



Developing a *sensorless* dynocard

Simon Jagers

2023 International Sucker Rod Pumping Workshop
Aug 28-31, 2023. Midland TX



Introduction

- Samotics is a Dutch technology company, founded in '15
- Using artificial intelligence, we monitor the health & energy-efficiency of AC motors and rotating equipment
- Our mission is to help industrial companies to eliminate unplanned downtime and energy waste

100+

employees

120+

customers

20+

countries

5+

OEM
partnerships

Objectives

1

Produce an accurate dynocard...

2

...from current and voltage data only...

3

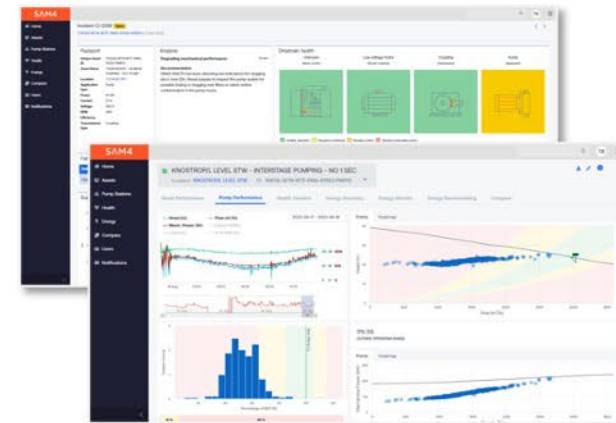
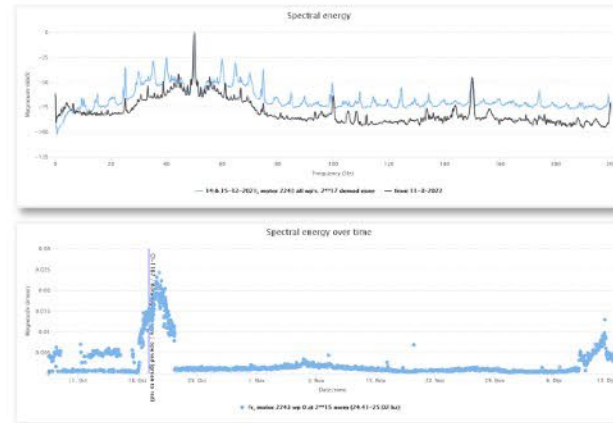
...to be integrated with control systems.

