

# History

Since our inception, m+p international has continuously developed successful products and realized countless projects globally. From our roots at the University of Hannover, we began with a handful of employees and have grown to become a trusted supplier to renowned companies worldwide with established subsidiaries and representatives in more than 30 countries. We are very proud of the major milestones that have marked our journey to ongoing success.

## 1980



Our story begins in November 1980: Prof. Dr. Dr. E. h. mult. Dr. h. c. mult. Oskar Mahrenholtz, then the head of the Institute of Mechanics at the University of Hannover, and his employees Dr. -Ing. Burkhard Grabowski and Dr.-Ing. Walter Klie rent office space in the Sprengel site in Hannover and found MAHRENHOLTZ + PARTNER Ingenieurgesellschaft.

The first orders received are for consulting and calculation tasks in machine dynamics and structural strength.

## 1982



We begin a relationship with Hewlett-Packard in Hannover, which at that time has offices all over Germany. This results in a cooperation between the two companies as MAHRENHOLTZ + PARTNER Ingenieurgesellschaft becomes a sales and technology partner (Channel Partner) for Hewlett-Packard. Increasingly, our activities shift towards measurement and data processing.

# 1983



Our company has been carrying out numerous demanding customer projects since 1983, in which we have repeatedly demonstrated our engineering know-how. From the early years, these include a generator test rig as well as calibration laboratory programs for Volkswagen, a test rig for quality assurance in cylinder-head gasket production for Klinger, a control system for the calibration gas laboratory of Daimler, and a simulation program for calculating injection processes for L'Orange (all situated in Germany).

# 1986



The number of employees continues to grow. To provide further office space for company expansion, MAHRENHOLTZ + PARTNER Ingenieurgesellschaft moves to Freundallee 17 in Hannover.

A major milestone for our company is the development of the first vibration control system based on an HP 1000 real-time computer (RTE-A operating system) and Hewlett-Packard measurement hardware for Volkswagen. Follow-up orders are received from Messerschmidt-Bölkow-Blohm (MBB) and Audi.

# 1988



MAHRENHOLTZ + PARTNER constructs a lamp test rig combining photometric and vibration tests. After some more recent modernization, it is still in operation today, which is a true testament to the fact that our technology is built to last! Customer: Volkswagen in Wolfsburg.

# 1989

## High performance measurement and analysis system

The construction of our vibration test table is a complex, digital vibration control and analysis system, the vcp 9000, developed by Mahrenholtz + Partner (m+p). This system is built around the HP 9000 environment hardware, with vcp 9000 software running on an HP 9000 Series graphical workstation (see figure 1).

For data acquisition and signal conditioning, the HP 2000 Board and is equipped with a signal processor module, 32 input A/D channels with 12.5 MHz frequency range and 72 dB dynamic range, and a programmable I/O output module with 30 bit resolution. The provided power bus into the HP 2000 hardware provides very high performance vibration control with fast reaction times because it handles all vibration control functions, including about shakedown and tracking.

A fast control loop is an absolute necessity for the types of tests we run. Without this intelligent fast loop, we would've been forced to transfer operations to the host computer, and performance would've been unacceptable. Not only that, the measurement hardware specific capabilities, in-line processing, is done on the computer for other tasks we want to run simultaneously (such as analyzing test data).

## Figure 2

The vcp 9000 software controls the test table and provides a high level of control and analysis.



The HP workstation runs the UNIX operating system with the 5.0.3 version of HP's HP-UX. The test table is fully integrated in 5.0.3 software, the system is much simpler to operate than previous vibration control systems. The graphical user interface makes it easy to display signals of interest, including any number of active measurement channels, the control status, and the output signal sent to the object.

## Taking vibration control to the next level

One of our separate in-situ shakedown of the entire machine was to go beyond traditional vibration

control capabilities. We wanted to analyze measurement data in a variety of different ways. As a result, the vcp 9000 provides comprehensive analysis functions, including PSD, sine and cross-correlations, transfer functions, and waterfall displays.

In terms of setting vibration limits, traditional vibration control systems allowed the user to define only a single amplitude level inside a specified part of the frequency band. In contrast, the vcp 9000 system lets us define up to 50 different limit levels for each of the 32 channels. We can even define slopes inside each of the 32 bands, not just fixed levels, providing unparalleled ability to shape the control signal to the customer's specific needs. This greatly expanded shaping ability is representative of the flexibility the system offers (see figure 3).

Safety and data integrity are also paramount concerns in vibration control. Innovative self-checking features reduce the risk of equipment damage or excessive wear.

All measured signals are checked for plausibility, and the system will alert the operator's attention in key locations that sense increments. The self-check also monitors the control loop and measures system gain, displaying the results in a separate window for the operator's reference.

Monitoring the resonance frequencies is another step we take to keep the control within safe operational limits.

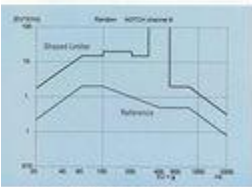


Figure 3 Advanced self-checking features reduce the risk of equipment damage or excessive wear.

Driven by our ongoing success, we develop a 2nd generation vibration control system: the VCP 9000 based on the HP 3565S Paragon and HP 9000 workstation with UNIX operating system. Pilot customer is MBB (now Airbus Defence & Space). The 48-channel VCP 9000 offers notching in sine and random mode. Further test laboratories in the Munich area follow soon thereafter: IABG, Bayern-Chemie, Siemens. One of our first vibration control systems is also operated in the ZARM Drop Tower in Bremen.

