CMWTEC technologie GmbH

NEWS SPRING/SUMMER 2020

PRODUCT NEWS AND INFORMATION

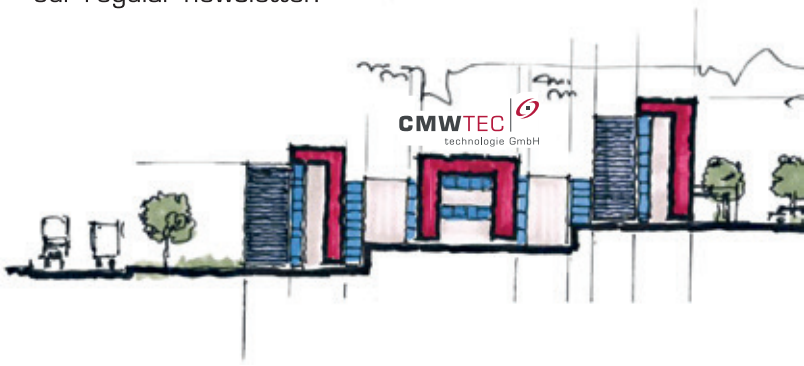
DEAR CUSTOMER AND INTERESTED PARTIES,

With this newsletter we would like to inform you about the further developments at **CMW**TEC and show you that despite the corona crisis and the associated restrictions, work on improving our products and researching new technologies continues with high intensity in addition to daily production.

The way we are dealing with the effects of the COVID-19 pandemic in our work with our customers and partners can be found in this newsletter.

One focus of this newsletter is to inform you about the research projects we are conducting with the support of friendly university institutes and companies. Our extended young team of engineers tries with high intensity and qualification to keep our products in the field of lead-acid batteries on a technically high level and to develop them further for the requirements of the future. It is also a declared goal of our company to offer high-quality test equipment and electrolyte infiltration equipment for the Li-ion battery industry and its suppliers. As you can see from the reports, all our activities are aimed in this direction and this should show you that we can be a competent partner for you in the further development of your production.

Finally, we would like to inform you that as a logical conclusion to all the above activities, we have acquired a 6000 square metre plot of land from the city of Limburg in the industrial estate at the ICE railway station. There we plan to expand by building a new production and two office buildings. You will find a sketch of ideas about this planned building directly after these remarks. We will also keep you up to date on this project, which is very important for the further development of our company, with our regular newsletter.



If you need further information, please contact us in whatever form. Come through this crisis period, which will certainly be a difficult one for everyone, and stay healthy.

I. Wipperfürth

Ingrid Wipperfürth
(Managing Director)

INNOVATION IS OUR ENGINE THAT DRIVES US

OVERVIEW OF ONGOING RESEARCH PROJECTS AT CMWTEC FOR OUR CUSTOMERS

SerEIS – IMPEDANCE TEST FOR THE BATTERY PRODUCTION PROCESS

Since 2017 CMWTEC has been conducting the research project SerEIS in cooperation with the Beuth University of Applied Sciences Berlin.

BEUTH HOCHSCHULE
FÜR TECHNIK
BERLIN
University of Applied Sciences

The topic and goal of the project is to develop a test algorithm based on the electrochemical impedance analysis (EIS-Electrochemical Impedance Spectrum), which allows to identify defective cells in a cell stack even if the cell stack is closed and thus no single cell voltage can be measured.

It is of particular importance that **CMW**TEC can offer a device that enables battery manufacturers to locate and document battery faults in the production process (i.e. not only in the laboratory) in an extremely short test time.

The project is gradually approaching the stage where first results are to be reported. The rather costly and also lengthy research work using electronic design, experiments and software development has now led to the creation of a prototype device (see below photo), with which extensive experiments can now be carried out to validate the test results and establish process reliability.

SerEIS Prototyp device

After the test phase, **CMW**TEC will then be able to offer excellent test procedures on its automatic test equipment together with the high-current test device E-Load, which is already being tested in practice. This will significantly improve the identification of manufacturing defects in the production process of cells and batteries and enable customers to increase the quality level of their products.