Electrical signature analysis

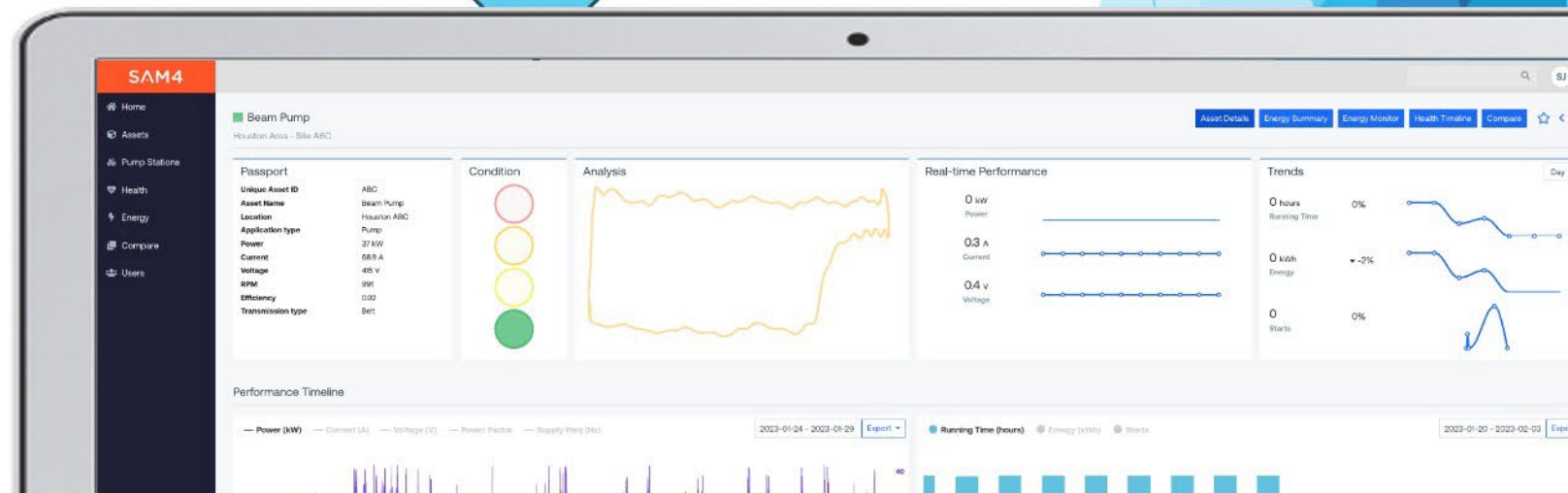
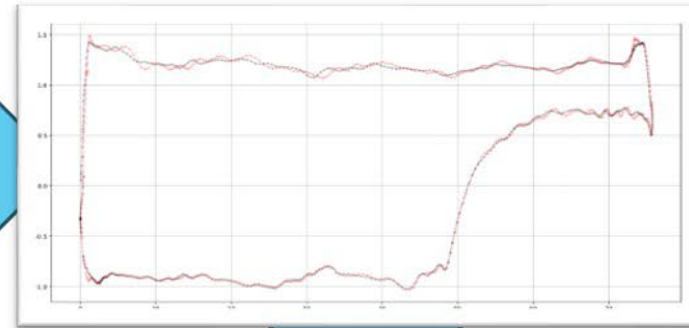
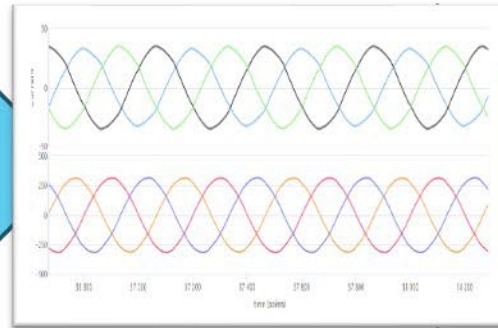
Data Acquisition

