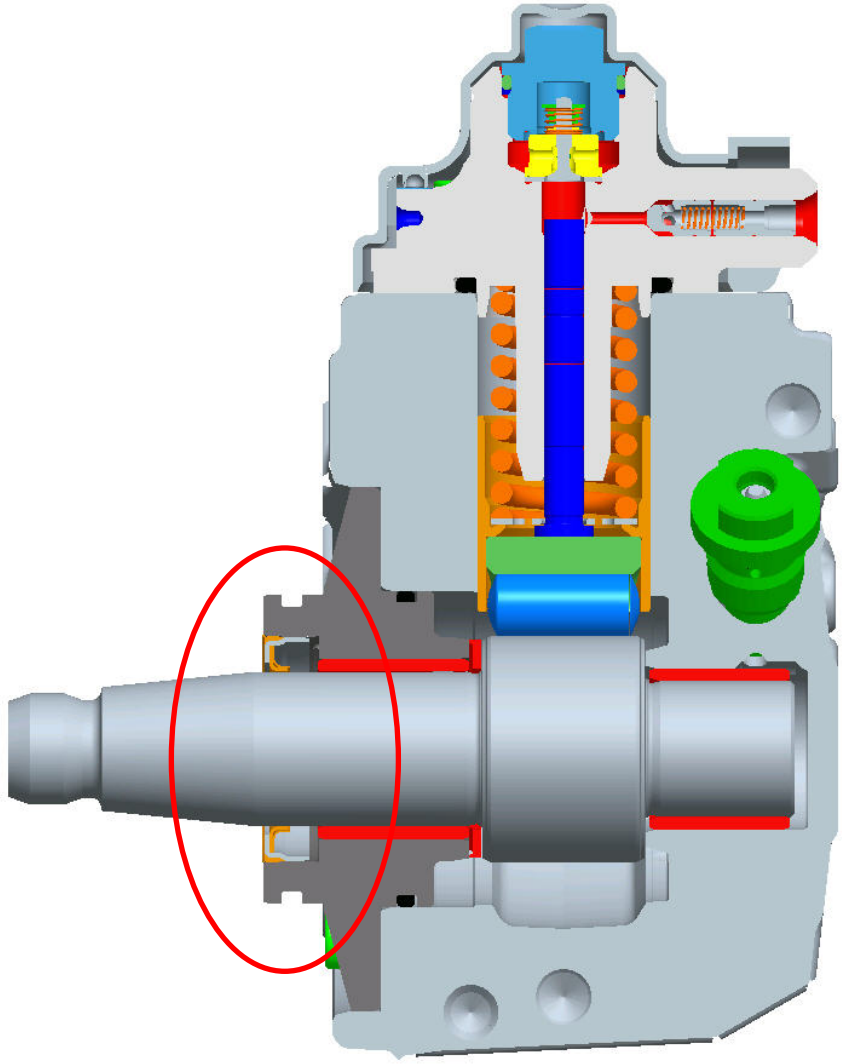
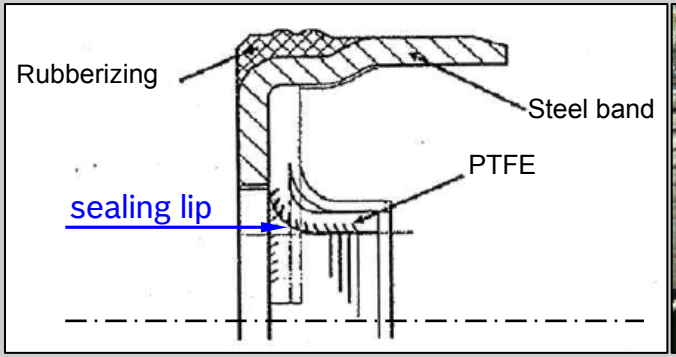
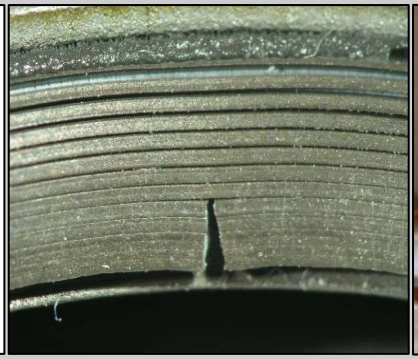
ENTIRE PAGE CONFIDENTIAL