A further field for the application of this method is seen in testing after electrolyte infiltration of Li-ion pouch cells for optimal electrolyte distribution.

ELECTROLYTE INFILTRATION OF LI-ION POUCH CELLS

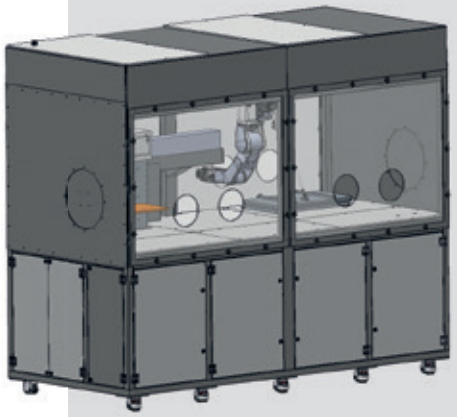
This is how synergy is created, the almost two-year development of the SerEIS test device will now be used in the current research project of the **electrolyte infiltration machine**, which we are developing for the PEM RWTH Aachen University.

PEM | RWTH AACHEN UNIVERSITY

The equipment is used for the electrolyte filling of new types of battery cells. In the spotlight are pouch cells and cylindrical lithium-ion batteries. Due to the special concept of the electrolyte filling system, it represents an important interface in the development process of battery cells.the manufacturer for safety reasons, not with electrolyte, but with water, the fact that infiltration with water is 35% shorter is important for the assessment of machine performance.

The unique selling point of this machine is an encapsulated process of industry-related battery cell prototypes and small series in a normal production environment. A clean room, which is normally required to produce lithium ion cells, is no longer necessary at this point. The equipment itself consists of a mini environment ME, which can be set up flexibly at all possible locations. This opens great potential, as the rapidly expanding battery industry can set up systems like the one described here quickly and at low cost to reduce development time. At the same time, costs can be significantly reduced by saving on clean room space and the high flexibility of the installation options.

The system consists of modular functional units. With this concept we offer our customers the possibility to upgrade the system according to their needs. The basic concept of the plant deals with the fully automated filling of pouch cells. These are **filled with electrolyte under a specially patented vacuum box** in a mini environment ME and then sealed. The cells are then fed by robot to the leakage test. In addition, the above mentioned SerEIS measurement takes place with the SerEIS test device developed in our company. All cells are numbered by laser engraving and scanned simultaneously. All data collected for each individual cell is stored in our database system. This way we always offer our customers the possibility to keep an overview of the production.



ACID EXCHANGER MACHINE

In the **currently conventional two-shot filling process**, the battery to be formed is filled with electrolyte of low acid density (approx. 1.1 g/ccm) and then formed. After formation, the battery's acid is dumped and then the battery is filled with acid of a density required for the application (1.28 - 1.30 g/ccm) to the final level.

Pilot installation

Our **new process the acid exchanger machine**. In this new development, electrolyte of low acid density is also filled and formed but is not dumped out afterwards. In stead, an electrolyte exchange is executed by filling in the acid with final density and simultaneously sucking out the formation acid. During this exchange process, automatic density measurement ensures that when the final density is reached, the process is terminated, and the final electrolyte level is reached.

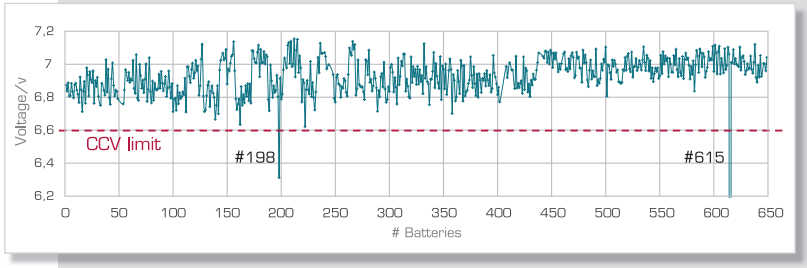
ADVANTAGE OF OUR NEW DEVELOPMENT

- no more dumping
- no acid disposal
- Clean battery boxes
- Acid level in the individual cells is already levelled
- less acid transfer to the following machines (acid levelling, washing machine, etc.)
- Less machines in a line (space saving, as there is no dumping machine)

