NXP Semiconductors Germany GmbH

Reducing scrap in Metal Etch Processes through Maglev Pumps

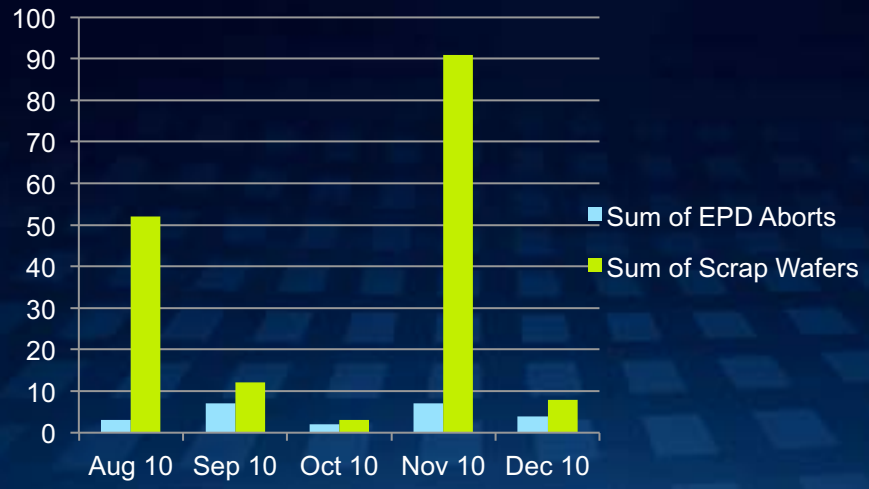
April 2013

Motivation

- One main task at NXP Hamburg is the production of angular and speed sensors on mature SAT tools
- Safeguarding the delivery performance for Automotive Products
- Challenge: Dedicated tool has no stable flow and no sufficient flow control
- Up to 3 EPD aborts per week with up to 63k€ reject costs per batch
- Metal residues

Process problems within Metal Etch

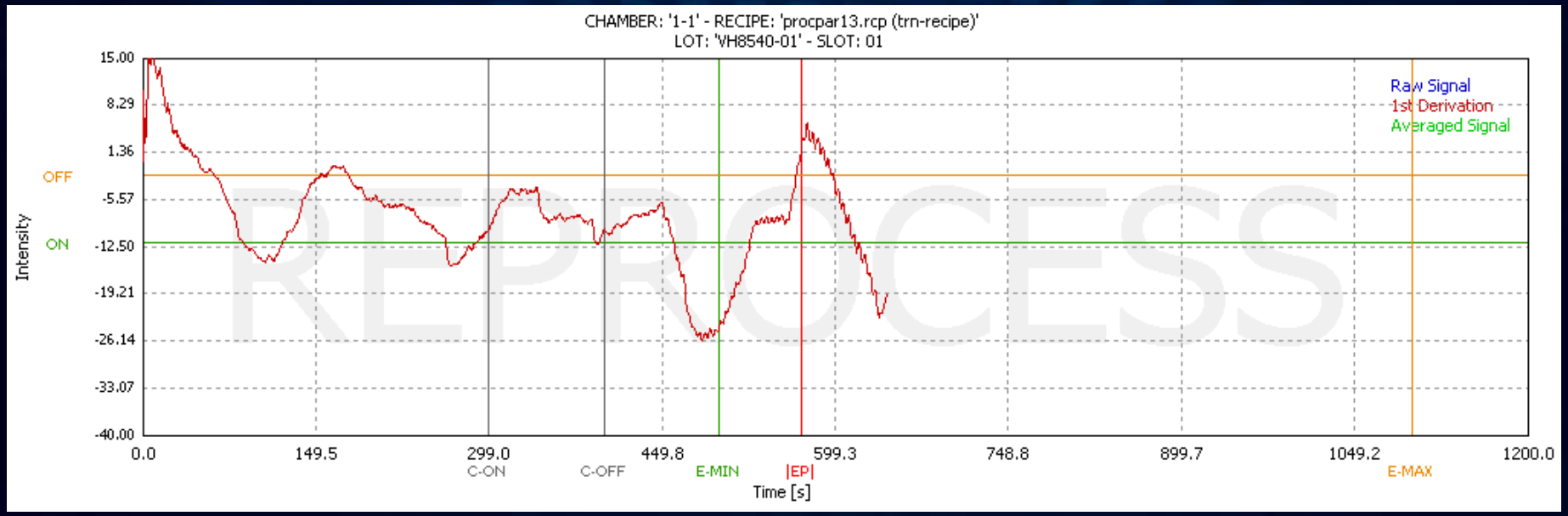
- Wide range of processes and type variations
- No SECS Download
- 6” and 8” production via the same tool
- One EPD algorithm for each AL material thickness (e.g. 0,8 - 2,5 µm) with different open area ratio’s



