volytica diagnostics

Impact of Operational Profile
on Stresslevel, Cost-Per-Cycle & Value Retention

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Every battery must be used to its true potential.

volytica diagnostics

Who are we?

Our Solution

We crack abundant data that others discard, using our proprietary battery algorithms

BESS

HEAVY DUTY

LIGHT VEHICLES

Cloud Platform
vdx engine

Car Park Management

Solar Park Asset Management

Condition Monitoring/ SCADA System

Plant State

Grid KPIs

PV Performance

No Additional Hardware
No hardware necessary – we tap into existing fleet or condition monitoring systems

10+ years of R&D
More than 10 years or R&D went into a smooth and easy onboarding process without lab experiments

Fraunhofer *inside*

Technology Agnostic
Every typical Li-Ion battery is supported

Operation & Safety Management

Investigate & Resolve Issues

Value Retention & Stress Measures

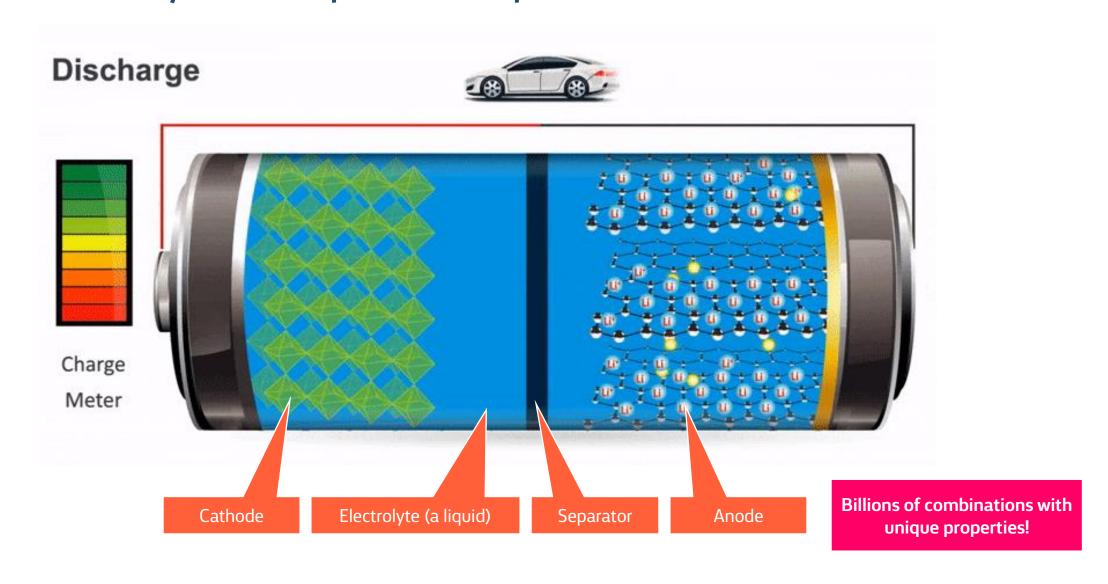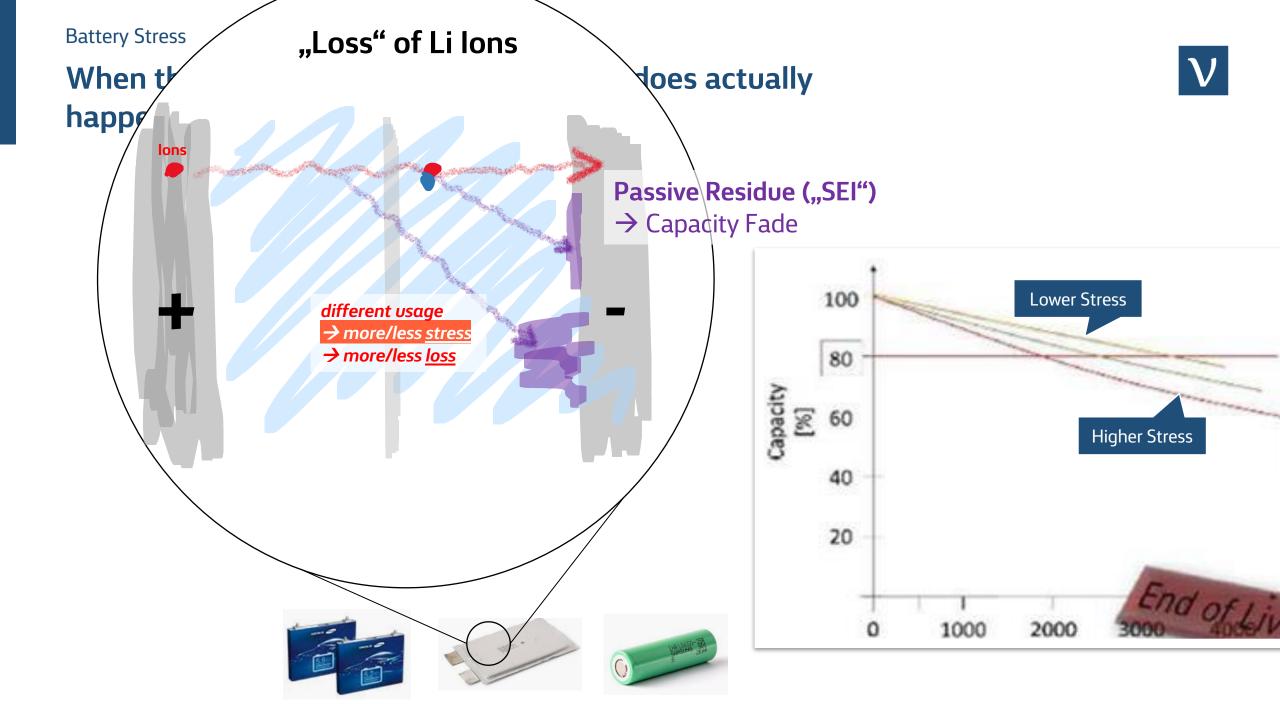# The *vdx sentry* is an automated battery expert, enabling you to efficiently manage larger and larger portfolios

