t_1)$.

If the value of INST_INIT t_0 is higher than the value of INST_FIN, one stops in error.



5 Example

```
dateu = DEFI_LIST_REEL (BEGINNING = 0.25,
                    INTERVAL = _F (JUSQU_A =  1. , NUMBER = 20),
                                 _F (JUSQU_A =  5. , NUMBER = 10),
                                 _F (JUSQU_A = 10. , NUMBER = 5  )
                      )
#
us1 = POST_USURE (
                     PUIS_USURE   = 0,312,
                     LOI_USURE    = 'ARCHARD',
                     NB_BLOC      = 4,
                     MOBILE       = _F (COEF_USURE = 30.e-15  ),
                     OBSTACLE     = _F (COEF_USURE = 20.e-15),
                     CONTACT      = 'GRAPPE_1_ENCO',
                     RAYON_MOBILE = 0.00485,
                     RAYON_OBST   = 0.00545,
                     LIST_INST    = dateu,
                     COEF_INST    = 31557600. ,
                     TITLE        = 'NO1 = Wear per years',
                     INFORMATION         = 2
                 )
#
us2 = POST_USURE (
                     RESU_GENE    = dynamoda,
                     GROUP_NO     = 'GNO1',
                     LOI_USURE    = 'EDF_MZ',
                     MOBILE = _F (
                                 COEF_USURE = 1.e-13,
                                 COEF_B     = 1.2,
                                 COEF_N     = 2.44e-08,
                                 COEF_S     = 1.14e-16,
                               ),
                     OBSTACLE = _F (
                                 COEF_USURE = 1.e-13,
                                 COEF_B     = 1.2,
                                 COEF_N     = 2.44e-08,
                                 COEF_S     = 1.14e-16
                                ),
                     USURE_OBST   = 'YES',
                     CONTACT      = 'GRAPPE_1_ENCO',
                     RAYON_MOBILE = 0.00485,
                     RAYON_OBST   = 0.00545,
                     LIST_INST    = dateu,
                     COEF_INST    = 31557600. ,
                     TITLE        = 'NO1 = Wear per year',
                     INFORMATION         = 2
                  )
```