Steinbeis-Transferzentrum
Neue Technologien in der Verkehrstechnik

winLIFE 4.0 2017: What is new related to 4.0 ?

simplified Installation

There is only one winLIFE version to install for 32 Bit and 64 Bit. No user decision is needed. Also the database was simplified: The ACCESS-database is left and only SQL-Server is used for all.

winLIFE 4.0 2017 Demo-Version

Now a version for demonstration purpose was created with exactly the GUI of winLIFE 4.0 2017. There are some restrictions but the user can get a look and feel of winLIFE.

Documentation

Because the winLIFE manual increased 1000 pages since now it is devided in 4 different manuals:

MANUAL: theory and User- Interface

EXAMPLES: 35 examples well documented

FKM QUICKCHECK: static and endurance proof according to FEKM guideline

FE INTERFACE: Only for the users who want access directly the FEA results without using the VIEWER4WINLIFE

Data Import from ANSYS, ABAQUS, Nx, FEMAP, Recurdyn

winLIFE customers use more and more huge models from FEA and as a result the routines for reading and writing data are more and more time consuming. To accelerate speed a lot of work was done. As a result winLIFE 4.0 2017 has no speed defects related to the original FEA codes by reading and viewing the models. In some cases winLIFE Viewer is faster than the original FEA software.

Beside the data import the VIEWER4WINLIFE performs the data selection for fatigue calculation and shows the results. Improvements for defining node- and element sets were done. Furthermore the support of element types in

ABAQUS was improved. There is much work to improve the VIEWER4WINLIFE and customer feedback are very welcome.

Data Access to Turbolab und FAMOS

You can now read in original files from Turbolab und FAMOS

Column limitation for load files are increased

The number of colums in the load files are not limited but the length of one line. The limitation now is 20000 charactres in one line.

Creation of dynamic Moment peaks for combustion engines

You can simply measure data of vehicle in operation using the CAN-interface existing in nearly each car. These data are very helpful to do fatigue analysis and predict the influence of the driver. Unfortunately the sample rate of the CAN is relatively low, it is sufficient to log the vehicle speed, rpm, gear, temperature but the very important moment signal of the engine only represents the mean value. The high frequent moment peaks resulting from the ignition are not included.

Because of the importance of such peak data of the engine winLIFE established a methode to create it. From the measured CAN-engine moment (mean value) an additional share which represents the moment resulting from ignition (dynamic value). Only basic engine data are needed to create such a signal.

