

Contributions to the Development Oil Supply Analyses / Swivel Test Bench



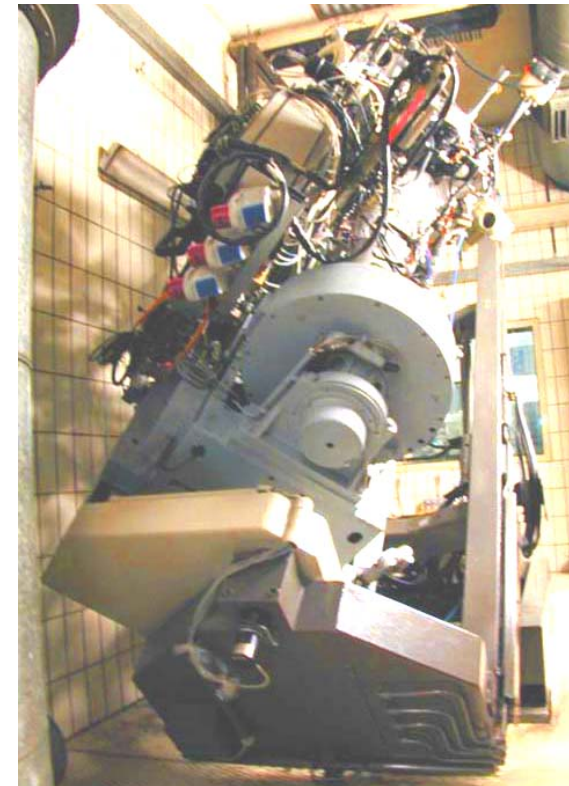
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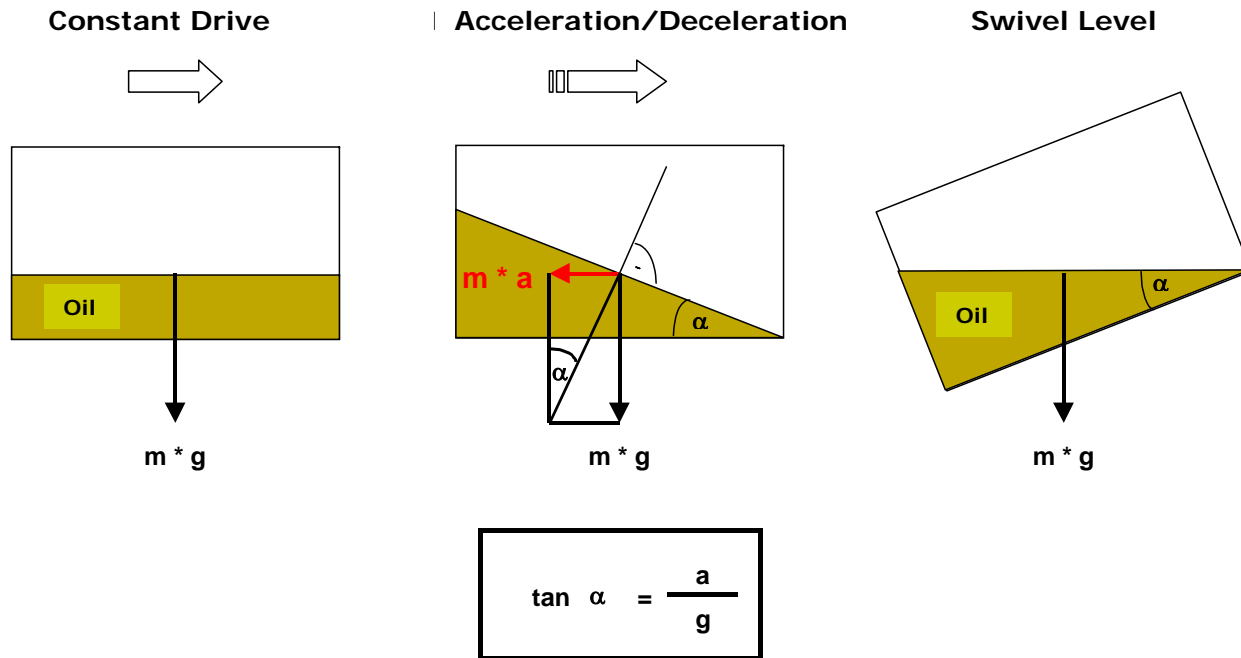
- Swivel Test Bench
- Correlation Driving Dynamics
- Swivel Test Bench / Metrology
- Oil Supply Analysis
- Oil Level Variation
- Crankcase Ventilation
- Versions of Optimization

