



STARKE

MINERALÖLWERK

Aue • Hannover • Niebüll



Services for the energy industry

StaSo Transformer Oil – quality and performance

StaSo Transformer Oil – a sustainable good choice:

- produced by using MSR-Technology
- sustainable and resource-saving
- environmentally friendly and high performing



Innovative – at the highest level:

- inhibited insulation oil based on naphthenic, re-refined premium base oil
- highest performance level according to IEC 60296
- for higher operating temperatures and extended life expectancy



Accepted – by the conservative “Transformer-Family”:

- Manufacturer of power- and distribution transformers
- Manufacturer of tap changer
- Transmission and Distribution Network Operators
- Power plant operators
- Service companies

Analyzed –without reservations:

- no increased inhibitor degradation
- no metal particle contamination
- miscible with all common, mineral oil based insulation oil qualities
- low stray-gassing-behavior

Mobile Transformer Oil Regeneration – operational safety

MRA – Mobile-Regeneration-Asset-Technology:

- longterm operational experience
- continous optimization
- own development & engineering
- constant investment
- three assets / rigs

MRA – value retention of transformer assets:

- bypass operation without production stop
- most effective and holistic system cleaning
- increased service life and operational safety
- technology for saving resources



updated reference list - realized projects MRA-Technology

power-, generator step-up-, network intertie-transformers, reactors, projects between 2010 - 06 2018

| number - Anzahl | system voltage - Bemessungs - Spannung OS [kV] | power range - Bemessungs- Leistung [MVA] | effective action - Art der Behandlung |
|-----------------|--|--|---------------------------------------|
| > 45 | > 380 | 200 - 600 MVA | regeneration &/or DBDS-elimination |
| > 59 | > 220 | 100 - 550 MVA | regeneration &/or DBDS-elimination |
| > 75 | > 110 | 30 - 200 MVA | regeneration &/or DBDS-elimination |
| > 79 | > 30 | 3 - 80 MVA | regeneration |
| > 82 | < 30 | 1,6 - 35 MVA | regeneration |

please note:

- more than 340 projects has been successfully realized since 2010
- more than 11.700 tons of transformer oil mobile regenerated since 2010
- all kinds of assets within the system voltages & power ranges has been covered
- all kinds of different locations has been served: power plants (nuclear, conventional, hydro), substations, railway lines, steel-, aluminium-, paper- & chemical plants and many more...

MRA – deployed staff:

- IHK degree in mechanical / electrical engineering
- SCC instruction
- instructed according to WHG
- Electrically instructed persons, rules of conduct in transformer substations
- flexible & redundant scheduling of all service technicians possible

Regeneration & DBDS-elimination – guaranteed success

- proof of guaranteed limit values according IEC 60422 after project completion
- process-accompanying documentation and analytics
- proper and professional disposal/recycling of resulting residues

MRA – Security for the customer:

- OHSAS-certification
- fully automatic control
- UMTS & WLAN remote maintenance
- Emergency shutdown programs
- air traps, check valves
- Smoke detectors, nitrogen quenching



Oil analysis – constant control

Mineral oil laboratory – quality assurance:

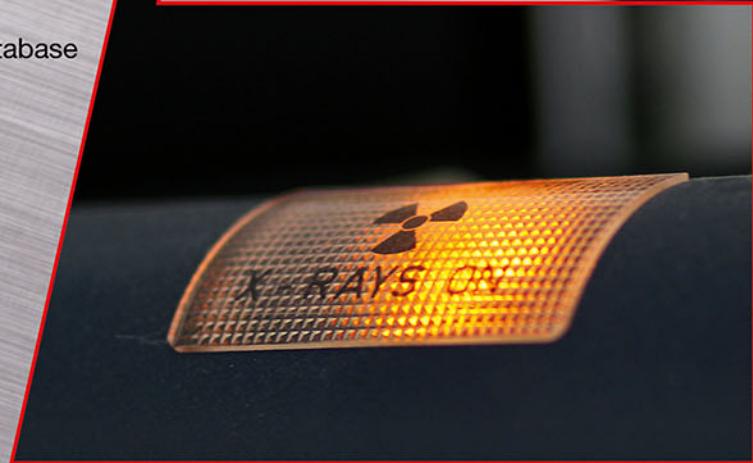
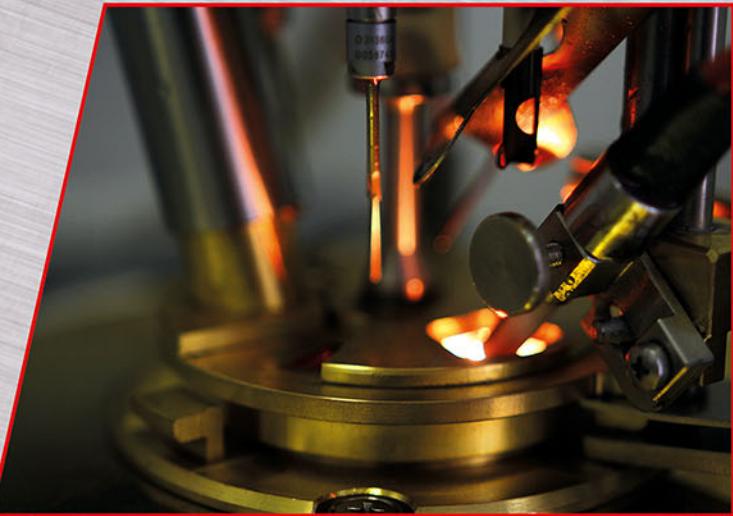
- certified according to DIN EN ISO 9001
- monitoring of defined quality indicators and specifications
- In- & output products / production processes / MRA projects
- order analysis for customers
- consulting and training