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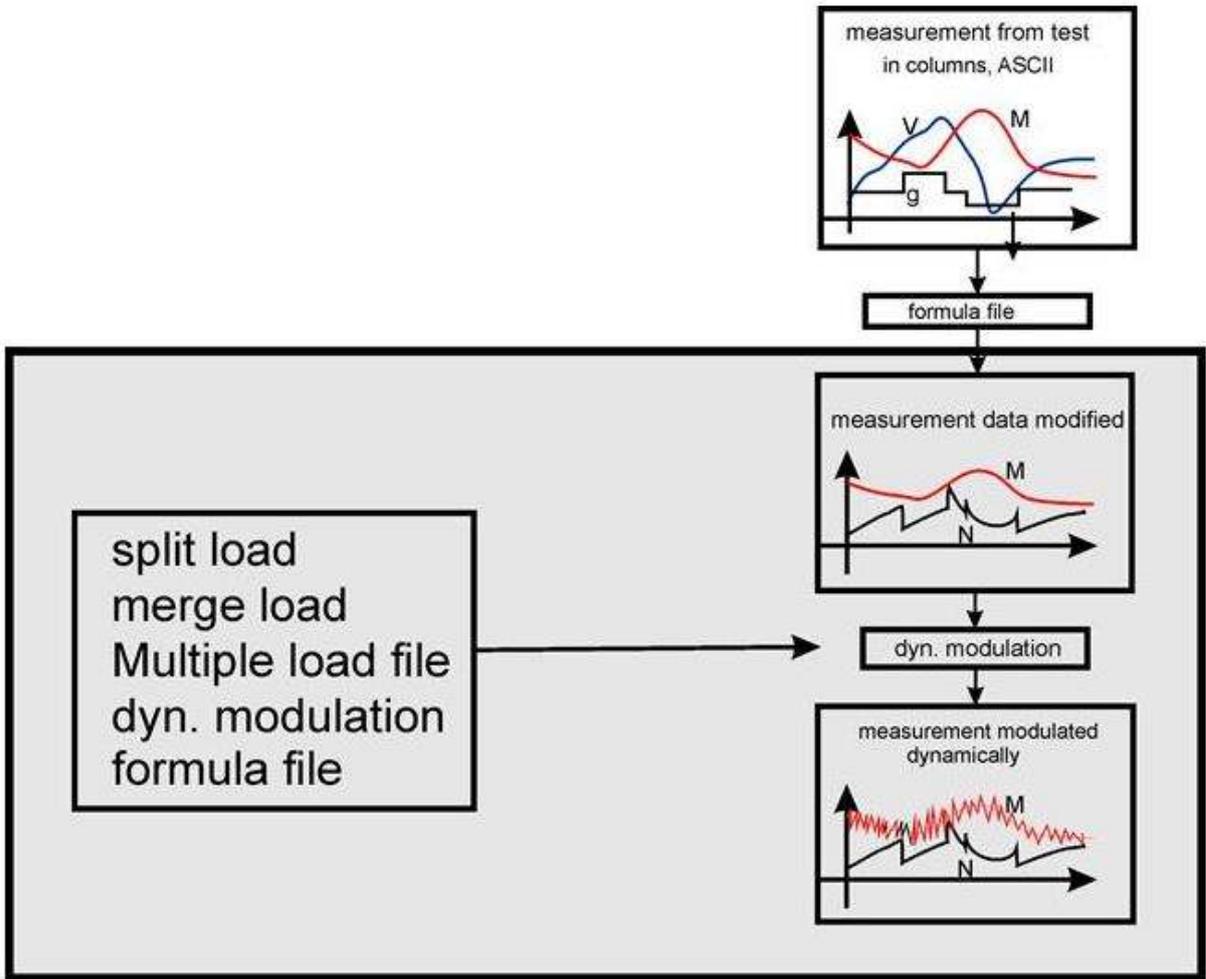
The result of such an action is shown in the following two pictures. Left hand side is the measured moment, right hand side is the created dynamic moment. Now drivelinie simulations can done taking the important dynamic moment into account.
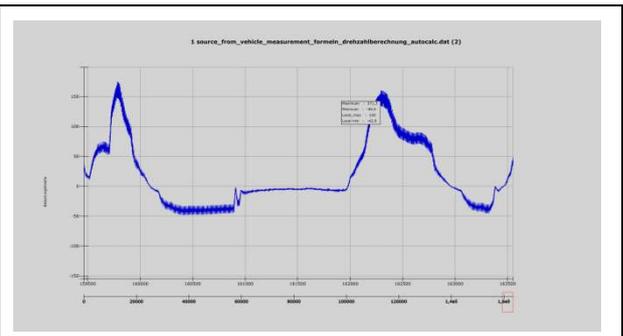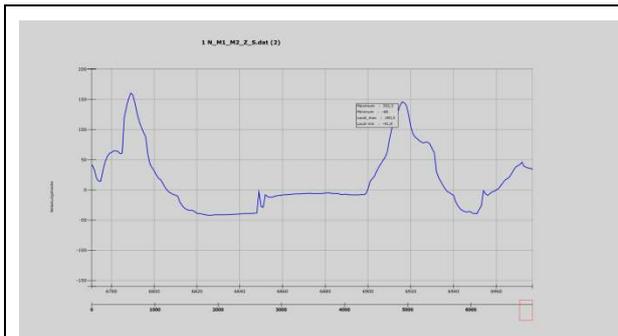
Formula generator