# 1992

Our pioneering developments in vibration testing laid the foundations for our next major step: In 1992 we establish m+p international GmbH, Hannover, and m+p international, inc., Verona, NJ/USA with the aim of marketing our vibration control systems worldwide.

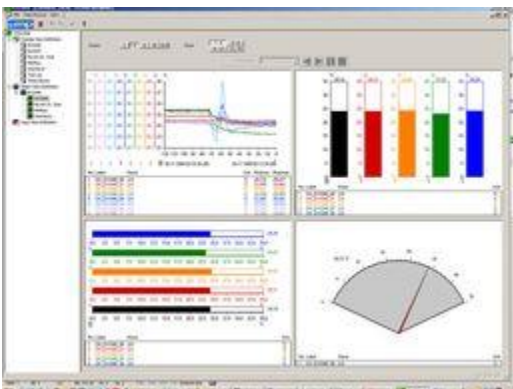
# 1993



Delivery of an m+p ACON conditioning system for activated carbon canisters, reducing vehicle exhaust emissions. Customer: Daimler. The first system under Windows NT™ goes to Porsche.

Even now, almost 30 years later, it is still state of the art thanks to further developments and adaptations to current standards.

# 1995



We take over the maintenance contracts for customers of UNIX-based CODA (Continuous Data Acquisition) acquisition software from Hewlett-Packard. Ten years later, we develop

our own m+p Coda software under Windows XP™ for pilot customer Isar 2 nuclear power plant.

# 1997



We launch the world's first vibration control system under Windows NT™, of which we are very proud.

Our next generation of vibration control systems supports measurement technology with VXI industry standard newly introduced by Hewlett-Packard. The VXI measurement hardware replaces the previous HP 3565S Paragon.

The first system for acoustic testing in reverberant chambers was sold to NASA JPL, California. We are the largest provider of acoustic control systems to NASA.

# 1999

In order to meet the growing number of enquiries from the UK, we found m+p international (UK) Ltd. in Farnham, England.

# 2000

MAHRENHOLTZ + PARTNER Ingenieurgesellschaft merges with m+p international Mess- and Rechnertechnik GmbH.

# 2001



We commence a partnership with M&M Corporation in Leuven/Belgium and take over the distribution and marketing of M&M Smart Office products worldwide. M&M Smart Office is the forerunner of the current m+p Analyzer vibration analysis software.

From the same year on, we offer the OR25 FFT analyzer from OROS as measurement hardware for our vibration control systems, thereby meeting the demand for smaller channel count systems.

# 2004

We found m+p international Sarl in Montesson as a further subsidiary, in order to push ahead with the targeted marketing of our systems in France and Spain.

# 2006



For Volkswagen Wolfsburg we develop a high-frequency test rig for determining the dynamic stiffness of elastomeric mounts in a frequency range of up to 2 kHz based on an



electro-dynamic shaker. Elastomer mounts are used in vehicles to reduce the transmission of noise and vibration from the engine and parts of the powertrain to the vehicle body.

Later, we go on to develop a high-frequency test rig with piezoelectric actuators in cooperation with the Institute for Dynamics and Vibration Research of the Leibniz University Hannover.

## 2007

With China established as a major global manufacturing center, the huge country becomes increasingly important for us. We establish a subsidiary in Beijing, the m+p international Representative Office, and add offices in other Chinese cities over the years.

## 2008



We launch our first own-brand measurement hardware: the m+p VibPilot with 4 and 8 channels. This compact measurement front-end proves to be a complete success, with laboratories worldwide utilizing the precision, real-time performance and reliability of m+p VibPilot.

## 2011



For multi-channel applications, we design the m+p VibRunner measurement hardware platform. It is ideally suited to the special requirements of dynamic testing, vibration control and monitoring with high channel numbers.

# 2012

We move headquarters to our current office building at Thurnithstraße 2.

# 2015



In a world first, we supply the industry's only high-frequency test rig with which automotive elastomer mounts can be dynamically tested at up to 3,000 Hz. The first rig is provided to the Fraunhofer LBF in Darmstadt. No other supplier is able to achieve this high frequency range.

Driven in particular by e-mobility, the test spectrum for determining dynamic stiffness - the key criterion - is changing towards ever higher frequencies.

# 2016



With the m+p Analyzer Revision 5.0, we launch the next generation of software for NVH applications. It replaces the previous analyzer and offers exceptional added value for the user, with many innovations and a massive increase in performance and data security.

# 2017





INDUS Holding AG, one of the leading investment companies for medium-sized enterprises, acquires a majority stake in m+p international. Until then, the founders and active employees were the sole shareholders.

The new m+p VibMobile hardware offers up to 64 channels of acquisition in a compact, self-contained chassis allowing for comprehensive measurement and analysis in the field.

## 2019



m+p VibControl turns 30 years old! Key test laboratories in numerous industries and major test houses worldwide continue to rely on our vibration control systems. NASA, for example, tests many of its missions with m+p VibControl.

## 2020



On January 1, Elke Baessler takes over management of the company from Dr.-Ing. Walter Klie, who has retired after almost 40 years. We look forward to continuing m+p

international's proud history of innovation and to serving the industry for many years to come.

In April our founder and long-time co-shareholder Professor Oskar Mahrenholtz passes away. We lose a valuable advisor and will honour his memory.