Data Analytics

Dashboard

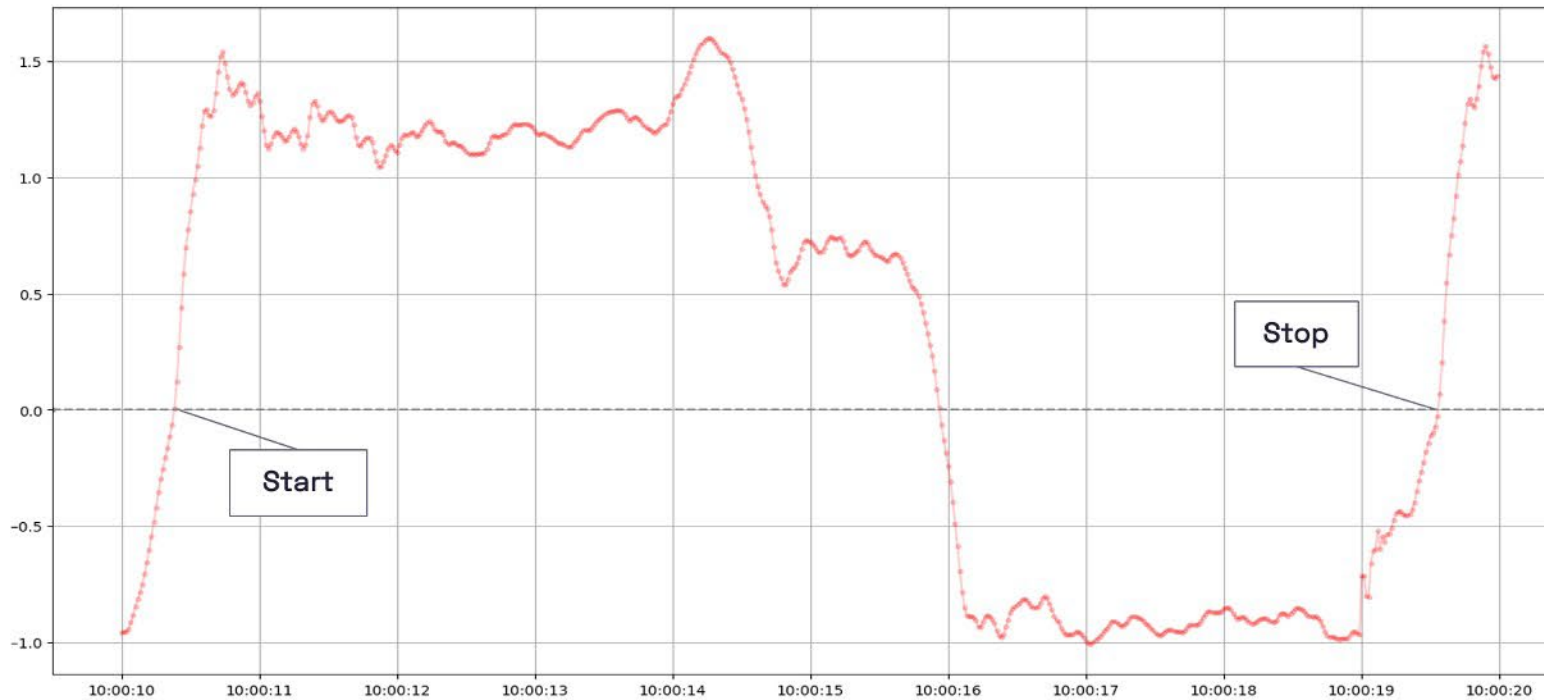


Data: use only current and voltage data



Methodology

Dynamometer: strain over time