END-OF-LINE TEST MACHINE (EOL)

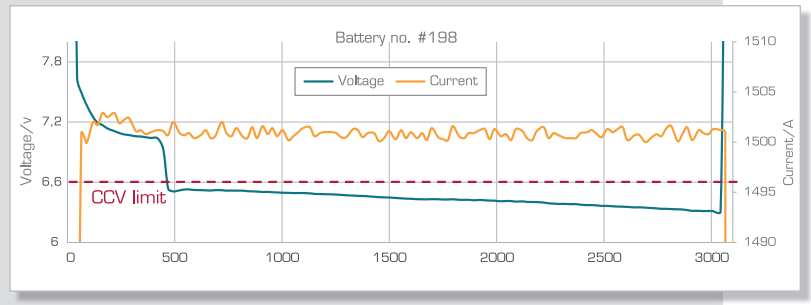
After commissioning and running our first **EOL** machines for two of our customers, we were able to collect a lot of real battery data from the production lines and examine each individual measurement on site. Thanks to the feature of **combining up to 5 test profiles at one test sequence** and the test data acquisition, every single produced battery can be tested like what can be done in high equipped laboratory within normal production rate. Beside the different profiles of high rate discharge, the machine can determine the AC impedance and DC internal resistance of the battery for deeper understanding the status of the battery and significant indicator for the quality. The combination and evaluation of these measurements all in one system allowed us to successfully detect the most common failure in the lead acid batteries right after the formation, more details about that will be published soon.

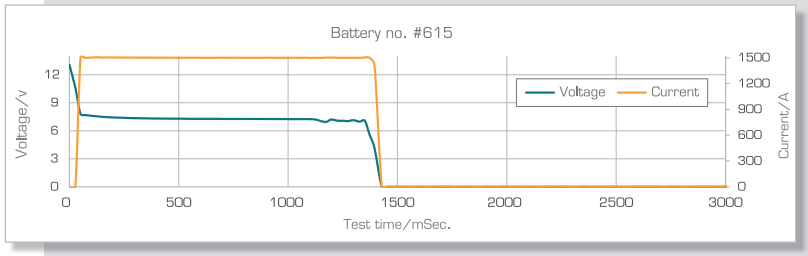
As a simple example, below are the measurements of the constant current voltage (CCV[1]) of 650 Batteries with an acceptance limit of 6,6 V.



As you see, 2 of the batteries are out of the CCV limit. That is what the conventional HRD machines can do. But with the new EOL, in addition to the internal resistance values, you can pick out the discharge curve of a specific battery with a high measurement frequency for analyse purposes. The graph below is for the first rejected battery #198. This battery has continued to supply current till the end of discharge period, even if the voltage went out of the range after ~ 0,5 seconds.

In opposite to that the second rejected battery #615 delivered a normal current for approx. 1,5 seconds and then the voltage drops till 0 volt. This behaviour is significantly different from the first rejected Battery #198. These two batteries can be used for further examination “e.g. tear down” to find out each fault reason.





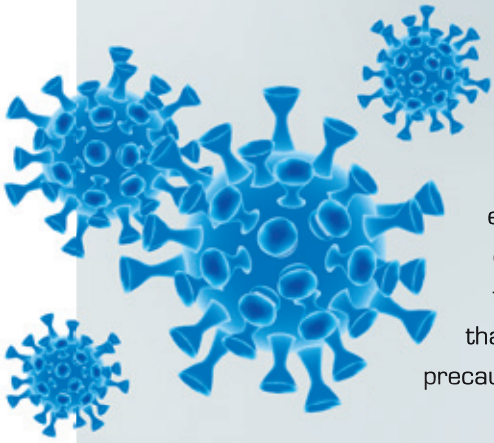
By comparing the other test measurement of this battery (ACR, DCR or DeltaV) all together with the voltage drop profile, you obtain much more data to find out the failure reason. In this way you can efficiently set and adjust your control limits, where the real failures could be.