Transformer oil analysis – for diagnosis:

- according to IEC 60422
- DBDS
- PCB
- Gas-in-oil -analysis (DGA)
- furan analysis
- miscibilities
- stray-gassing

Resources – to meet demands:

- specially programmed laboratory database
- Traceability and sustainable analysis documentation
- very good equipment (including GC, IR, RFA, HPLC)
- motivated & experienced staff



Recycling of used oils – rescue the molecules

Material recycling – re-refining

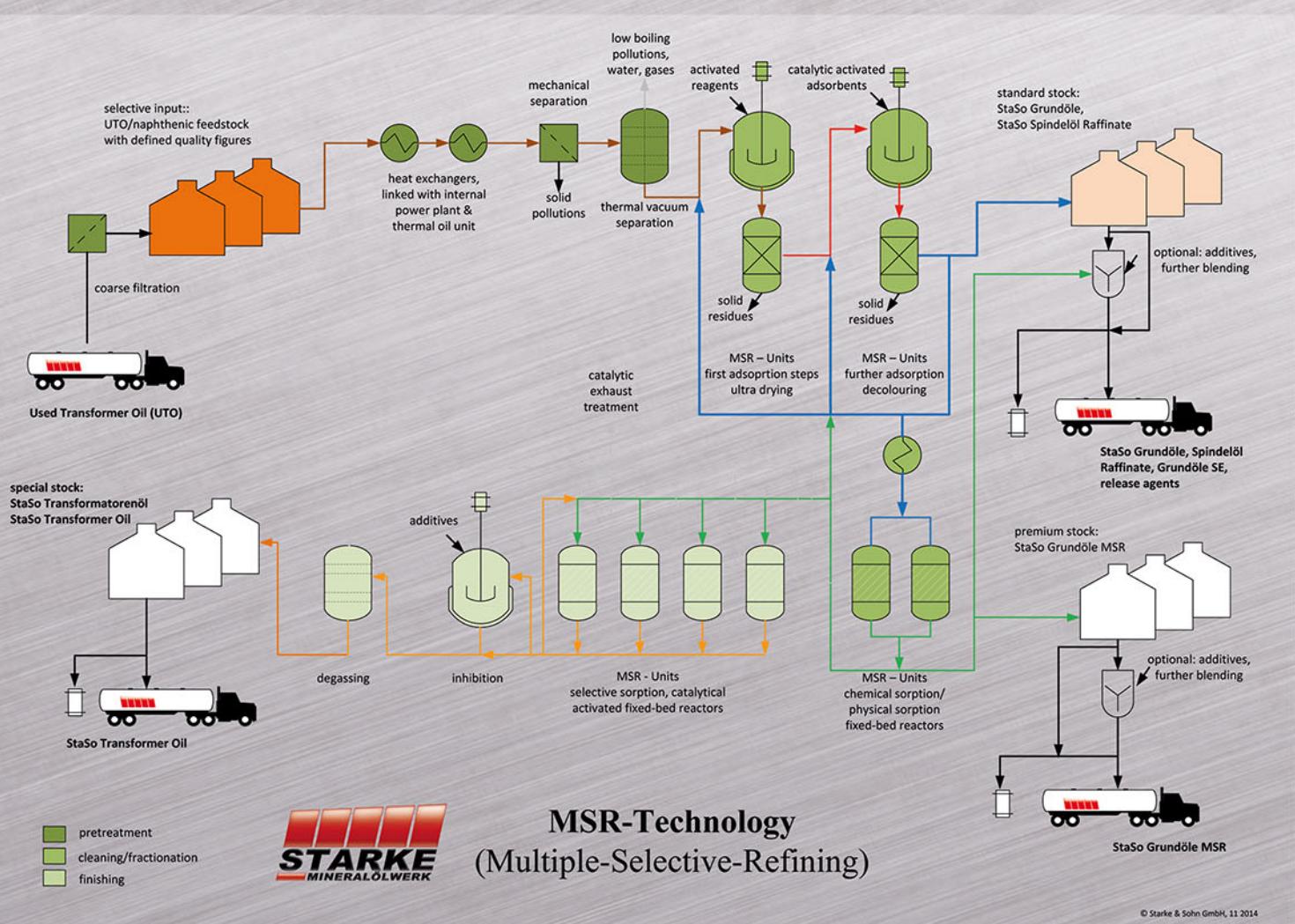
- specialized in transformer and turbine oils
- own truck fleet with special equipment
- exorbitant storage capacities at three locations
- waste disposal company approved in accordance with BlmSchG
- certified according to DIN EN ISO 9001 and OHSAS 18001
- recognized specialist company according to WHG



MSR-Technology – sustainability

MSR: Multiple - Selective - Refining

- for used transformer and turbine oils
- special processing based on defined and analytically determined key figures for each raw material input
- batch-oriented production according to specification (25 - 100 t batches)
- mechanical, thermal and physico-chemical process engineering, core competence: adsorption





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