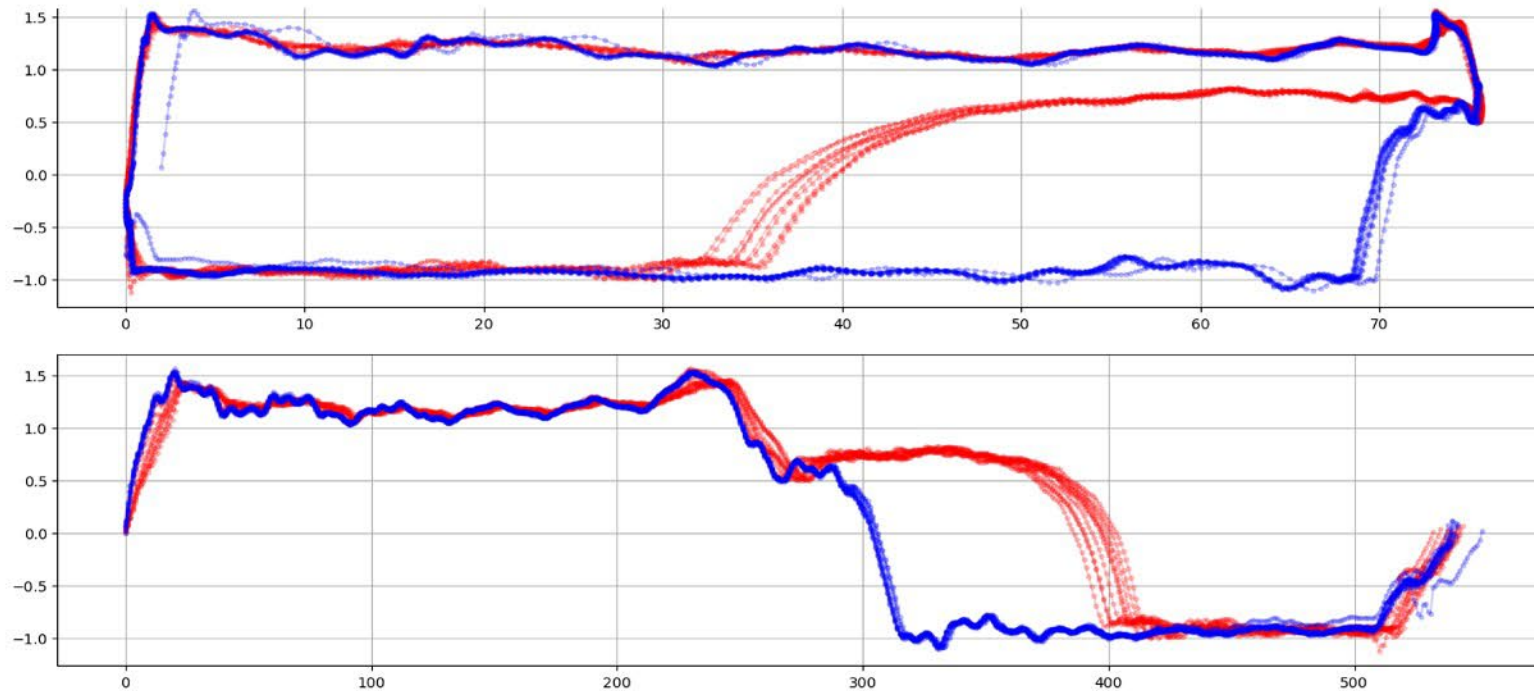
Methodology

SAM4 data: motor load over time



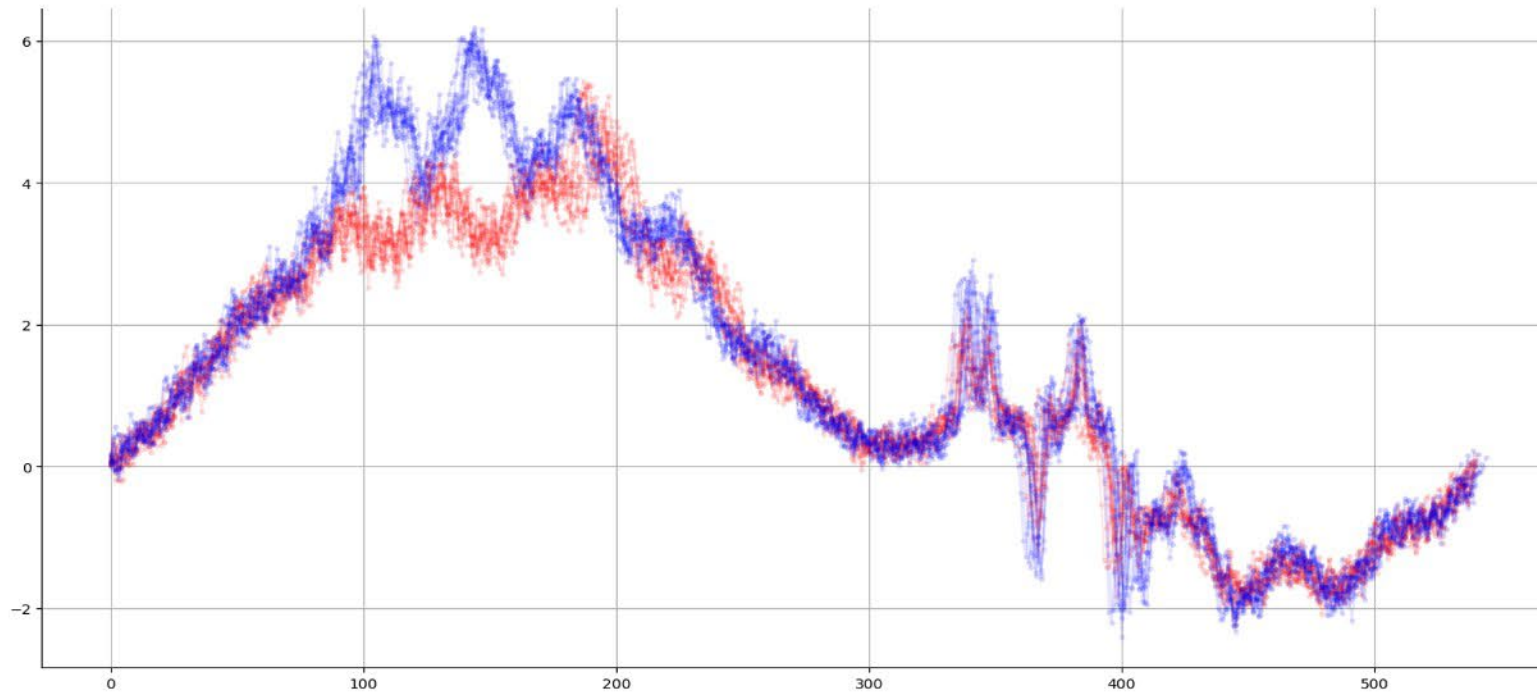
Methodology

Normal vs Excessive (dyno)



