Industry 4.0: How Digitization can succeed in the materials testing laboratory

About the status quo of
Digitalization of test laboratories.

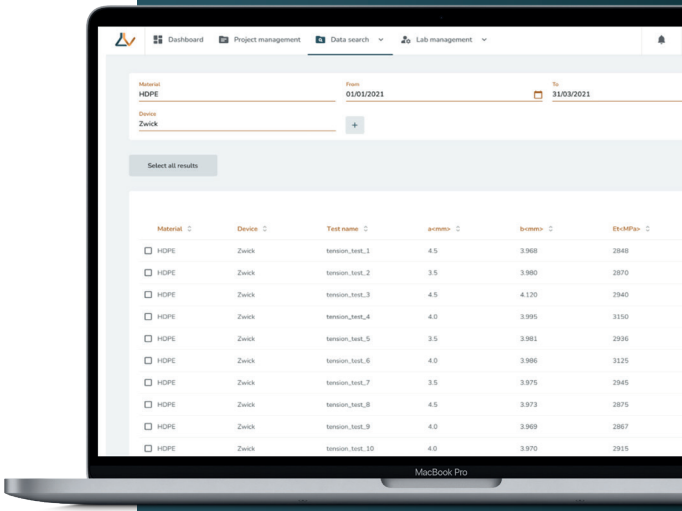

Table of Contents

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Laboratories should be intelligent and connected. But are they already?

About wish and reality of the digitalization of testing laboratories

The world of testing laboratories is changing. This means that the need and the desire for digitization have also arrived. However, the implementation of the paperless lab is still a lon way off in many cases. At least that is what the survey results of a study conducted by the INC Invention Center together with the Analyzing & Testing Business Unit of the NETZSCH Group suggest. What challenges do laboratories face? And can digitization solve them?

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Lab 4.0: What does that mean?

Lab 4.0 refers to the intelligent networking of machines and processes in the laboratory with the help of information and communication technology, i.e. software.

Usually, LIMS (Laboratory information management system) or QMS (Quality management system) are used for this purpose, but implementing such systems entails high investment costs and lenghty IT projects.

In a smart lab, ideally not only the lab devices are connected with each other, but the various systems and machines in the production or from other departments in the company should be part of the network. This allows, for example, machine data from real-time operation to be merged with laboratory data, correlated and results to be derived for material optimization.

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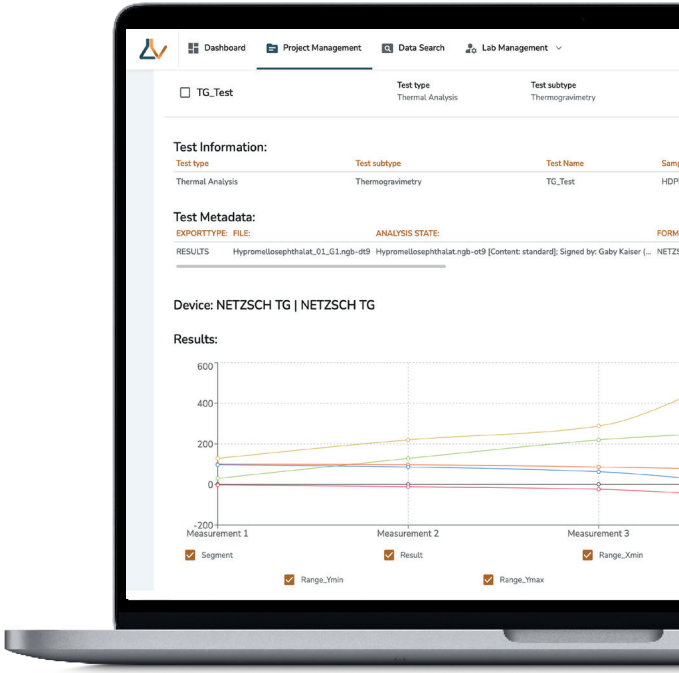
Such connectivity makes it possible to collaborate across departments and locations (even internationally) to make testing laboratories, quality and product development faster and more efficient.

Today, the smart lab is mostly more wish than reality

However, reality shows that the smart lab is more of a wish than actuality. A survey (1) of 64 testing laboratories from German-speaking countries paints the following picture:

- Over 50% of laboratories do not use professional laboratory software, such as LIMS or QMS.
- Instead, almost 30% work with Excel. The rest works with their own systems or on paper.
- More than 70% of lab instruments are not connected to any software and are not part of a network.



Testing laboratories shy away from high investment costs and time expenditure

Dr. Stefan Thomas, Executive Director INC Munich, was one of the study leaders and conducted qualitative interviews. He says:

„As reasons why the digitization of testing laboratories is progressing only slowly, small and medium-sized labs cited in particular the very high investment costs and the large amount of time that IT projects entail. Laboratories find it difficult to assess whether the investment costs of a LIMS or QMS are actually worthwhile. In addition, the implementation of such complex software requires a lot of time. Testing labs are already under time pressure. This is no reason why they often shy away from the introduction of a LIMS or QMS. Under the current conditions – a shortage of skilled workers and rising energy costs – the reluctance to make high investments is likely to intensify. Therefore, a web-based platform for documentation, data management and devices connectivity is more than ever an attractive alternative. LabV is such a platform, developed specifically for the needs of small and medium-sized companies."

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Challenges of testing laboratories

Testing labs are currently facing several challenges that could be overcome through end-to-end digitization.

