IKT

INTERNATIONAL
KNOW-HOW TRANSFER
AND TRADING

MAS

IKT Measurement Analysis Service
(Micro Balance Environment)

used for the

financial and technical risk reduction in weighing projects
chambers and/or rooms, (USD 100 – 500,000 project volume)

by early analyzing the unpredictable but measurable
fatal local vibrational and other perturbations

in the
automotive, chemical and other industrial R&D and production

The sensitive heart of any project is the ultra micro balance
(accuracy about 1 µg, left inside the chamber).

The MAS contains the complete measurement equipment for analyzing fatal and other failure contributions in order to comply with specifications and regulations (e.g. US EPA, EU Stage V, for particulate matter filter weighing.).

The picture shows

- **Dr.sc.nat.ETH Ernst Joerin, Winterthur/Zurich, with the full measurement equipment for**
- **the analysis of dangerous vibrational perturbations (VWE), red sensors on the floor**
- **the analysis of all critical systems specs to be re-checked or certified (CCM), e.g. temperature, humidity, air flow, cleanliness, electro-static discharge, with special balance accuracy/perturbation analysis (Mettler Toledo UMX5)**
- **for harsh testing and production environment**

Joint Global Measurement Experience

First Step : The VWE Analysis

(VWE = Vibrational Weighing Environment)

The main clients` interest

is precision weighing at the top accuracy level of about **1 micro gram (1µg).** This is usually done with either Mettler Toledo or Sartorius "Ultra Micro Balances", which typically have a read-out accuracy of 0.1 µg, a reference repeatability of 0.25 µg and a sample weighing accuracy of about 0.5 µg – under nearly *ideal conditions***.** **"**Ideal" means practically no perturbations from all kinds of failure contributions such as vibrations, temperature and humidity influences, pressure changes, electrostatic, draft, drift and other factors which affect a specific sample weighing operation.

For this purpose

the client usually defines a **"weighing chamber"** or **"weighing room project".** The environmentally controlled climate inside the chamber or room should create the "*best real conditions*" around the micro balance, at least according to regulatory or other experimental conditions required to make reliable and accurate weighings. The weighing operation should be optimally placed in a total process. In the Automotive Industry with Diesel engine emission test requirements the chamber or room is usually a sub-project of a total "Automotive Test System", as supplied e.g. by AVL or HORIBA.

The client`s first need is

- **to decide on the right place** in the factory or laboratory building, before making any too detailed and expensive concepts
- **to reduce thereby the considerable financial risk** of such projects (USD 100 – 500`000.--) (e.g. to have an excellent micro balance and room, but no accuracy finally)

The vibrational perturbation problem

Although most senior production engineers and scientists do have quite a good experience and **feeling** for such suitable sites of a micro balance, the **facts and numbers** related to the actually occurring vibrational perturbations as a function of a 24 hours typical working day are not easy to get.
Furthermore, a specific micro balance does not feel a certain mechanical perturbation always in the same manner. E.g. the x-y horizontal perturbations affect the weighing result generally much worse than the z-vertical perturbations. The reliable experimental check of both these factors require quite expensive measurement and analysis tools as well as experience and time.

The IKT Measurement Service 1 : VWE Analysis with direct plus indirect perturbation check

- IKT offers to the clients the VWE Analysis with the chronological **double check method** . In addition to the classical (standard) accelerometer based vibrational **direct perturbation measurement** the micro balance accuracy is observed **at the same time (indirect perturbation measurement).** The direct measurements give usually quite good indications for the origin and type of perturbations (frequency, amplitude), the indirect measurements, however, give the finally decisive balance accuracy indication at a certain site – and therefore a strongly reliable prediction of the investment success chance.
- **The analysis takes 36 hours.**
- In case where a certain planned site can be made suitable by a specific concrete or other foundation construction IKT makes the basic **geo-technical proposal** which is usually realized by the client`s well established (special) local construction partner.

IKT Expert Partners :

Mettler Toledo (Greifensee, CH) with the UMX5 ultra micro balance support, **Dr. U. Joerin Geo-Technical Analysis (Zurich,CH)** and **Dr. A. Ziegler Consultants (Zurich, CH)** with the direct vibration measurement interpretation (SYSCOM MS2003 sensor system) and geo-technical construction practical experience.

The picture shows :

- the white Mettler Toledo UMX5 under the air draft (lamp) shield on a massive granite table inside the chamber, with the red direct vibration sensors on the floor in front of the chamber (for the **VWE**)

- the Schiltknecht Airflow ThermoAir3 sensor close above the MT UMX5 cell, the black CIMET clean air tube sensor inside back, and the silver control box in front, the yellow tube cap right to the draft shield for the Novasina pressure gage, the polonium device and other particulate matter equipment (for the **CCM**)

Second Step : The CCM Analysis

(CCM = Chamber Characteristics Measurement)

The client`s second need is :

- **to measure all of the specified experimental conditions of a chamber/room**
- **to recalibrate important sensors or subsystems (e.g. T-, RH- and air flow Sensors)**
- **maybe to certify a total chamber or room system (e.g. if partly "home-made")**

The "complete service" problem

Although there are many well established special components suppliers (including calibration) there are only few measurement service suppliers with the complete set of test equipment , which do have also a system manufacture experience and can interpret minor deviations in relation to the relevant technical source for that (e.g. in the air conditioning system). This is including the VWE competence. Most of the clients do not have the complete measurement set for checking all the parameters permanently.

The IKT Measurement Service 2 : CCM Analysis with Complete System Performance Check

- IKT offers to any clients the CCM Analysis **for the specific total chamber or room system** (in close cooperation with the client`s senior engineers and scientists) upon specific request.
- In case of the need for a certification this is offered together with a leading EU clean room certifier (usually CAS AG Clean Air Service, Wattwil, Switzerland).

IKT Expert Partners : (in addition to the VWE Analysis)
CAS AG Clean Air Services (CH), **Vaisala** (SF;D), **Schiltknecht AG** (CH), **Novasina AG** (CH), **ZHW** Zurich University of Applied Science (CH) among other air conditioning partners from EU/USA.

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