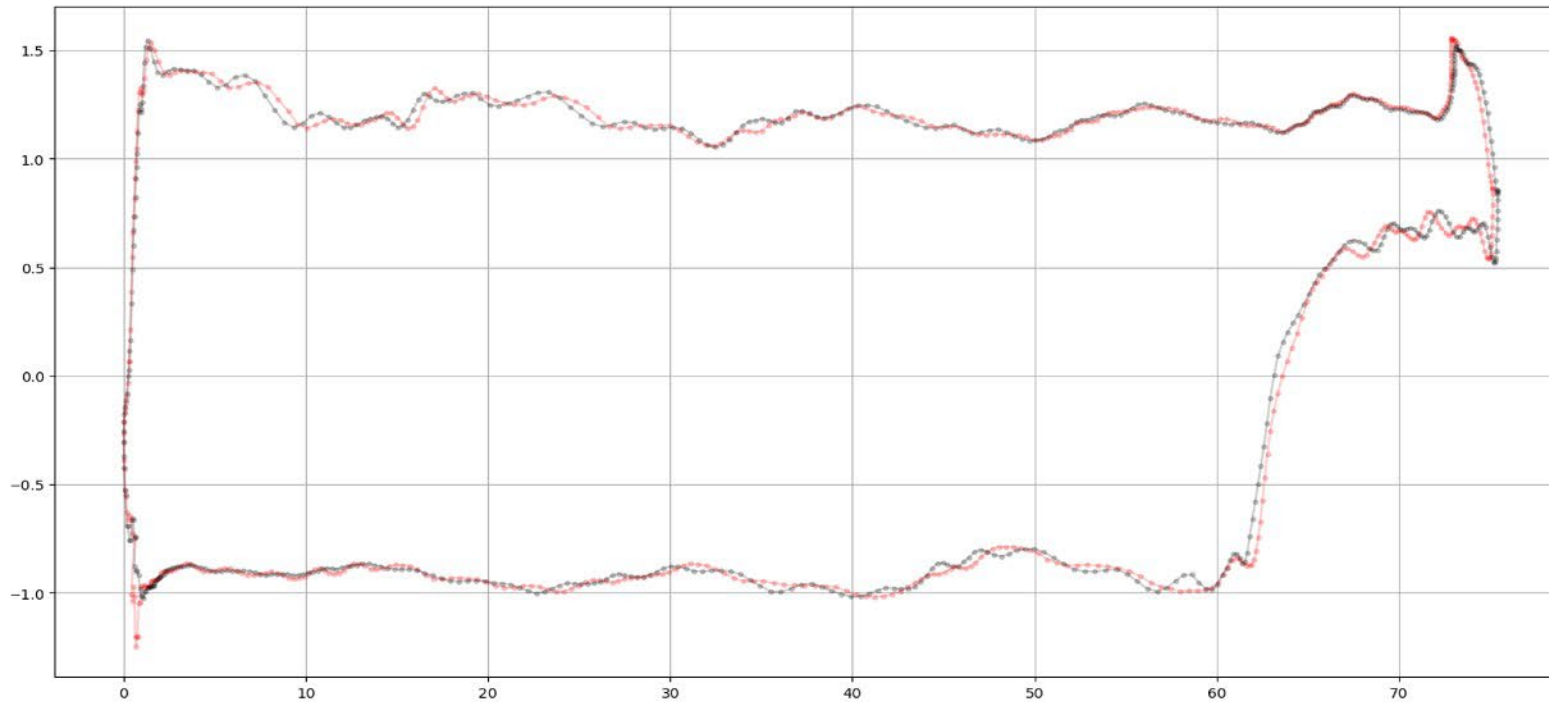
Methodology

Normal vs Excessive (SAM4)