The new generator calculates new signals from existing data. The picture below shows an example where based on measured speeed data the rotation speed of the engine was calculated by help of the known transmission ratio in the gears.
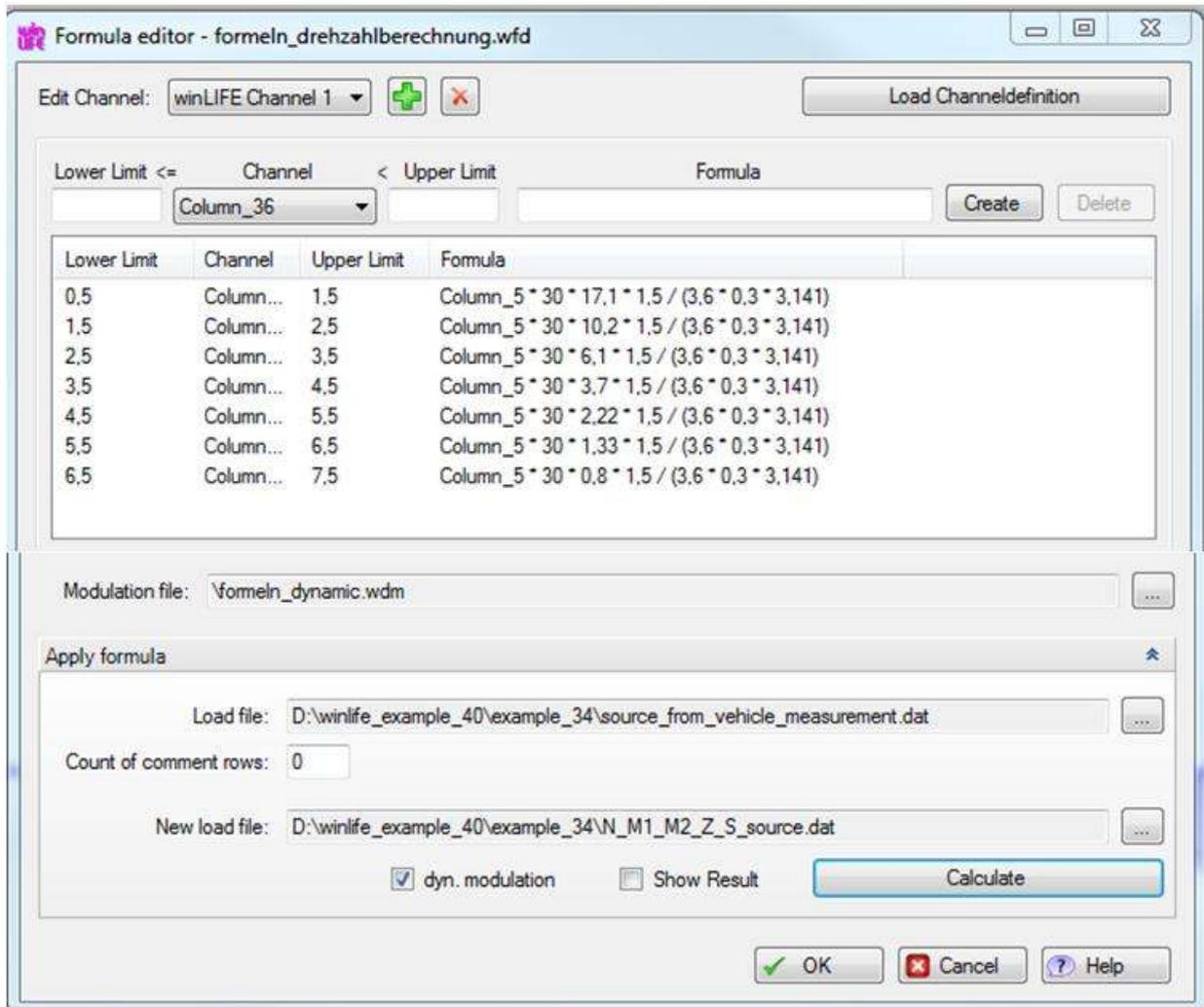
Viewing Signals