Tool problems

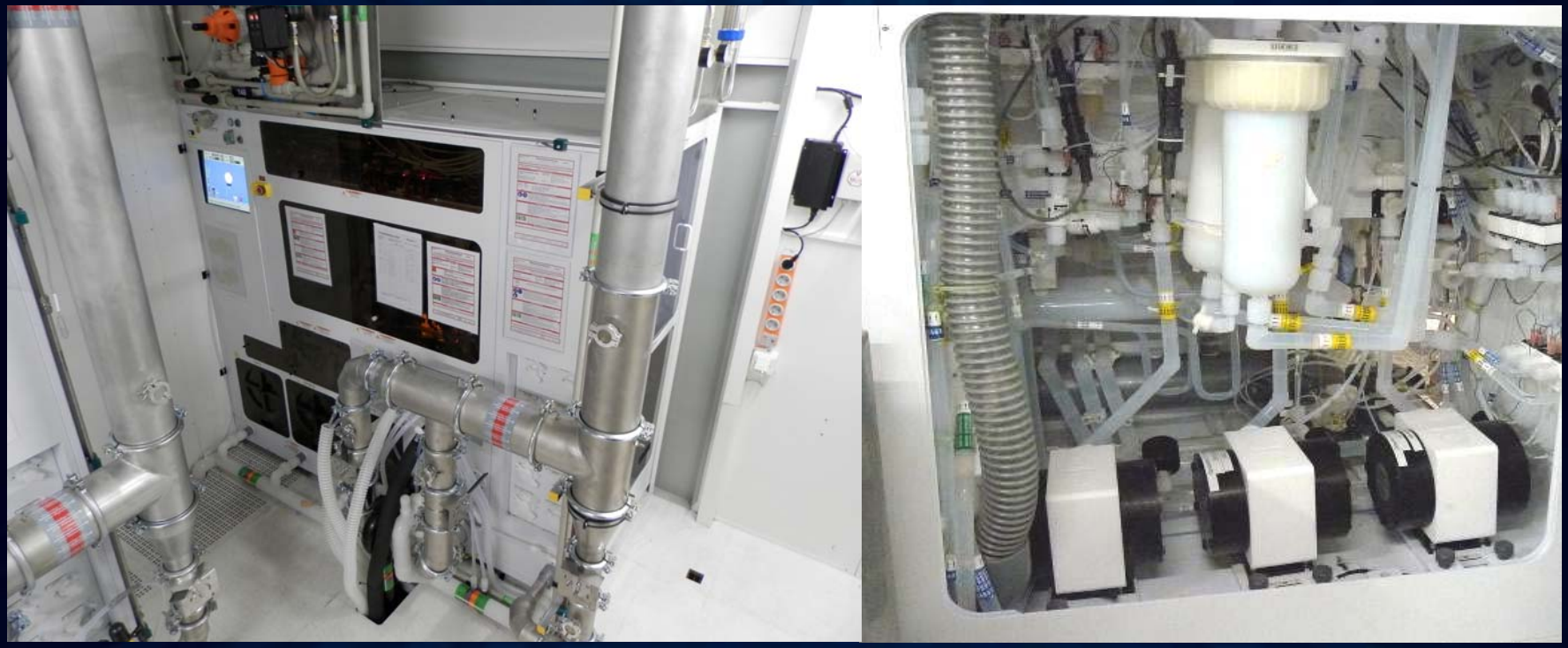
- Flow derivation between 1 to 10 lpm
- Flow average not known
- Up to 3 EPD aborts a week
- Actions followed after process abort caused by EPD:
  - process stop
  - analysis and engineering capacity
  - fault reporting
  - tool downtime