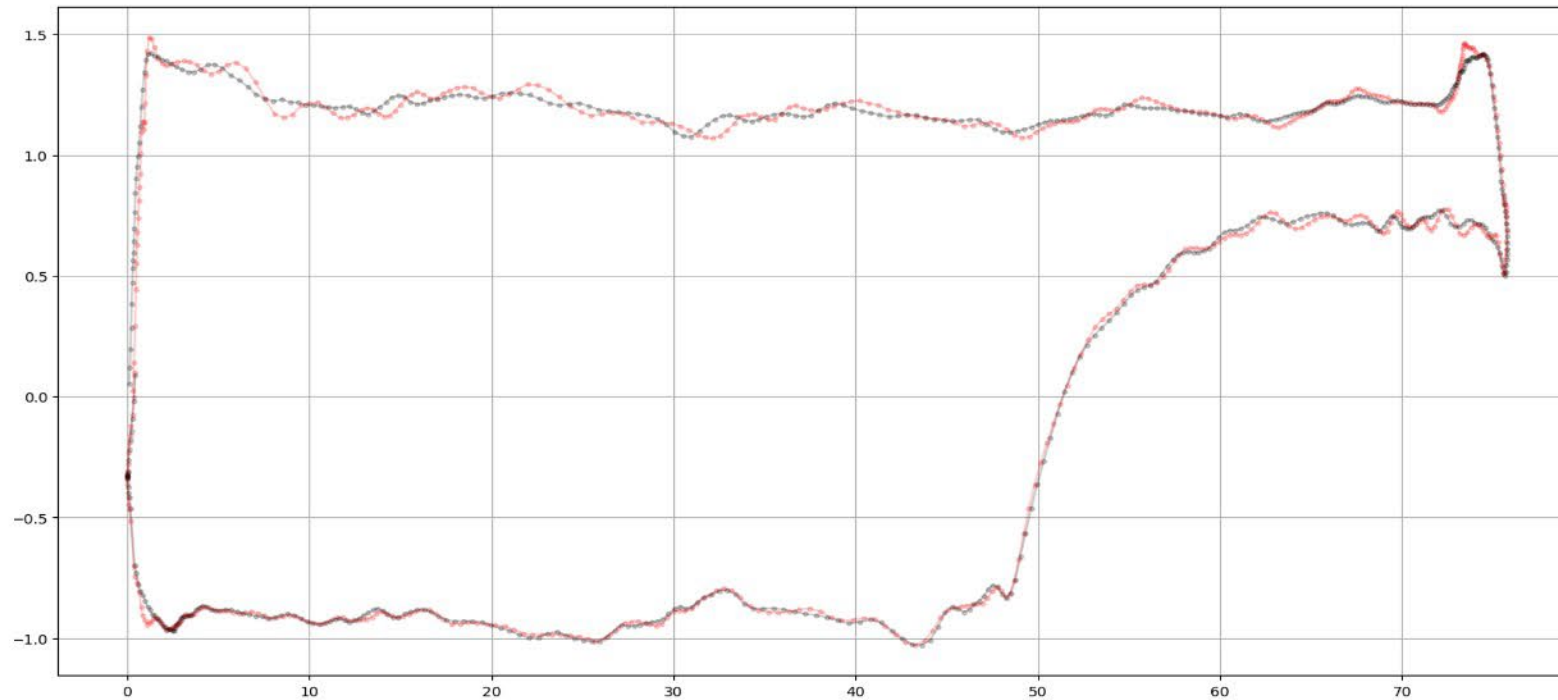
Results

Dyno vs SAM4



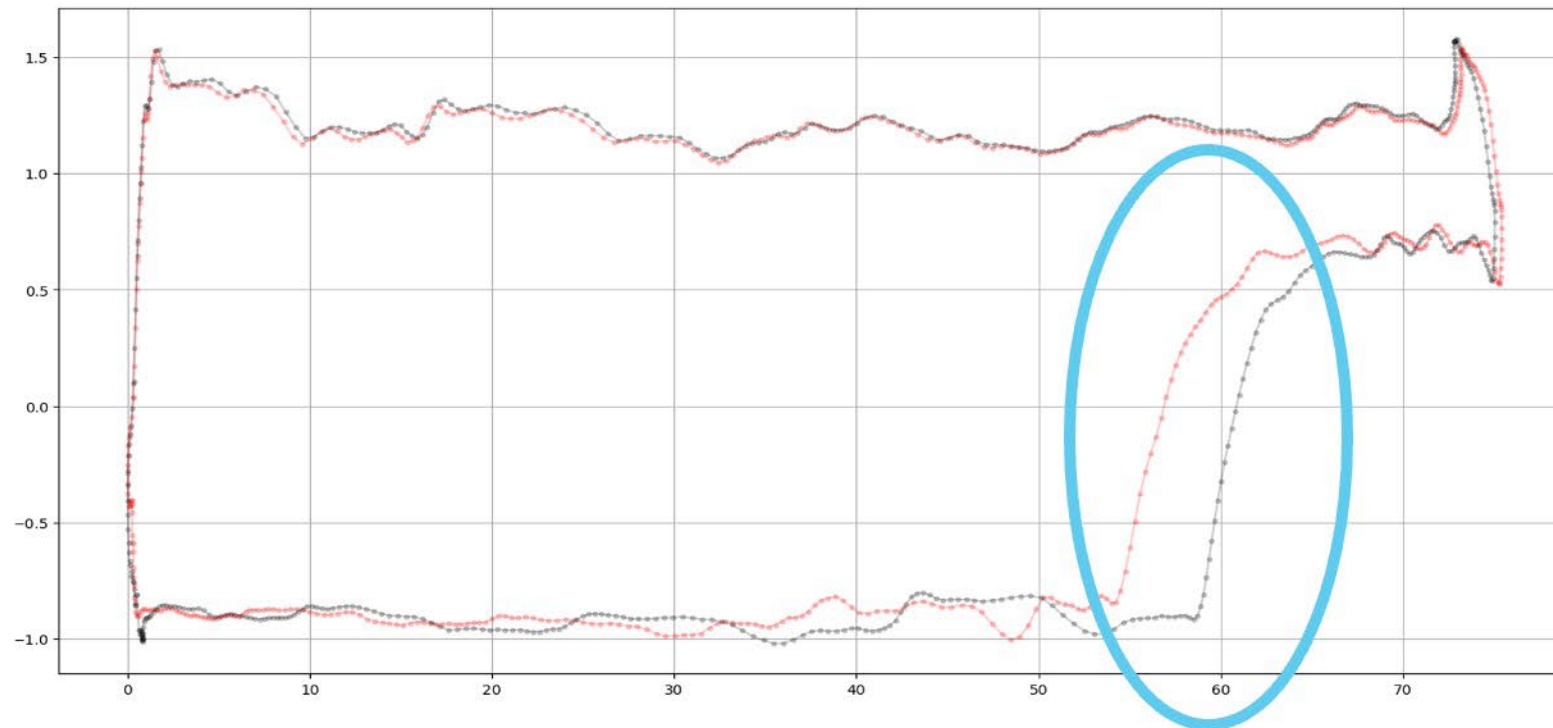
Results

Dyno vs SAM4



Results: error (1 in ~75)

Dyno vs SAM4



Conclusions

1