Staff shortage

One oft he most pressing challenges for laboratories is the availability of skilled employees. Staff shortage has been one of the biggest hurdle for several years already, especially when it comes to preventing downtime of the lab equipment. (2)

The personnel problem is likely to become even more acute in the coming years when the baby boomer generation retires. Then there will not only be a lack of experts who will have to be replaced, but also long-standing laboratory knowledge will be lost.

This problem could be alleviated by a platform in whcih measured values, data and notes on laboratory measurements are documented. "LabV, for example, automates the documentation process and thus creates efficiency benefits of up tot en percent. This relieves the laboratory staff", says Dr. Stefan Thomas.

Knowledge management and historical data

Especially since not only retires take knowledge with them, but also employees who switch companies.

While it used to be the norm to stay with the same employer for life, today people are more likely to leave the company or take on a position outside the testing laboratory. Therefore, a functioning knowledge management is more important today than ever before. Even against the background of acute absences (illness, vacation, parental leave, trade faires, etc.), a knowledge database that all employees can access is relevant. If employees are absent, it is often difficult for the colleagues who take over to access the data because it is stored locally and in the logic of the respective person.

Dr. Thomas has an example of this from the practice of R&D labs: "Laboratories often receive development orders for new materials that have been already tested months or years ago. With LabV, they can access the data form these earlier measurements and save themselves having to carry our new testings. Here, LabV acts as the lab's material memory, which makes everyday work easier and speeds up the product development process."

Scattered data from different devices

Since most devices in many laboratories are not connected, the data is scattered in different systems. Sometimes measurement data is even recorded manually and stored on paper. Data must then be transferred, i.e. typed, for analysis purposes. It goes without saying that this is a major source of errors. Connecting all devices in the laboratory and collecting the data on a platform therefore helps to optimize lab processes.

In this context, many laboratories would like a software or platform to enable the following:

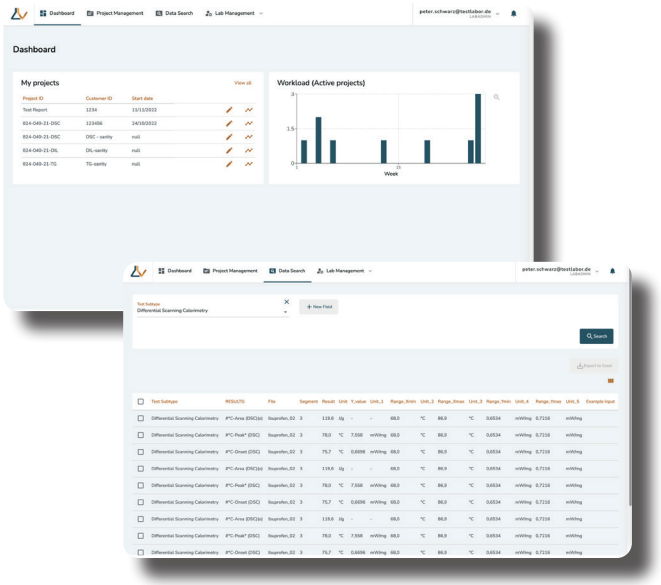
- Data exchange between devices
- Automatic message when tolerance limits are exceeded (3)

Data analysis

Intelligent data analysis is only feasible in connected laboratories where historical data can ba easily accessed. For this reason, many laboratories are unable to implement comprehensive analyses that would enable faster optimization or new product development. They simply lack the necessary database.

Here too, a data platform connected to all analyzing devices represents an opportunity for small and medium-sized companies to achieve their transformation to a Lab 4.0. As a practical example, Dr. Thomas cites the following situation:

"You want to compare regular measurements of a material over a period of several months in order to identify deviations, influences and trends. The data preparation, which must first be carried out in order to be able to run such an analysis, means considerable effort. But not with LabV, where all historical data is available in a clean, comparable and centrally documented form."



LabV® paves the way to digitalization for testing laboratories

LabV® is a data platform that was developed specifically based on the needs of testing laboratories.

The Software has all the relevant functions:

- Connecting all laboratory devices using a patented mapping engine.
- Project management: create customer and project specific testing processes to manage and leverage data from all measurements.
- Lab management: one-stop management of lab, users and templates.
- Data search: search and filter test results according to desired criteria in the entire database.

Advantages for small and medium-sized testing laboratories:

- All relevant functions
- Fast implementation thanks to a web-based infrastructure
- Significantly lower investment costs than LIMS or QMS
- Short training duration
- Individualizable

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Key facts of the study

- **64 laboratories in German-speaking countries**
- **Approx. 80% of which 100 to over 1,000 employees**
- **Online survey and individual telephone interviews**
- **Performed by INC Invention Center together with NETZSCH Group**
- **Survey period: Q4 2019**

About LabV® Intelligent Solution

LabV® Intelligent Solutions is a young IT company specializing in the development of software for data management and data analysis in testing laboratories

The LabV® software brings Industry 4.0 to your testing laboratory. By connecting all devices and systems, the web tool enables digital transformation. Data management and data analyses become smart and efficient. LabV is particularly suitable for small and medium-sized testing laboratories that want to drive digitalization quickly and cost-effectively.

Footnotes

1. INC Invention Center with the Business Unit Analyzing and Testing of the NETZSCH Group, presentation, page 3, 4
2. NC Invention Center with the Business Unit Analyzing and Testing of the NETZSCH Group, presentation, page 3
3. INC Invention Center with the Business Unit Analyzing and Testing of the NETZSCH Group, presentation, page 5, Fig.13