Bad EPD Trace



Early EPD detection caused by oscillating flow

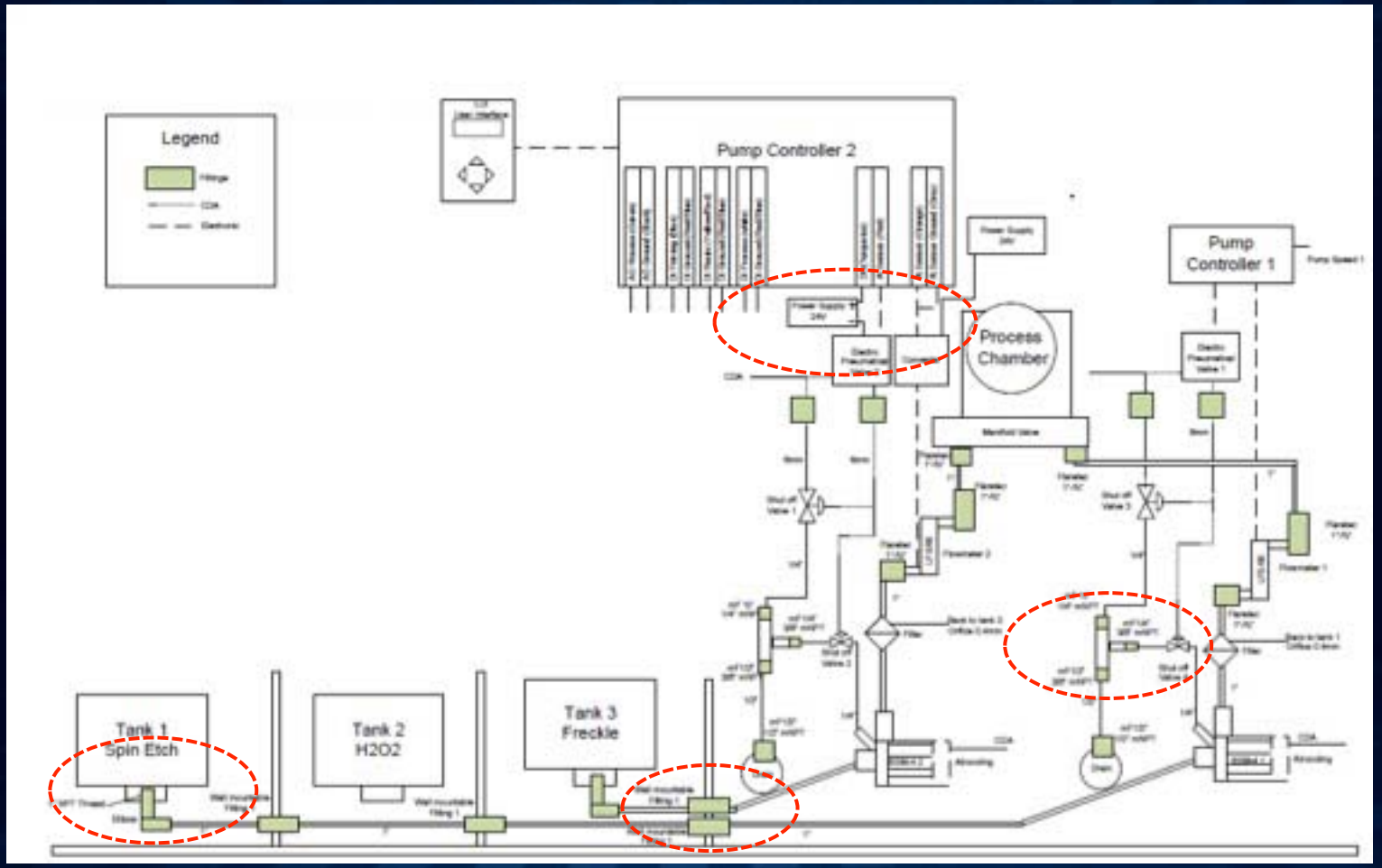
Old style SAT Tool with pneumatic Pumps



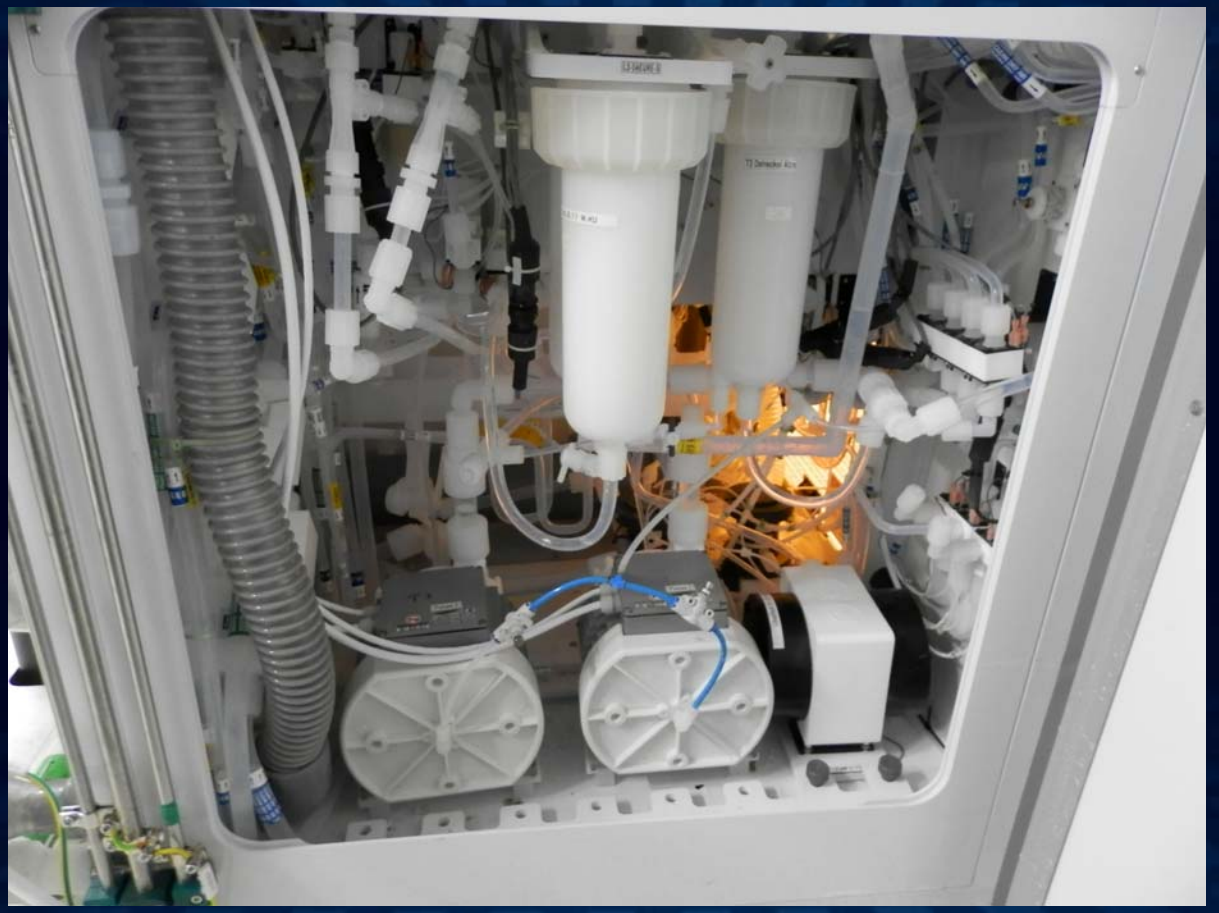
Required Tool modifications

- Extend the tank tubing from ¾“ to 1“
- Extend the recirculation tubing from ½“ to ¾“
- Connect the tanks from the bottom
- Implement Levitronix flowmeter
- Adapt the electrical interface of the Levitronix pump controller
- Venturie nozzle for debubbling