Now you can view up to 200 loadings in one graphic. 200 makes not really sense but 5 or ten often are helpfull. The following picture shows 4 signals.
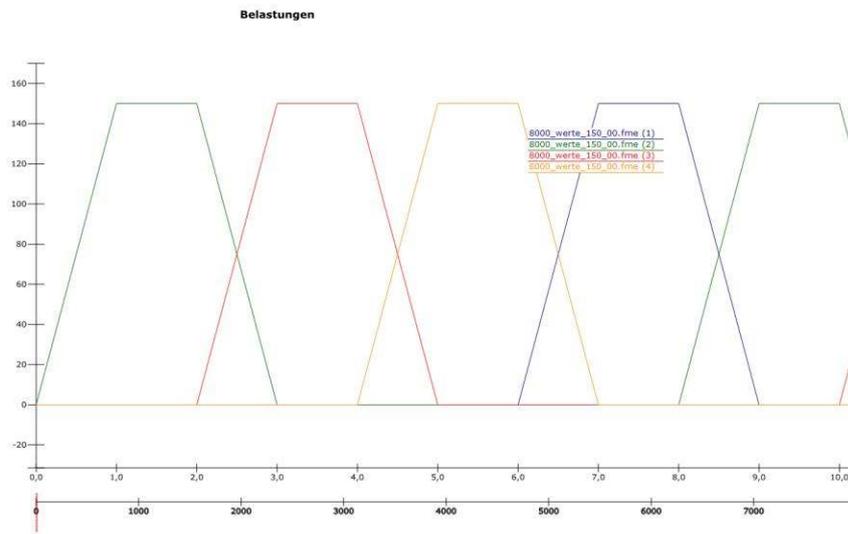
FKM guideline also for weldings

The last winLIFE version did not include welding dalculation according to FKM. This we changed because customer demands. To prove and to enable the user to follow up the results all examples from FKM guideline were calculated and are documented in winLIFE. To simplify the understanding intermediate results are given in the protocol file together with the formulas and their numbers to indentify it doughtless.

All examples you find in the winLIFE Help as shown in the next picture. A screen shot of FKM guideline is given at first to identify simply the example.

stress components
(local nominal stresses)

verification points
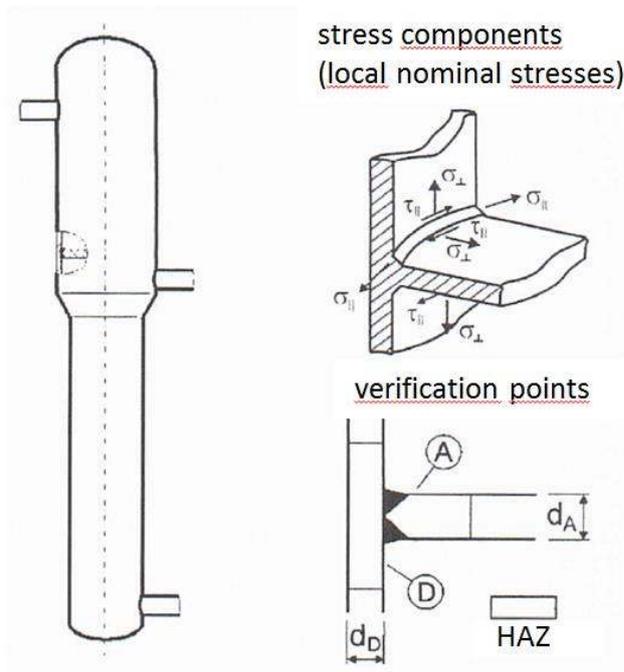
After the calculation the winLIFE protocol file includes intermediate parameters and gives the location of the formula number in the FKM guideline. This makes ist easy to find the formula and to follow to understand the results.

```
Fatigue durability proof for node 1
Component related standards
          sigma_W,zd:  1.37250E+02        fW,sigma:  4.50000E-01  Rm:  3.05000E+02  (4.2.1)
Temperature factor
          KT,D:  9.16000E-01  (4.2.4)
Dickenfaktor
          f_t:  9.03986E-01      (4.3.23-27)
Umrechnungsfaktor
          f_FAT_sigma:  3.68403E-01      ND:  5.00000E+06      k:  3.00000E+00      NC:  2.00000E+06  (4.3.22)
          f_FAT_tau:    2.28653E-01      ND:  1.00000E+08      k:  5.00000E+00
Component alternating strength
          sigma_s_WK:   1.33212E+01      FAT:  4.00000E+01     KV:  1.00000E+00      KNL,E:  1.00000E+00  (4.4.2)
          tau    _WK:   5.78756E+00      FAT:  2.80000E+01     KV:  1.00000E+00      KNL,E:  1.00000E+00
Mean stress factor
          KAK_sigma_s:  8.69565E-01      R:   0.00000E+00      sm/sa:  1.00000E+00
          KAK_tau  :    9.17431E-01      R:   0.00000E+00      sm/sa:  1.00000E+00
Amplitude of component endurance limit
          sigma_s_AK:   1.45955E+01      K_e:  1.26000E+00     K_AK:  8.69565E-01    M:  1.50000E-01  (4.4.7)
          tau    _AK:   6.10614E+00      K_e:  1.15000E+00     K_AK:  9.17431E-01    M:  9.00000E-02
bearable value of amplitude
          sigma_s_BK:   5.79221E+01      KBK_sigma:  3.96850E+00  (4.4.39)
          tau    _BK:   2.54184E+01      KBK_tau:    4.16277E+00
Maximum of amplitude
          sigma_BKmax_s:7.80450E+01  (4.4.41)
          tau_BKmax:    1.41900E+02
Proof - individual stresses    jD:  1.52840E+00
          aBK_sigma_s:  4.48582E-01      sa:  1.70000E+01      sigma_BK:  5.79221E+01  (4.6.4)
          aBK_tau  :    4.20907E-01      sa:  7.00000E+00      tau_BK:    2.54184E+01
Proof - accumulated stresses
          aBK_sigma_wv:  7.01228E-01  (4.6.13)
Capacity utilisation = 70.1%, fatigue durability of node 1 proved.
```