Screenshot of the vdx sentry feature in the vdx asset cockpit dashboards

Battery Degradation

What is he talking about?

Li-Ion is not Li-Ion:
There are virtually billions of possible subspecies!

Discharge

Charge Meter

Cathode

Electrolyte (a liquid)

Separator

Anode

Billions of combinations with unique properties!

The "Jungle"

Every combination and every innovation comes with particular and peculiar strengths and weaknesses!

When th... ...does actually happe...

„Loss" of Li Ions

Ions

Passive Residue („SEI")
→ Capacity Fade

+

different usage
→ **more/less stress**
→ **more/less loss**

−

Lower Stress

Higher Stress

End of Liv...

Minor Changes can have Major Impact!

End of Life / EOL

"End of Warranty"/ EOW

window shifted

swing (always 60%)

10% - 70% (60% DOD)

20% - 80% (60% DOD)

30% - 90% (60% DOD)

90%

70%

10%

+180% Lifetime
by just shifting the window

-45% Cost-Per-Cycle
at <u>identical</u> cycle/ MWh throughput

Temperatur

Swing

Example: Lazy idling 💤

Batteries are made for working.
They keep degrading while idling.

Idle @ 50%

....

Idle @ full

Lower SOC can reduce battery ageing

Idle @ 80%

-3.5% / yr

-6 % / yr
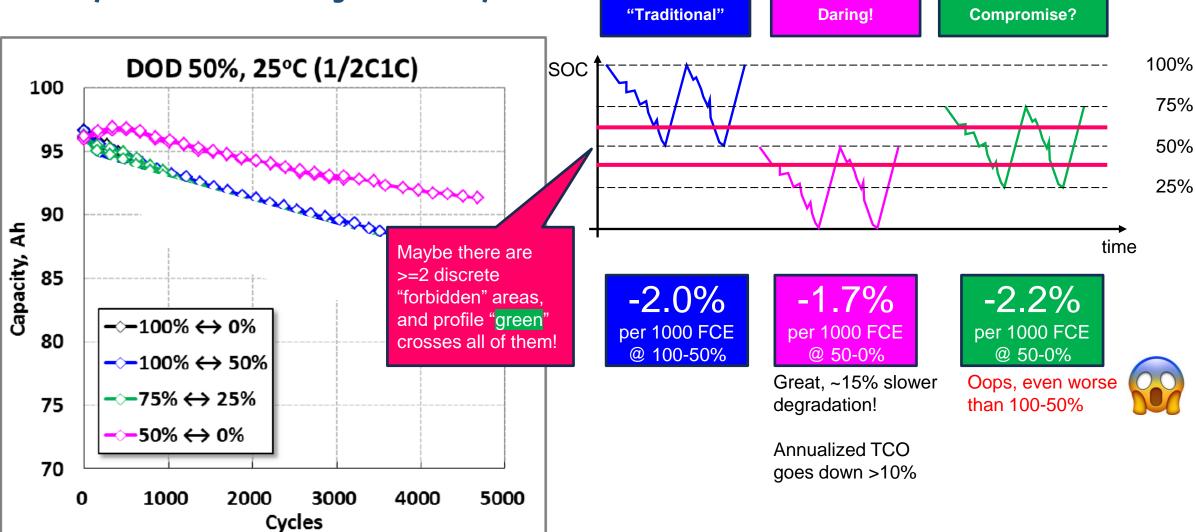
A. J. Warnecke, „Degradation Mechanisms in NMC-Based Lithium-Ion Batteries", Dissertation, RWTH Aachen University, 2017

