STATUS REPORT: STRUCTURAL PERFORMANCE

Project 2695-21 -- Evaluation of the STFI Strip Compression Tester

The modified moisture compensation package installed in May utilizes AC circuitry and contacting probes independent of the tester clamps. Experience with this device has shown the need to control the pressure exerted on the specimen, and to ensure parallelism of probe surfaces.

The measured electrical resistance of the samples was found to increase continuously with pressure up to pressures of at least 40 psi. The amount of increase depends on the moisture content of the sample, with the greater increase at higher moisture levels. The selection of a pressure to be used for the measurement appears to be arbitrary, but needs to be controlled within about 0.5 psi for reproducible results. Non-parallelism of the probe surfaces was found to have a significant effect on the measured electrical resistance and needs to be controlled to one part per thousand or better.

A schematic of a device that will permit control within the required limit is shown in Figure 1. The air cylinder is selected to have a fixed travel distance. Its position is set so that upon activation it will compress the spring under the opposing probe a controlled distance, thus controlling the pressure exerted on the specimen. The entire assembly will attach to the STFI tester housing. It is expected that this device will be installed in the STFI tester early in October.

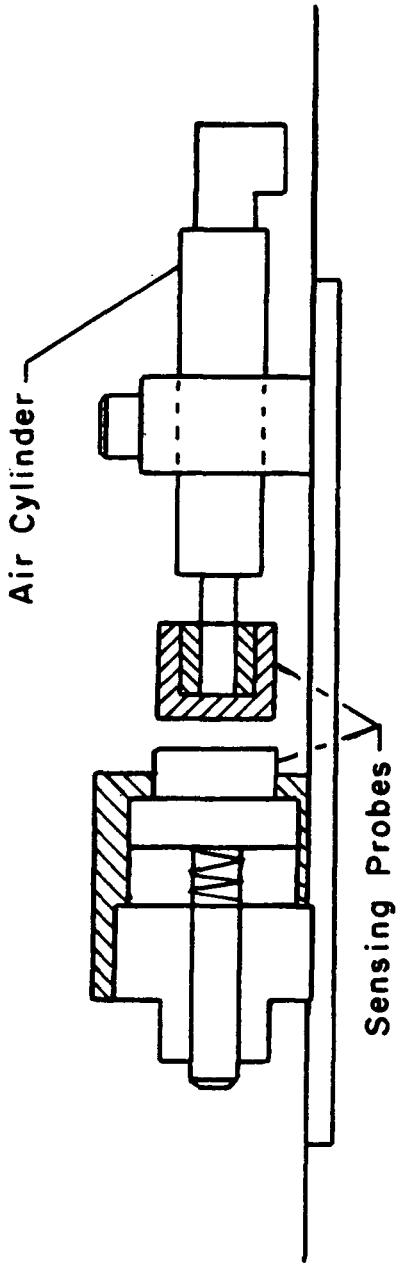

Figure 1. Schematic of Moisture Sensing Device

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Project 2695-21 -- Evaluation of the STFI Strip Compression Tester

SUMMARY

A modified moisture compensation package has been installed in the STFI tester. The new device utilizes AC circuitry, and has its own contacting probes independent of the tester clamps.

A laboratory microprocessor has been installed in the system and provides for moisture compensation and rapid data handling.

Statistical considerations show that the number of tests made with the STFI tester should be 4.4 times greater than with ring compression tests to obtain comparable confidence limits. Considering the speed of testing with the STFI tester, this should not be a problem.

After a planned modification of the contacting probes, and some updating of the microprocessor software, the tester should be fully operational.

We are presently exploring with L & W the implementation of the moisture compensation concept in a commercial package.

Modification of Moisture Compensation Package

The first moisture compensation package installed on the STFI tester utilized DC circuitry to measure the resistance of the sample. The measurement was made in the area of the specimen being tested for compression strength using the clamps of the tester as contacting probes. To accomplish this, it was necessary to construct new parts of non-conducting material to electrically insulate the

two pairs of clamps. An undesirable "hum" was encountered during the measurement which, it was felt, could be eliminated by the use of AC, rather than DC, circuitry.

After installation of AC circuitry it was learned that more reliable results could be achieved by keeping the contacting probes small, relative to the sample dimensions. This is most easily accomplished by installing small probes independent of the STFI clamps. This has the advantage that the device can be added to an STFI tester without major mechanical modification of the tester. The effect of measuring the resistance in an area of the specimen apart from the test zone should be minimal when averaged for a number of tests.

Statistical Variability

The within sample variance for tests made with the STFI tester is considerably higher than for tests made with the ring compression test. The average coefficients of variation are 10.7 and 5.4% for STFI and ring compression results, respectively. Thus the number of tests represented in a single average value would have to be increased with the STFI tester to obtain comparable confidence limits in the average. Computations based on the above coefficients show that the increase should be 4.4 times.

Part of the higher variability obtained with the STFI tester is probably due to the smaller specimen dimensions used for this test.

The laboratory microprocessor has been connected to the instrument sensors and provides printed information on the moisture content of the test specimen, on the computed 50% RH compressive strength, and the average of a number of tests. A minor program modification will permit computation of statistical information.

Work is presently underway to determine the most suitable contact area and pressure for the probes.

STATUS REPORT: STRUCTURAL PERFORMANCE

Project 2695-21 -- STFI Tester with Modifications

For 1981 one of the objectives of this project was to develop a moisture measurement and compensation package for addition to the STFI strip compression tester. This addition would automatically correct compressive strength measurements made on unconditioned samples to standard test conditions. An initial concept was developed and tested and shown to be workable. Hardware for a refined version of the moisture measuring system was designed and fabricated but has not been installed or tested because the project was placed in a hold position. The latter action was taken because of the announcement by TMI of the availability of a commercial moisture measuring system for the STFI tester (their system only measures moisture, it does not compensate for it).

For 1982, our objective is to evaluate the new TMI system. To this end we made arrangements with TMI to retrofit our STFI tester with the new moisture measuring package. Special scheduling by TMI was intended to give us three day turn around on the installation. As of now, however, they have had the instrument for 3-4 weeks and we don't expect it back for at least another week. When we receive the instrument we will evaluate its ability to accurately measure moisture content over a range of moisture levels and mill sources. We will not attempt to establish correlations for grades on mills. This is in accordance with the plan agreed to in October.

Additionally we will prepare a wood grain covered report to document all of our work with the STFI tester. Publication of a corresponding paper is a subject for future discussion.

STATUS REPORT: STRUCTURAL PERFORMANCE

Project 2695-21 -- STFI Tester with Modifications

At the February meeting it was concluded that the TMI moisture measurement add-on for the STFI strip compression tester does not satisfy the needs of FKBG members. It was further concluded that IPC should seek a vendor to market an automatic moisture measurement and compensation package based on the IPC concepts and data. Accordingly, we have approached L&W, the vendor for this tester, through STFI, to determine their interest in this opportunity. All other things being equal, L&W is a natural choice for the vendor since they manufacture the basic instrument.

Both STFI and L&W reacted with considerable enthusiasm and are studying the details as a basis for further discussion. We have indicated the urgency of the task and the need to take maximum advantage of the information and design concepts we have already developed. We have further stated that the initial moisture correlations should be industry aggregate values; however, the software should be developed in EPROM (Erasable Programmable Read Only Memory). An EPROM cannot be changed by the local mill but it could be returned to or traded to the vendor for a new EPROM based on local mill data.

Dr. Christer Fellers of STFI will be at the IPC on June 11 for detailed discussion of this issue. A firm decision from L&W should be reached shortly, but probably not by June 23.