Moment-stress-pathes in drivelines

You can simply check the nonlinear calculation in drivelines by help of the moment-stress-path. The graphic shows the characteristics and helps to understand the phenomena in the system. The algorithmus which first time was released in last winLIFE-version now was improved.
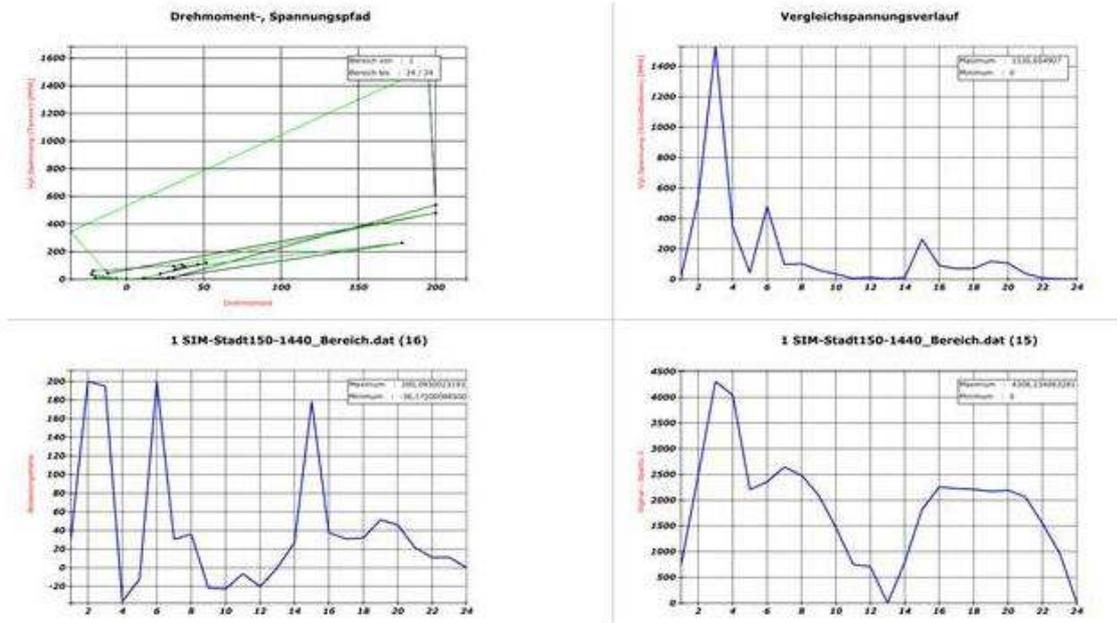
Crack Growth calculation

Using the crack growth module in winLIFE the problem appeared that there are two different unit systems common.