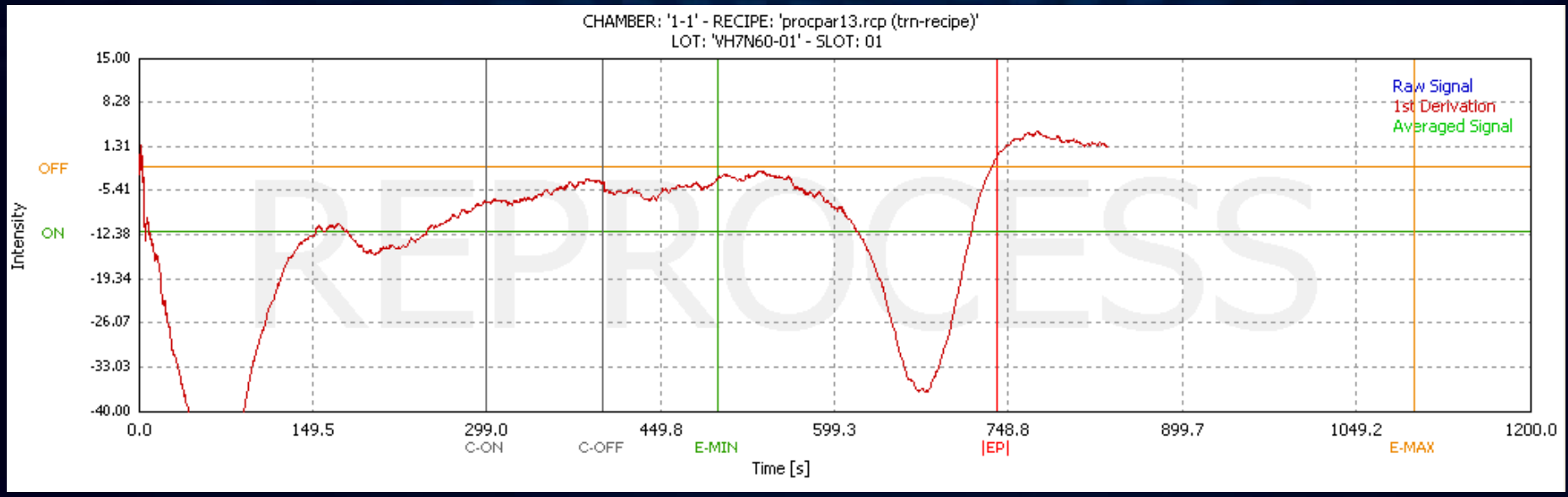
Functional schematic



SAT Retrofitting with Levitronix BPS4



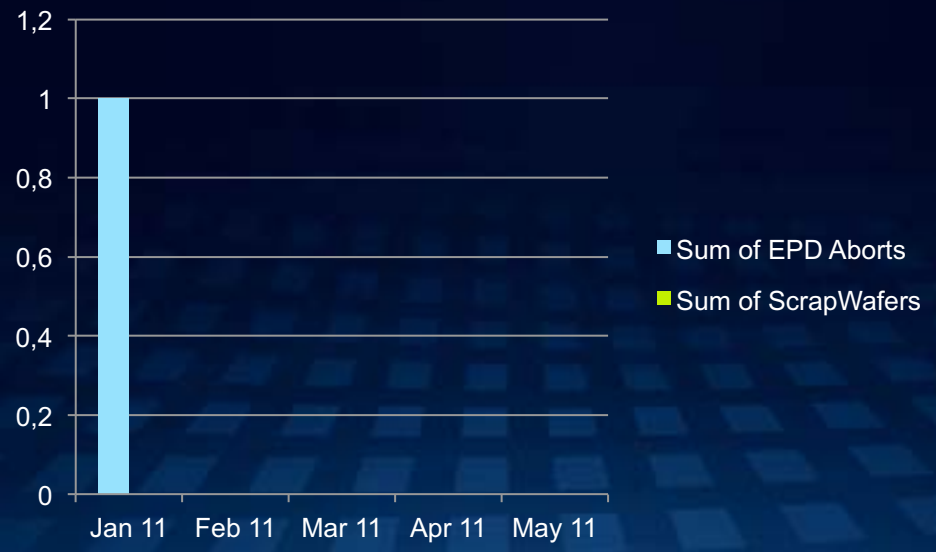
Good EPD signal



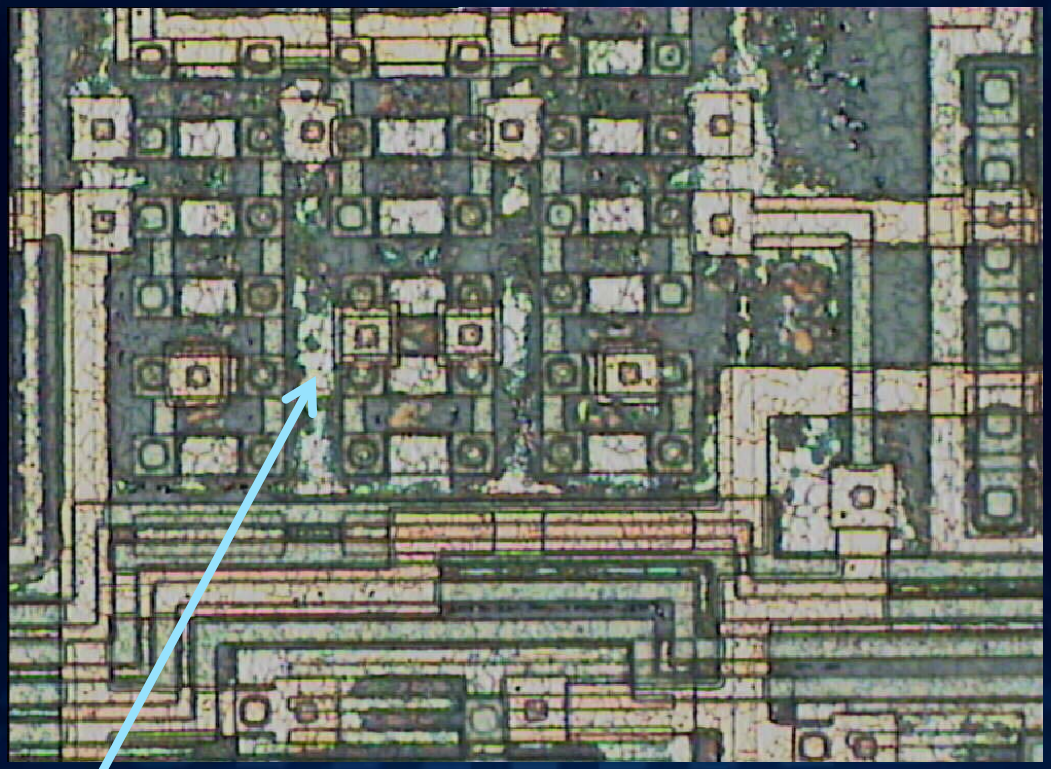
Good signal / noise ratio >>5

Improvements

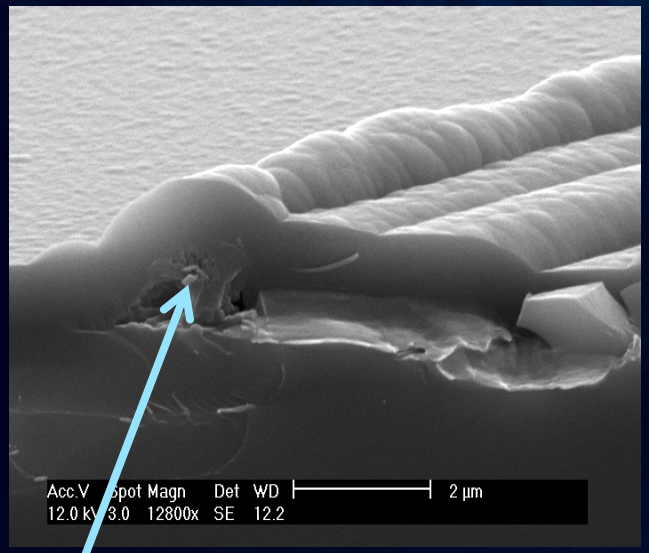
- Flow limits by +- 0,5 lpm with deviations of 0,1 lpm
- Reliable flow measurement