The “sensorless” pump performance card is highly accurate and can replace the load cell

2

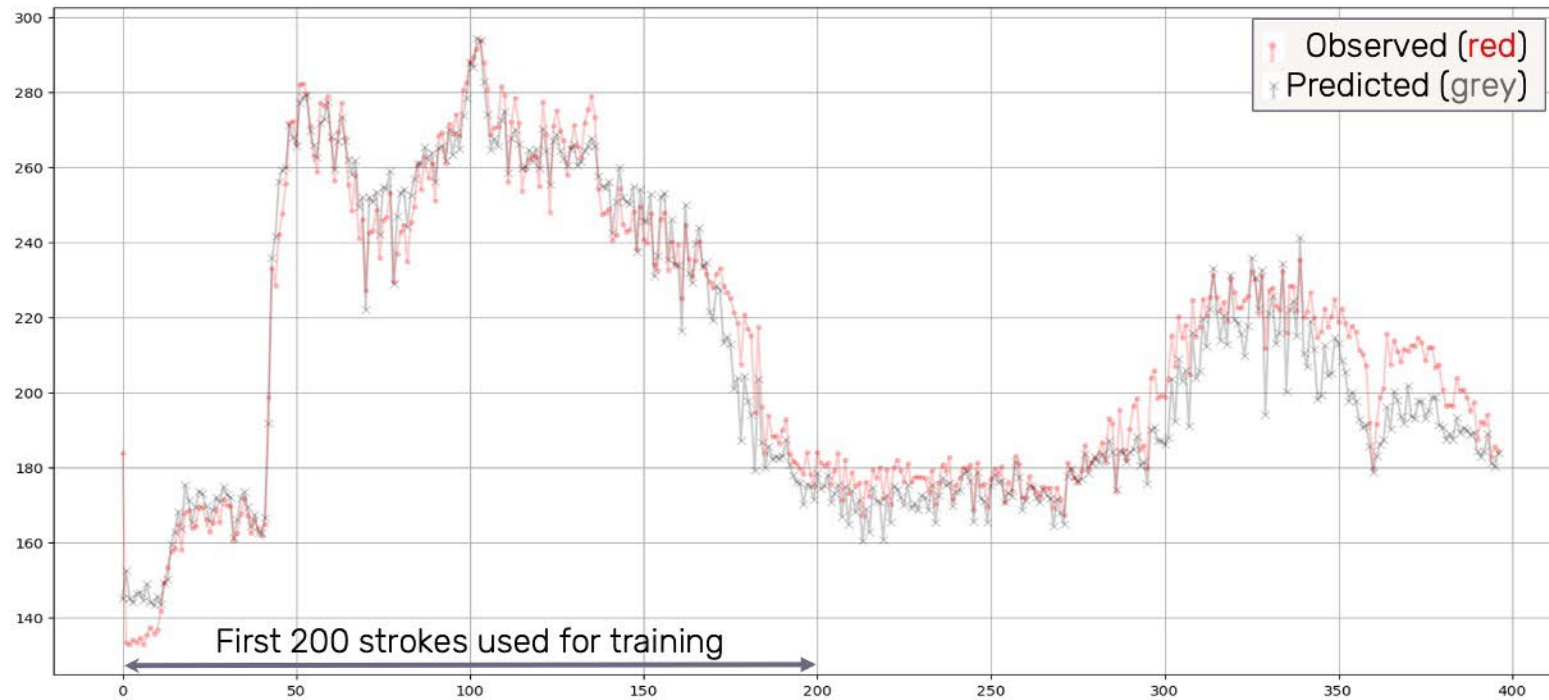
Installation inside the Motor Control Cabinet reduces installation and operating costs