The material parameter units are located in exponential equations and as a result the transformation from the one unit system into the other needs some user effort. In the literature you find both unit systems and so you need very often to transform.

To assist the user winLIFE now can switch between these two unit systems. The picture below left shows the data in one unit system, marking the rectangle you get the other unit system (right picture).
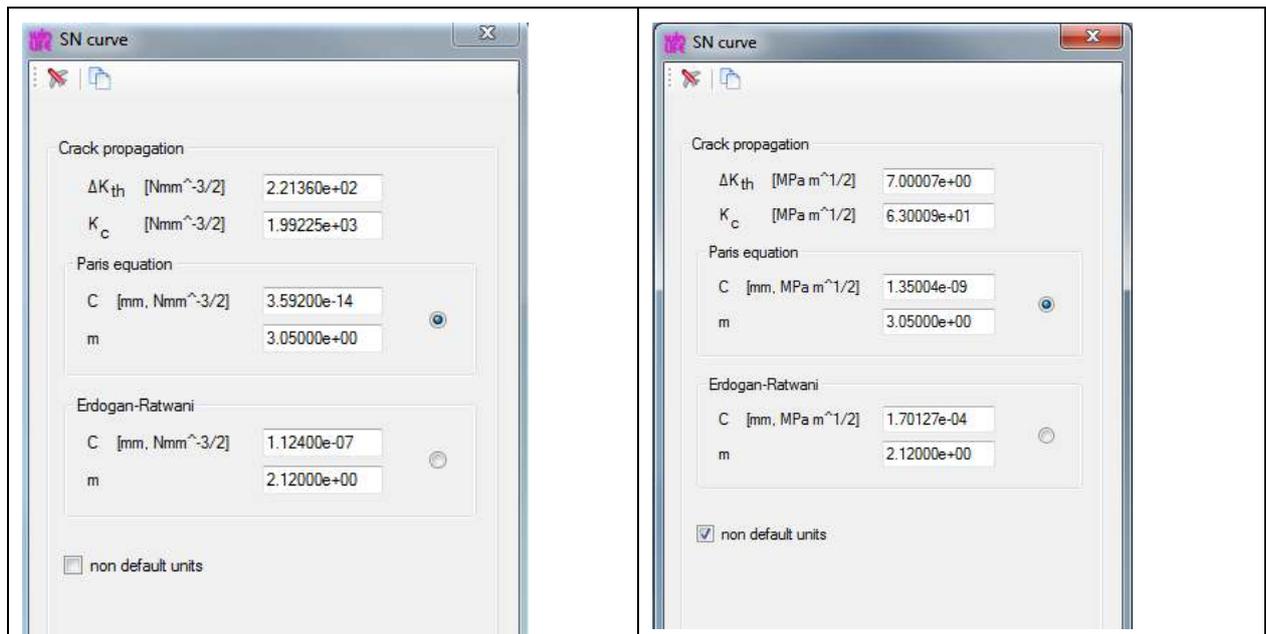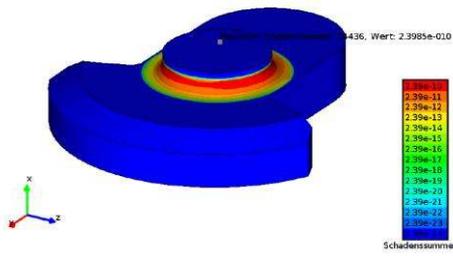
Mode Superposition

The Mode Superposition enables to solve high dynamic problems with a limited calculation time. You can use this methode in the multiaxial module and there are some winLIFE power user who do so very successful since some yearrs. But the majority of the user do not have the basic knowledge to use it.