Status problems/measures CP 4
crack in oil seal



Status problems/measures CP 4.1 (4 cylinder) crack in oil seal: **Summary**



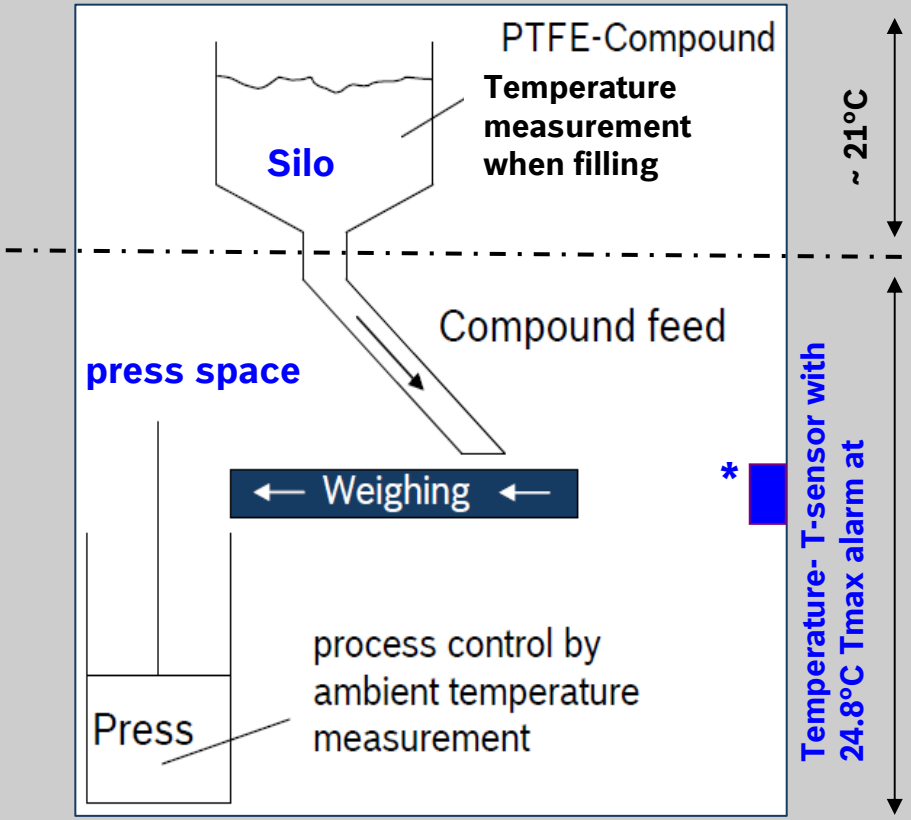


Problem	Leaking CP4 due to crack in oil seal	
Cause	Process temperature exceeded when pressing on the oil seal blanks at the supplier	
Status	27 0 km (12 VW, 15 Audi), 7 (+ 5 not yet confirmed) VW field complaints	
Immediate measure	Pulse bubble test of ongoing series production and warehouse stocks at Bosch and VW Group plants until clean date from	08/18/2010, done.
Corrective measures	Introduction of an additional air-conditioning system in the press space	07/23/2010, done
	Investigation of the temperature and flow profile in the press space by Bosch room climate experts (incl. temperature measurement with 10 sensors and data logger)	09/1-2/2010, done.
	Reduction of the limit temperature of room monitoring	09/20/2010, done.
	Concept for optimizing the room air conditioning	11/26/2010
	Direct, proximity-type temperature measurement of the billet under examination	11/26/2010

Status problems / Measures CP 4.1 (4 cylinder)