[1] constant current voltage (CCV) is the voltage of the battery under load at the end of the discharge test.

CUSTOMER INFORMATION
COVID-19 PANDEMIC

The Coronavirus (COVID-19) pandemic is causing confusion and uncertainty across the globe. Businesses are attempting to deal with the outbreak by following World Health Organization (WHO) guidance on how to protect workers while continuing to operate normally and service their customers.

At **CMW**TEC, we have imposed a work-from-home policy in the office and a maximum presence of 4 people in the assembly workshop policy to limit the potential spread of infection. While we implement our business continuity processes, we want to assure you that we will continue to operate as before. You will continue to receive the exemplary levels of service that you come to expect from **CMW**TEC, and we will be leveraging all the technologies at our disposal to support you.



Our sympathy goes out to the people affected by this unforeseen event, and we appreciate the work of health professionals, local communities and governments around the world who are at the forefront of efforts to contain the coronavirus. Please be assured that we are following the COVID-19 situation closely and have taken precautions to ensure the work on our contracts and service delivery.

Our office and workshop is open and we continue with the assembly of the actual projects. You can reach us by phone and email to the contact details as usual so that we can support you if necessary.

We are aware that under these circumstances, travel is not the first priority for any of us at this time, but we want you to know that the safety of our employees and nevertheless being available for our customers is our top priority. We would like to thank you in advance for your confidence in **CMW**TEC in planning your future projects.

We hope that you, your family and colleagues in the company have not been affected personally and all doing well. Our commitment to you during this situation remains as strong as ever.

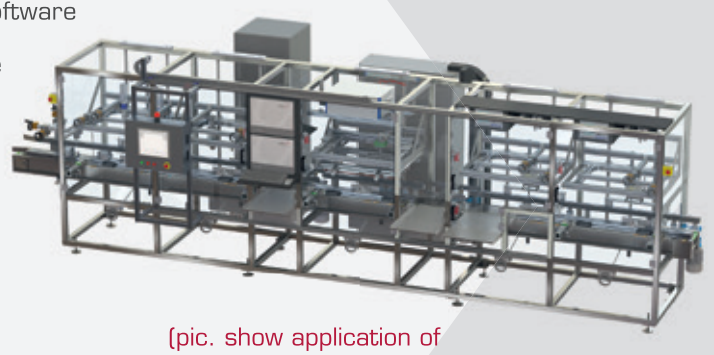
Thank you for your business and stay safe!

CMWTEC AT A GLANCE

MACHINE PRODUCT PORTFOLIO

AUTOMATIC AND FULLY AUTOMATIC MACHINES FOR SLI AND AGM AUTOMOTIVE CAR AND TRUCK BATTERIES

- Acid Filling Machine – Initial Filling, Leveling, Refilling (after Dumping), Filling and Sipping
- GEL Filling Machine
- Volumetric Filling Machine under Vacuum [VACBOX] (AGM/VRLA Spiral Batteries)
- Acid Level Control Machine
- Degassing Bottle Insertion Machine
- Dumping Machine
- Plug Insertion Machine
- Single Plugs/Charge-Eye Plugs
- Washing & Drying Machine
- Washing Machine
- High Voltage Leakage Test Machine
- End-Of-Line Tester Machine with integrated E-Load and Test Software
- High Rate Discharge Test Machine
- OCV Test Machine
- Air Leak Test Machine
- Post Brushing Machine
- Post Greasing Machine
- Anti-Static Spray Machine
- Pin Marking Machine
- Hot Stamp Marking Machine
- Laser Code Marking Machine
- Labeling Machine, - Bypass Labeling,
- Application Stamping, Print Labeling



(pic. show application of combination machine 5-in-1)

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