Brief Breakout:
Why does *SOC* damage a battery?

DOD 50%, 25°C (1/2C1C)

Legend:
- 100% ↔ 0%
- 100% ↔ 50%
- 75% ↔ 25%
- 50% ↔ 0%

Maybe there are >=2 discrete "forbidden" areas, and profile "green" crosses all of them!

"Traditional" | Daring! | Compromise?

SOC / time

100% / 75% / 50% / 25%

-2.0% per 1000 FCE @ 100-50%

-1.7% per 1000 FCE @ 50-0%

Great, ~15% slower degradation!

Annualized TCO goes down >10%

-2.2% per 1000 FCE @ 50-0%

Oops, even worse than 100-50% 😱

Impact on Business Models

And how to use it in our faor

volytica coined the "stresslevel":
How damaging (=costly) is the current operation?

vdx stresslevel © engine

SOC

90%

70%

10%

... and ...

- Temperature,
- Idle SOC,
- Charging Power,
- Discharging Power,
- ...

Calendric data

- Stressmap to compare prediction and true value
- Stressmap generated

Cyclic data

Remark :

- 6-dimensional problem
- Some variables must be left out for the representation.

Stresslevel

1.7
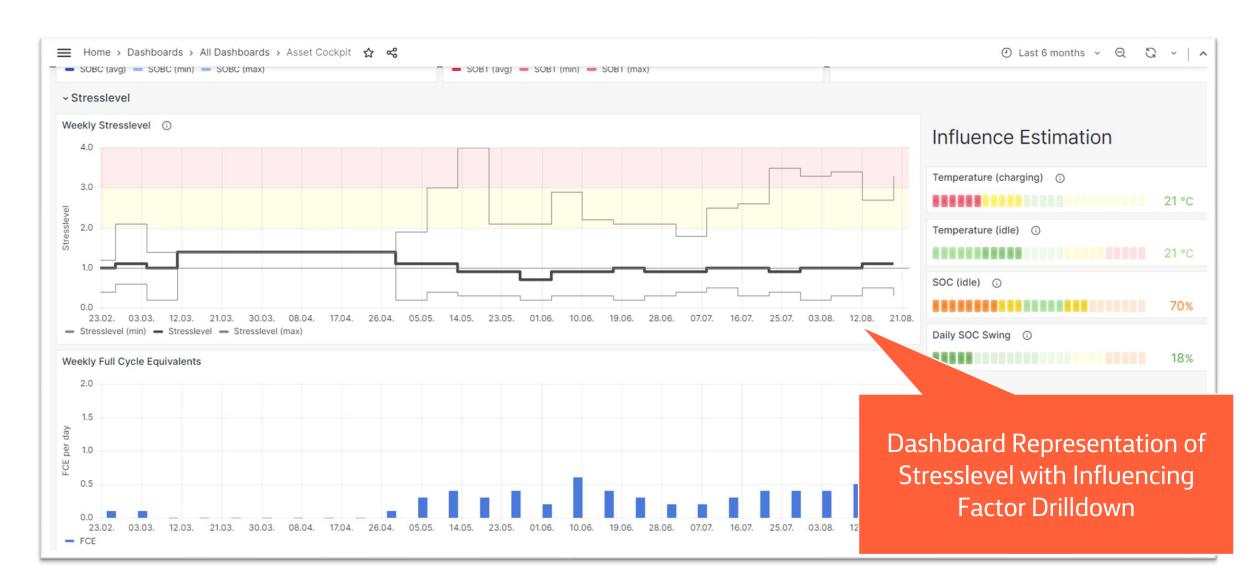
* Example

➔ **~70% faster degradation** than planned & designed

➔ **~70% higher costs-per-cycle** than planned

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How damaging (=costly) is the current operation?

Dashboard Representation of Stresslevel with Influencing Factor Drilldown

Thank you!

👉 **Get in Touch**

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