- No EPD related aborts after improvement
- Minimized maintenance costs and downtime of pump‘s (20k€ p.a.)



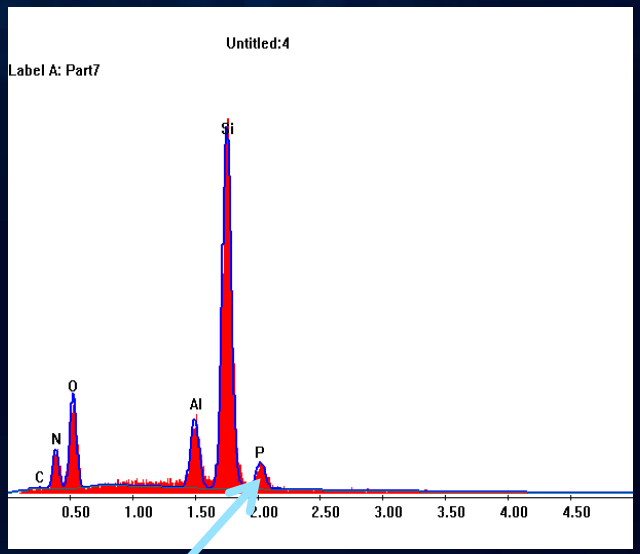
AL residues caused by insufficient chemical flow



Chemical residues after Al etching



Caused by extensive chemical flow, visible after plasmanitrid deposition



Phosphoric acid from AL etch


Thanks for listening!