Swivel Test Bench

- Swivel Angle max. 50°
- Engine Self-Weight max. 1 ton
- Coasting Mode max. 350 kW
- Equivalent Acceleration 1.2 g
all directions



Correlation Driving Dynamics



Acceleration/Deceleration	[g]	0,00	0,09	0,18	0,27	0,36	0,47	0,58	0,70	0,84	1,00	1,19
Swivel Angle	Degree	0	5	10	15	20	25	30	35	40	45	50

- Gas Content Measurement (TMT, Flucon, DSI)
- Blowby Measurement (with additional Air Injection)
- Oil Pressures and Temperatures
- Standard Measurands
- Special Measurands according to Customer Request
- Video Control - maximum of 8 Cameras



Limit Values for Oil Pressure and Gas Content

- at maximum swivel angle
(driving dynamics, longitudinal and lateral acceleration)
- at extreme oil levels (MIN, MAX, underfilling and overfilling)
- at maximum oil temperature

Targets

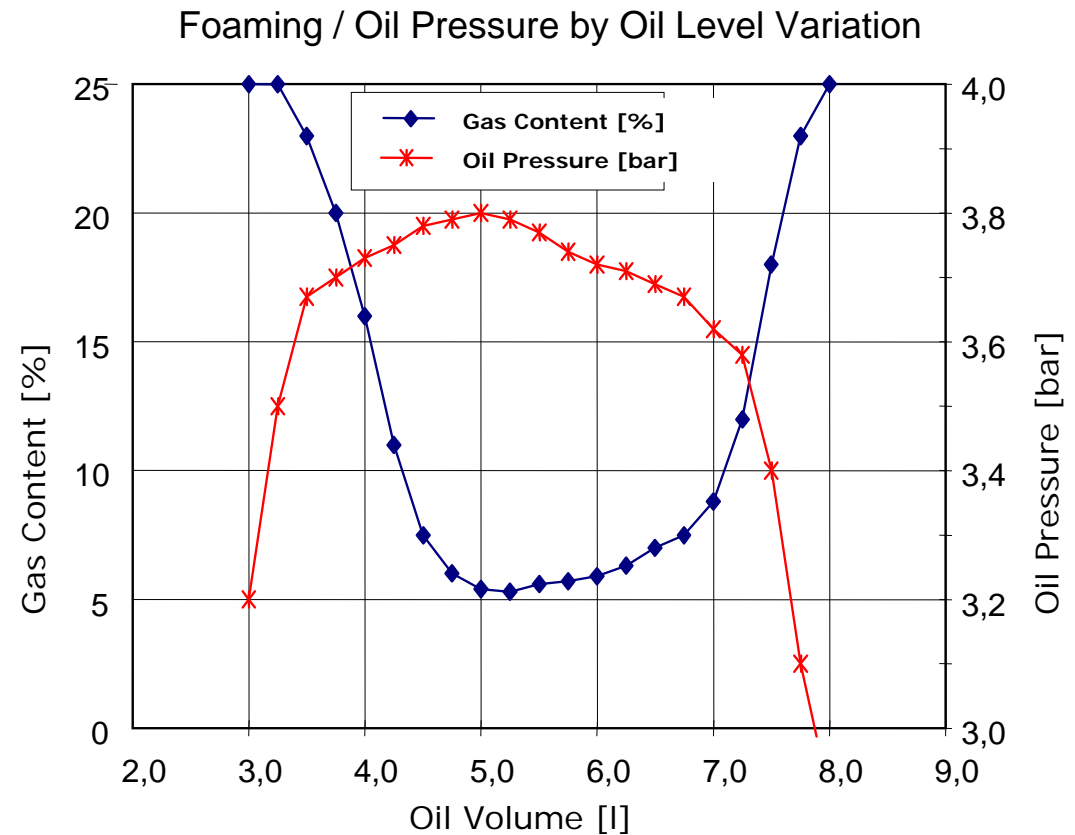
- No oil throw
- No oil behind oil separator

Constant:

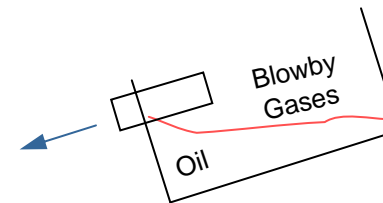
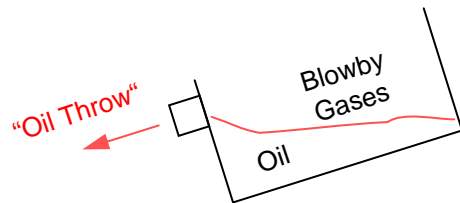
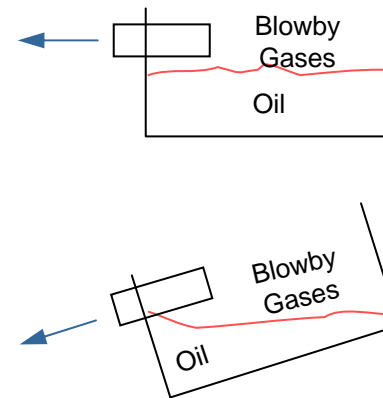
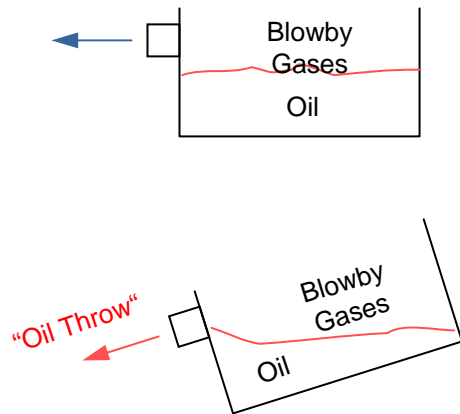
- Fitting position
- Speed
- Torque
- Oil temperature

Abort Criteria:

- Maximum gas content
- Minimum oil pressure
- Oil throw

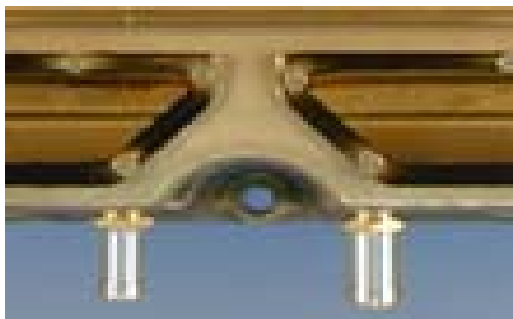


Crank Case Ventilation



Option A

Option B



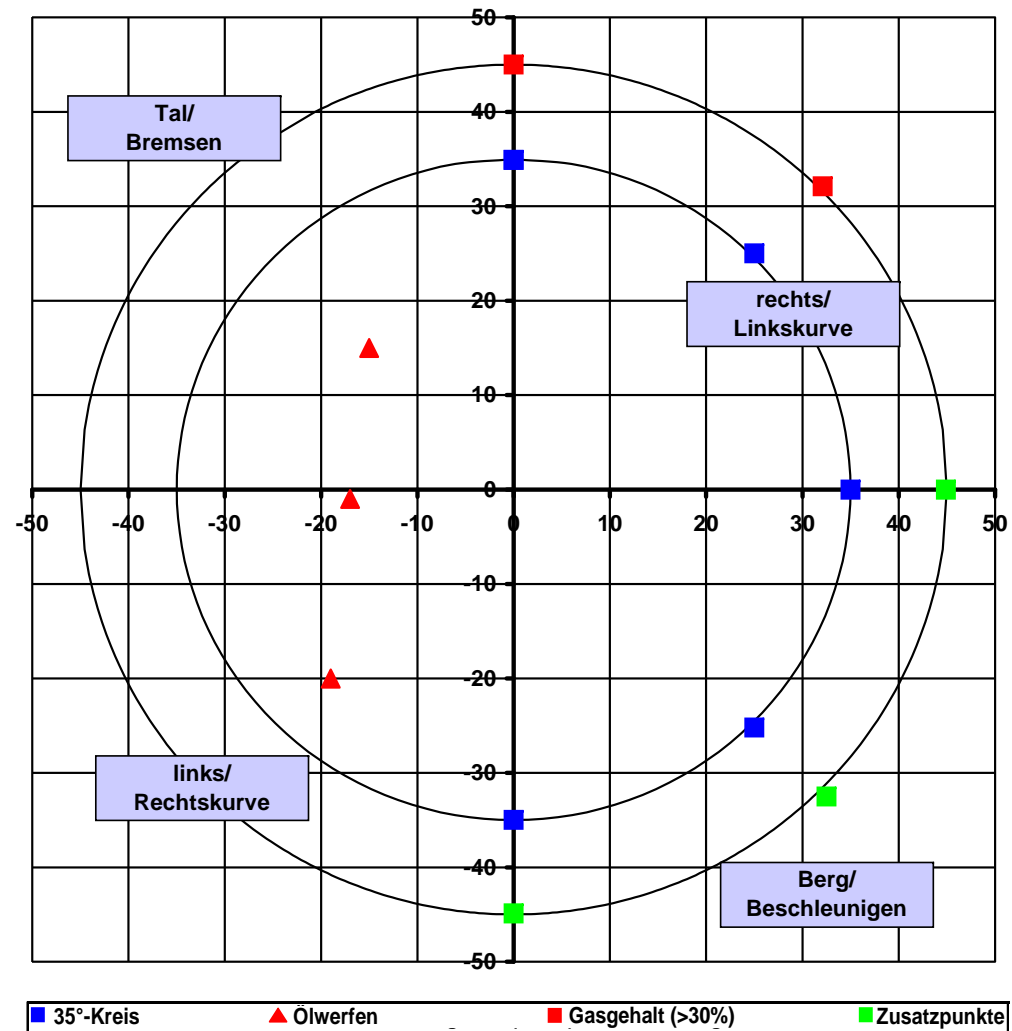
Crank Case Ventilation

Option A

- Maximum oil level
- Speed = speed_{max}
- Torque = 0

Result

“Oil throw” within right turn



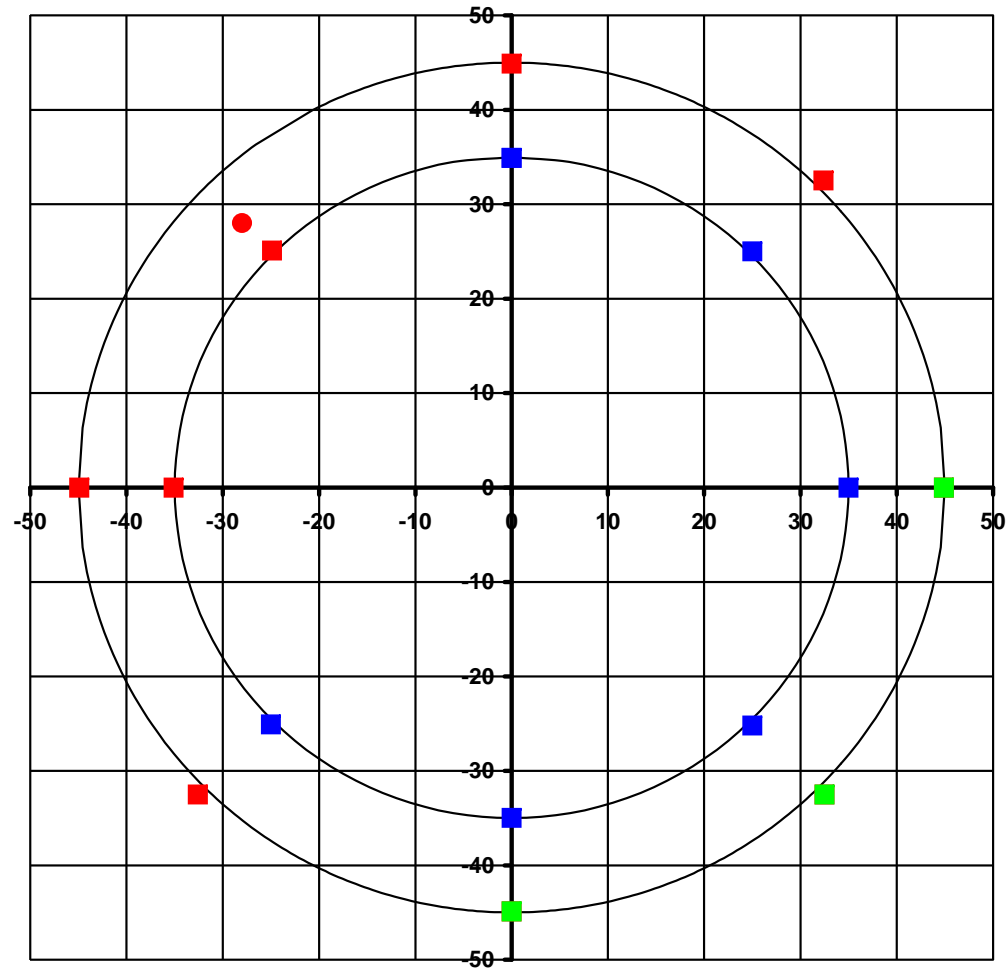
Crank Case Ventilation

Option B

- Maximum oil level
- Speed = speed_{max}
- Torque = 0

Result

No "oil throw"
within 45 °-circle,
increased gas content



Versions of Optimization



Measures at critical Operating Conditions (Oil Throw/Gas Content):

