

National standards of Turkiye improves with 4x500Kg Mass Comparator Magazine



__Customer__



The customer is UME (National Metrology Institute of Turkiye). They are a Research and Development Institute working under the umbrella of TÜBİTAK (Turkish Scientific and Technological Research Institution). They are located in Kocaeli / TURKIYE. Their main purpose is to approve all measurement made in Turkiye and to assure all

these measurement are comparable internationally; improve new and existent measurement techniques to ensure the fidelity of all industrial and commercial measurements. For that, they create National Metrology System for increasing the quality of Turkish products and to help improvement of Turkish scientific and technological infrastructure. They create and preserve Turkish Measuring Reference Standards and they assure International Measurement System Traceability.

They wanted a magazine capable of making 3 calibrations of 500Kg masses at the same time. This machine should also be used for verification of masses between 100Kg-500Kg according to the standard OIML R-111.

There was no standard production of this kind of machinery with such capacity neither in UME nor in the World. They created a project with World Bank Credit and they searched for a technologically capable company in Turkiye. Maysistem was having a good reputation in UME so they choose Maysistem as a contractor. We decided to make the whole machine with a collaboration of a machine company.

__Project__



This project was very important because the machine would be used for calibration and correction of masses of national sub laboratories.

The machine and related calibration software should be capable of doing three calibrations at the same time. UME also asked computer calibration software to make full automatic calibrations. The loading and positioning speeds of the masses should be controlled so that the masses would not have sudden shocks or frictions and they would be protected. Noise and heat spread of the system should be at minimum level.



First challenge for this configuration was the fragility of the standard masses. They were national standards and they had to be handled with extreme care. Top platform had to be slow enough to protect masses but fast enough to make three calibrations quickly.

Second and the most critical challenge were positioning. Total weight of the top platform was calculated as 4.5 tons (2 tons from 4*500Kg weights and 2.5 tons from the weight of the main platform). This platform has to be positioned on the high precision scale with a ± 500 micron ($1/2$ of a millimeter) error. 4.5

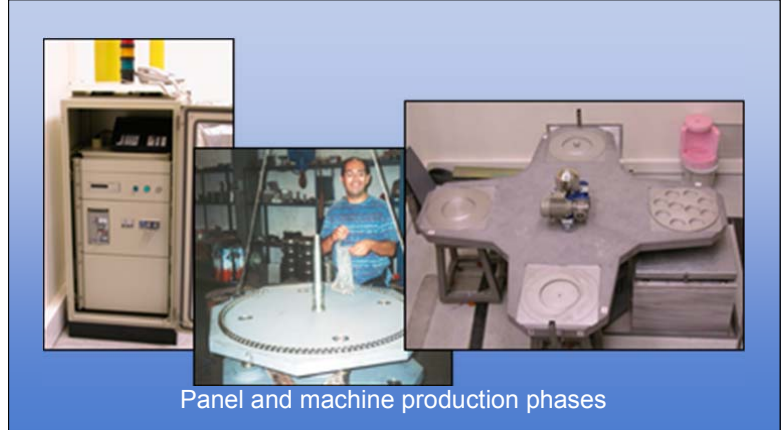
tons platform should start turning and stop slowly at the correct position.

Solution



Doing three calibrations at the same time made the software more complex. We worked with UME to write the calibration and calculation methodology and this information were transferred to the software. We decided to create an automation system sitting on the machine and on the computer at the same time. The computer software was communicating with high precision scale to read the weight of currently loaded mass and was recording them. Also it was controlling online, all sensors and motors through Schneider PLC (Programmable Logic Controller) and Motor Controllers. It was using an AI (Artificial Intelligence) for positioning the platform. If there was an error of positioning, it was trying another algorithm to stop at the right place. It learns the curve of the machine in time and adjusts itself accordingly to ensure long term stability. Also AI controls all measured series. It possesses all calibration routines and according to the standard chosen, it gets all necessary measurement series, it decides if there is a measurement error and repeats the calibration automatically if necessary and creates printed "National Calibration Certificate". The full long calibration takes 33 hours without human interaction.

It was used industrial standard equipments as Schneider's PLC and sensors as IFM lasers to provide high accurate controls. Also humidity and temperature of the laboratory were measured and used to have compensated their effect to the calibration.



It took 8 months from July 2002 to February 2003 to create the software and firmware working together flawlessly. Mechanical part of this machine was also challenging because of the structure of the top platform. This 2.5 tons platform was processed as monoblock.

Conclusion



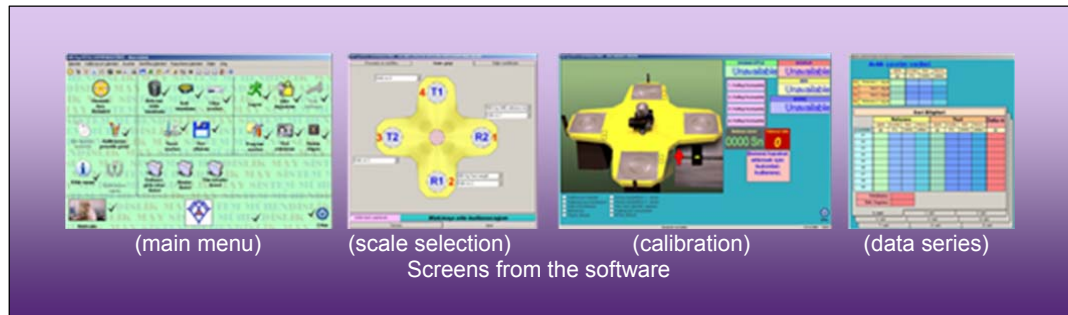
With this machinery working since 2003, UME is doing all 100Kg-200Kg and 500Kg calibrations with this machine. After one year, specialists from Hellenic Institute of Metrology - EIM/Greece came to see the performance of the machine.

The project in completed with minimum range of profit because of its national identity and reference value. It can be found the results of "intercomparisons" of 500Kg machines from the internet.

You may also find from the link below, an article explaining the ability of mass laboratory in UME:

http://www.mmo.org.tr/resimler/dosya_ekler/bb149ef71276209_ek.pdf?dergi=950

Result



MAY SİSTEM MÜHENDİSLİK San. Tic. Ltd. Şti.

Sahrayıcedit Mah. Orta So. No:32/14 Kadıköy / İSTANBUL / TURKIYE
(+90 216) 358 70 95 / (+90 216) 368 54 35
bilgi@maysistem.com - <http://www.maysistem.com>

All rights reserved
Document ID : MaySS.2003-1