3

Additional insights into the condition & performance of the drivetrain are valuable

Results: reducing complexity

Dyno vs SAM4



Future Work

1

Develop process & performance features:
e.g. BPD, # of strokes, inlet pressure

2

Automated classification of pump card

3

Test robustness of the algorithms

4

Develop a software-only version



Q&A

- ▶ Simon Jagers
- ▶ *Founder Samotics*
- ▶ simonjagers@samotics.com
- ▶ www.samotics.com



Copyright

- ▶ Rights to this presentation are owned by the company(ies) and/or author(s) listed on the title page. By submitting this presentation to the International Sucker Rod Pumping Workshop, they grant to the Workshop, the Artificial Lift Research and Development Council (ALRDC) rights to:
 - ▶ Display the presentation at the Workshop.
 - ▶ Place it on the www.alrdc.com web site, with access to the site to be as directed by the Workshop Steering Committee.
 - ▶ Links to presentations on ALRDC's social media accounts.
 - ▶ Place it on an USB/CD for distribution and/or sale as directed by the Workshop Steering Committee.
- ▶ Other uses of this presentation are prohibited without the expressed written permission of the company(ies) and/or author(s) who own it and the Workshop Steering Committee.



Disclaimer

The following disclaimer shall be included as the last page of a Technical Presentation or Continuing Education Course. A similar disclaimer is included on the front page of the International Sucker Rod Pumping Workshop Web Site.

The Artificial Lift Research and Development Council and its officers and trustees, and the International Sucker Rod Pumping Workshop Steering Committee members, and their supporting organizations and companies (here-in-after referred to as the Sponsoring Organizations), and the author(s) of this Technical Presentation or Continuing Education Training Course and their company(ies), provide this presentation and/or training material at the International Sucker Rod Pumping Workshop as is" without any warranty of any kind, express or implied, as to the accuracy of the information or the products or services referred to by any presenter (in so far as such warranties may be excluded under any relevant law) and these members and their companies will not be liable for unlawful actions and any losses or damage that may result from use of any presentation as a consequence of any inaccuracies in, or any omission from, the information which therein may be contained.

The views, opinions, and conclusions expressed in these presentations and/or training materials are those of the author and not necessarily those of the Sponsoring Organizations. The author is solely responsible for the content of the materials.

The Sponsoring Organizations cannot and do not warrant the accuracy of these documents beyond the source documents, although we do make every attempt to work from authoritative sources. The Sponsoring Organizations provide these presentations and/or training materials as a service. The Sponsoring Organizations make no representations or warranties, express or implied, with respect to the presentations and/or training materials, or any part thereof, including any warranties of title, non-infringement of copyright or patent rights of others, merchantability, or fitness or suitability for any purpose.