MORE ON THE METHOD

For joining adherents, as well as for the users of the IDD method proposed, the following notices take place.

- The method serves universally for fatigue life assessment under any stress-time functions (oscillograms) $\sigma_x(t)$, $\sigma_y(t)$ and $\tau_{xy}(t)$ of plane (surface) state of stress calculated while designing or obtained from strain-gage measurements, etc. There is not another, such a universal method. Instead, a very great number of particular methods exist. They are with limited validity and application, and incompatible.
- The method proposed, as a result from the new IDD concept, is *radically different* from the existing methods. Two kinds of differentials are new basic notions that substitute previous basic notions: $\mathrm{d}s$ *instead of loading cycle and* $\mathrm{d}D$ *instead of damage per cycle*. Tens, hundreds or millions of $\mathrm{d}D$ damage differentials (ΔD finite differences) are summed (numerically integrated) per $\mathrm{d}s$ loading differentials (Δs finite elements) what is enabled without any problem by a contemporary computer.
- The loading can be any:
  - represented by a single arbitrary oscillogram, i.e. the loading is uniaxial or multiaxial proportional, deterministic or random, cyclic or non-cyclic; the loading can also be represented by statistical distribution of instantaneous stress values (no stress amplitudes and their distribution are needed);
  - multiaxial (combined), represented by two or three arbitrary oscillograms, non-proportional, deterministic or random; the loading can also be represented by multiaxial statistical distribution of instantaneous values (no amplitudes) of the stresses that are stress state components.
- IDD is direct integration (summation) of damage differentials per the loading differentials, applicable to the arbitrary oscillograms, no matter how they vary, because their variations are just integration conditions. They do not participate in the integrand (they are not behind the integral sign). The arbitrariness of the integration conditions namely allows the proposed method to be universal in terms of loading. The directness of summation of differentials abolishes any need of preliminary search for cycles or reduction of multiaxiality.
- IDD is a *strategy* for re-directing the fatigue life investigations to come onto the base of differential analysis (to be at the differential level). IDD is not the next fatigue life criterion, among the others, but an approach that can incorporate all existing criteria.
- The concrete $\mathrm{d}D$ integrand proposed can be improved, expanded and grounded not only empirically but also theoretically and physically. Any researcher in the physics of the fatigue damage is welcome to take the challenge.

- For fatigue life assessment based on the proposed method under non-proportional loading, the user has to enter empirical IDD parameters denoted as f_c, f_τ, N_c and N_τ. The first two, f_c and f_τ, are called factors of (sensitivity of the material to) loading non-proportionality (they are not involved under one-component or proportional loading). For them, an initial empirical data bank has already been built and will be developed and enlarged. The N_c and N_τ numbers serve for forming no-damage areas in the σ'-σ'' plane under non-proportional loadings. The method proposed works with an accuracy which corresponds to the present stage of acquiring the f_c, f_τ, N_c and N_τ parameters. This accuracy is fully satisfying in comparison to the existing methods that compute too different lives. And, upon enlarging and perfecting the data bank of the four IDD parameters, the accuracy will increase.
- Software that enables the method is proposed. As an algorithm, it is not simple. Its input is open: it does not practically restrict the volume of so-called 'leading' entry data. They are apart from unlimited number of instantaneous stress values (ordinates of the oscillograms) called 'current' data. The leading data include S-N lines. They can be specified and entered by following all the fatigue life experimental and theoretical studies done in the world so far. IDD does not oppose any other existing particular method but can use it: not only differentials, but the whole world-wide fatigue life experience can be 'integrated' (incorporated) by the IDD software thanks to its unrestricted input.
- This thesis contains also demo exercises for acquiring the software. The latter consists of several applications (written in Fortran 77) working within MS Windows. The dialog between user and computer is as simple as just to enable the method. Any funding organization or engineering corporation can adopt the method and organize a team for development of contemporary, licensed and marketable software for fatigue life computation.