Crack in oil seal: **Cause/temperature in the press space**

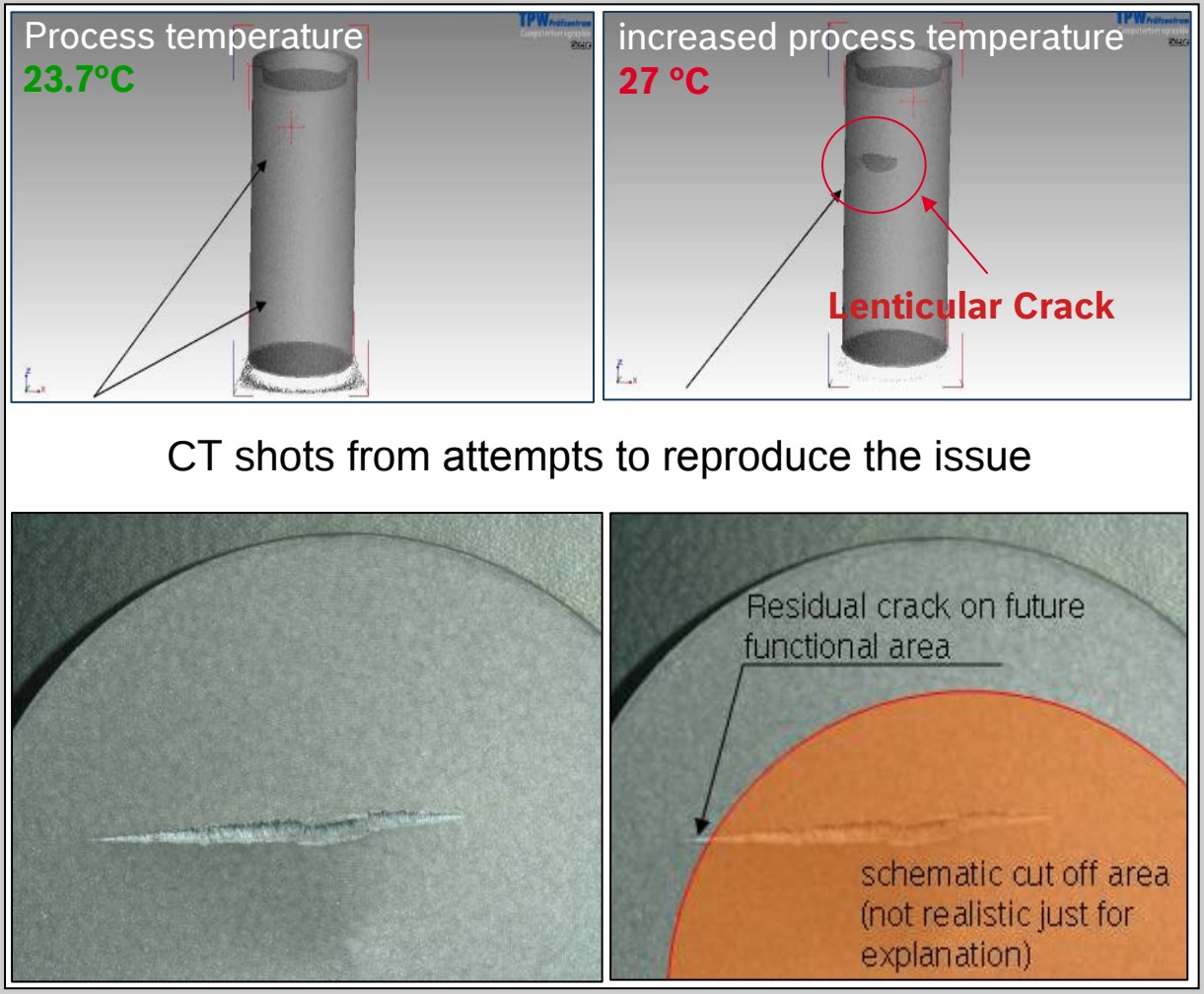
- The room temperature in the press space is set using a an air-conditioning system.
- The PTFE compound in the silo is held at a stable 21°C.
- A temperature sensor* on a wall supplies the control signal.
- The temperature distribution in the press space is not constant.
- A ΔT up to just under +2°C was measured between the sensor and the area above the press (by Bosch room climate experts).
- The press is switched off if the room temperature exceeds 24.8°C as measured on the temperature sensor.



Status problems/measures CP 4.1 (4 cylinder) crack in oil seal: **Cause / Fault mechanism**

If the powder temperature is too high when pressing, the viscosity of the material prevents correct outgassing of the air that is contained, so that the air remains in the blank prior to sinterizing.