To support such users some examples are prepared in winLIFE. Beginning with a simple two mass spring system the basics are explained. A very complex example – the fatigue of a crakshaft - was investigated and the results are impressive. The following pictures give an impression of some eigenmodes calculated in Recurdyn.
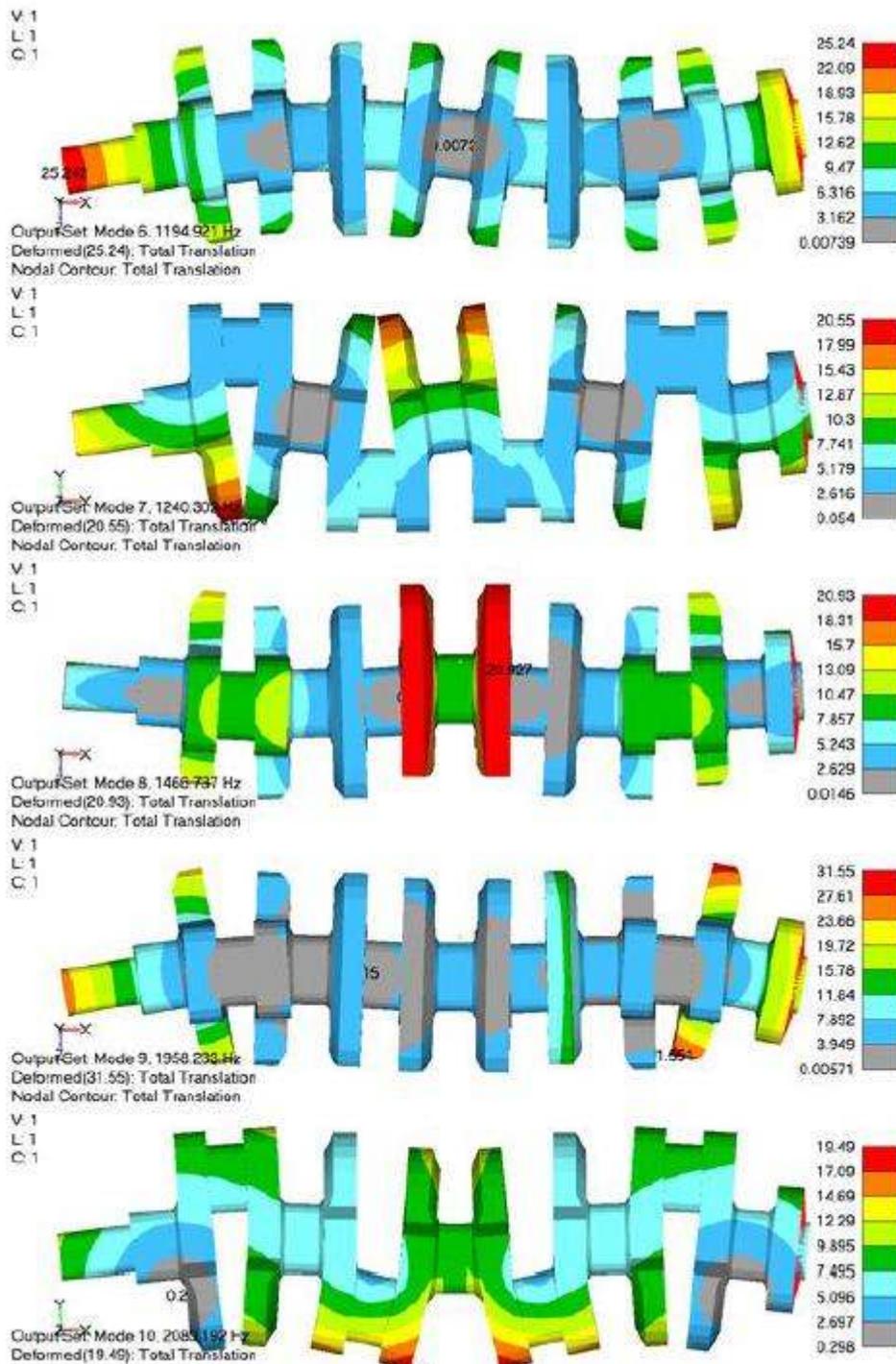
The final result coming from winLIFE using Recurdyn results is shown in the following picture.

The complete documentation – it is a part of a scientific work which is share of an examination procedure - will be published on our homepage in the chapter publications soon.

In the next seminar about random fatigue the mode superposition will be included.