- Adjustment of minimum and maximum oil levels
- Adjustment of oil grade / quality
- Modifications of design:
 - Oil pump (point of suction, delivery rate)
 - Oil pan
 - Oil baffle

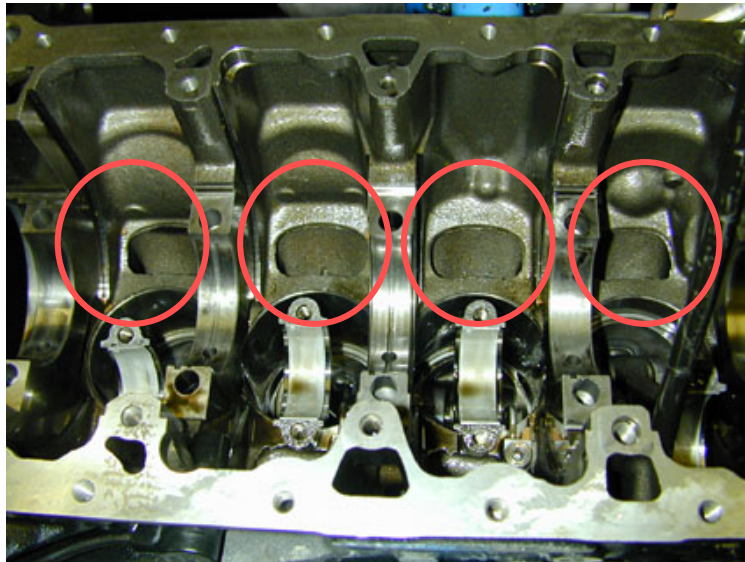
Versions of Optimization



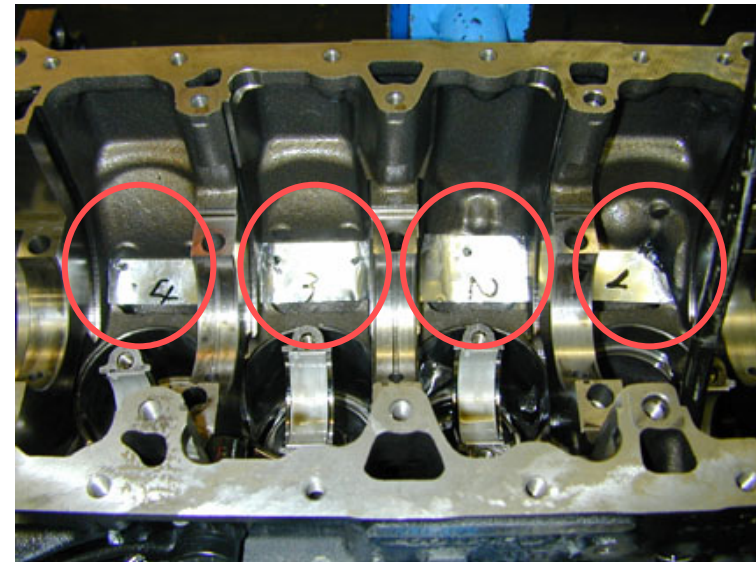
Refinement of Crank Case Ventilation System

- Adjustment of minimum and maximum oil levels
- Modifications of design:
 - Oil return channels
 - Oil separator (Centrifuge, labyrinth, etc.)
 - Valve bonnet

Versions of Optimization



Original Blowby Channels



Blowby Channels with "Splash Guard"

Locations



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