How to use data files of rubber shearing test

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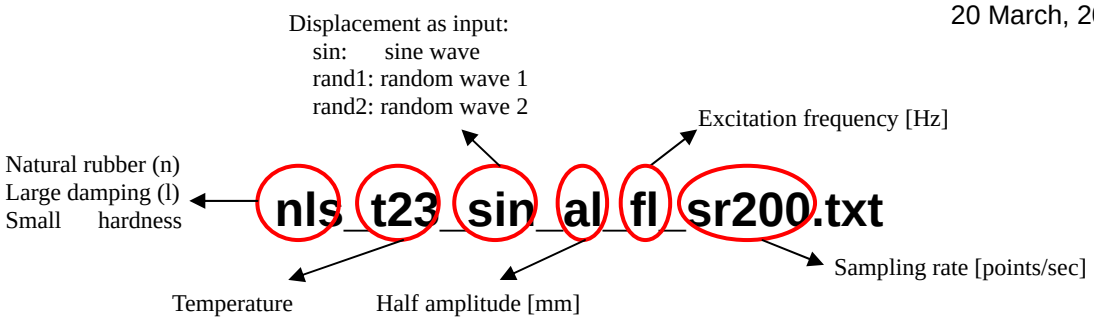

Fig.1 Description of file name (any file name without having "a…(amplitude)" indicates that all experimental data are put together into one file in order of excitation amplitudes)

(1) Loading conditions

Cyclic shearing tests are conducted on four different types of antivibration rubber, as indicated in Table 1, to examine their temperature- and rate-dependency. Relationship between the shear stress and shear strain have been obtained by mainly applying the sine wave excitation with the displacement control under the conditions of the temperature ranges $5 \sim 40^{\circ}\mathrm{C}$, the range of excitation frequency from 0.2 to 15 [Hz], and the amplitudes of 1 to 8 [mm] (shear strain between 25 and 200 %). The temperature change of the side surface of a specimen is measured by an infrared camera to capture the self-heating effect due to energy absorption during tests.

Two special displacements other than sine wave are inputted only in the case of $23^{\circ}\mathrm{C}$ to examine the dependency on the maximum strain ever experienced and the small history loop with unloading-reloading. They are called "Random wave 1" and "Random wave 2".

(2) File format

Files have two columns of character data: the first and second columns respectively indicate (engineering) shear strain γ and shear stress (true stress) τ [N/mm^2] defined as follows:

$$\gamma = \frac{u}{h}, \quad \tau = \frac{F}{2A}$$

where u [mm] is the displacement of a specimen measured during the test, h=4 [mm] is the height of the specimen, F [N] is the load measured during the test, A=25 x 25 [mm] is the cross-sectional area of the specimen. Since two identical rubber blocks are attached to one specimen, the stress value is calculated by dividing the measured data by "2".

Table-1 Basic data used for tension tests

Material	Natural Rubber	Natural Rubber	Natural Rubber	Natural Rubber
Hardness	50	65	50	65
tanδ	0.03	0.05	0.20	0.27
Young's module [MPa]	3.60	7.39	5.52	9.71
Mnemonic name in a file	nss (Small damping Small hardness)	nsl (Small damping Large hardness)	nls (Large damping Small hardness)	nll (Large damping Large hardness)
Specific heat [J/g･K]	1.55	1.43	1.47	1.40
Heat Conductivity [W/m･K]	0.23	0.23	0.22	0.22