Non-escaped air expands during the sinterizing process and can cause the matrix structure to burst
=> lenticular cracks



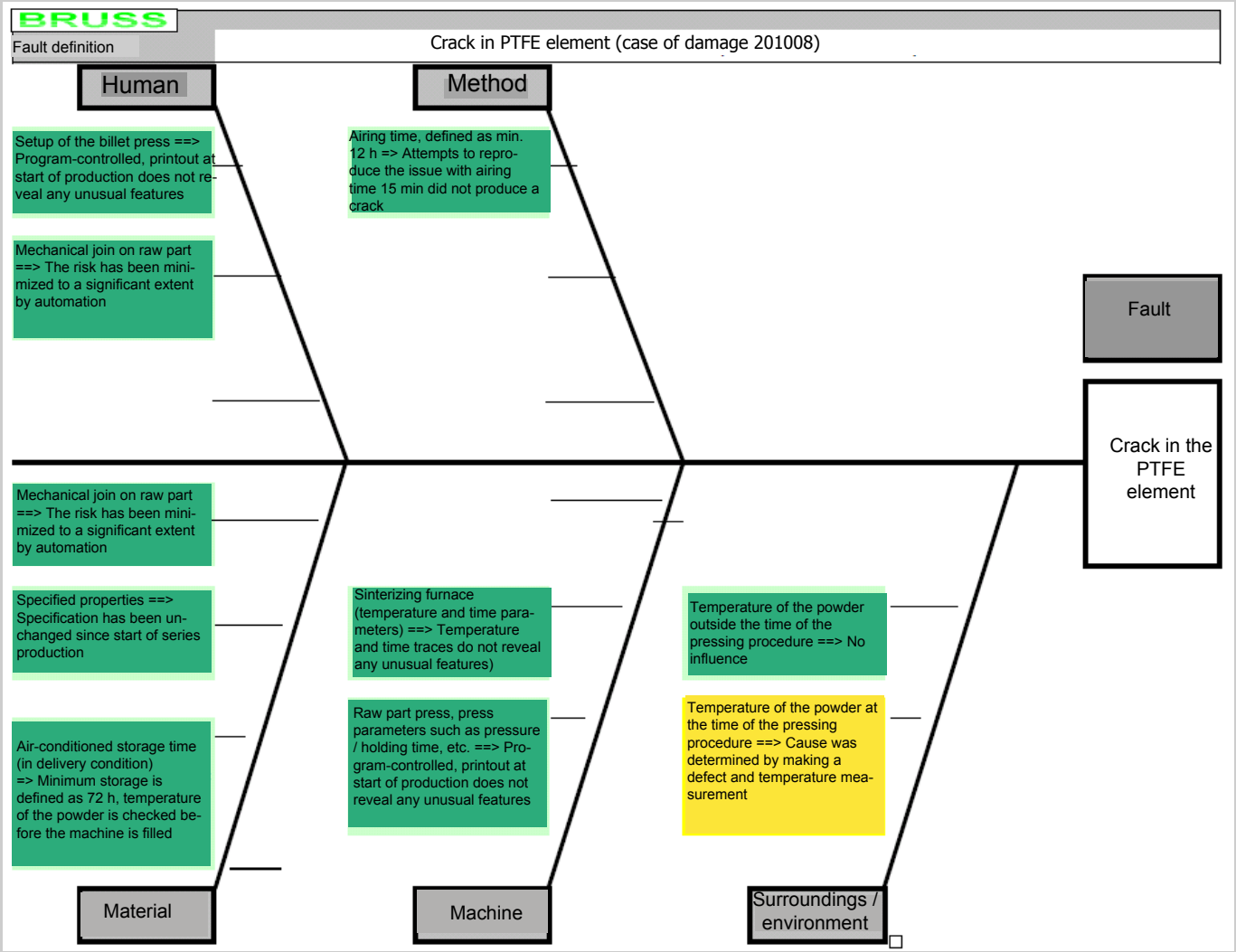
Status problems/measures CP 4.1 (4 cylinder)

Crack in oil seal: **Backup**

Backup

Status problems/measures CP 4.1 (4 cylinder)

Backup crack in oil seal: **Ishikawa**



Status problems/measures CP 4.1 (4 cylinder)

Backup crack in oil seal: **Pulse bubble test**