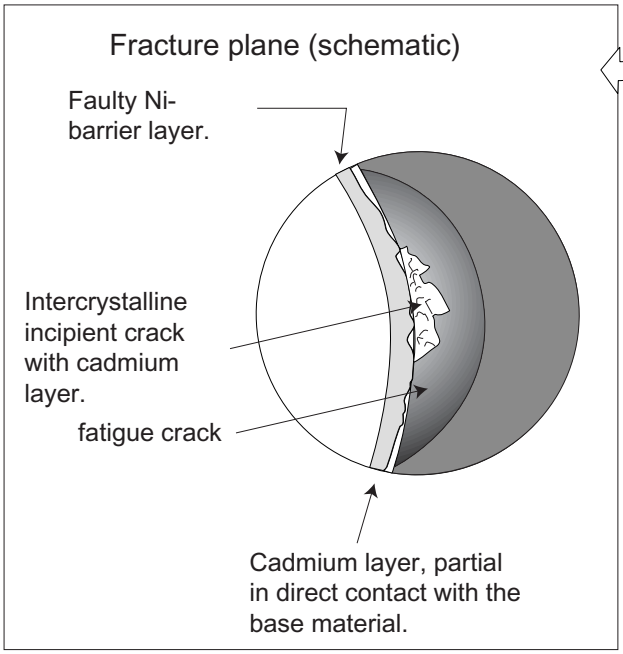
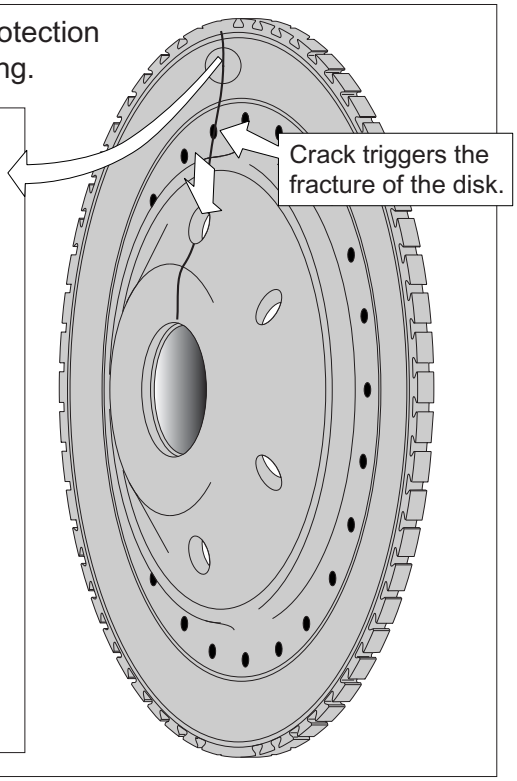
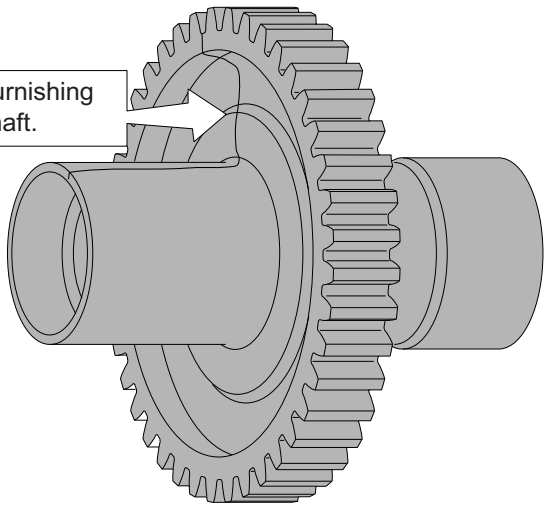
The use of repair processes with a high danger potential should be only performed by especially sensitised personnel and tightened control. The development of less dangerous processes is a task of the OEM.

Embrittlement by cadmium by corrosion protection of a high loades steel part with a Ni-Cd-coating.







Stress corrosion cracking during the burnishing of gears.

Ill. 21-10

Ill. 21-10 *(Lit. 21-9): Some* ***repair processes of eler aeroenging types*** *have an* ***especial high danger potential****. For this reason those processes will be replaced as far as possible by not so hazardous. But this can also again trigger problems (e.g. changed sliding features).*

Plating with cadmium*: Besides the* ***toxicity*** *in connection with cadmium (Cd) two extremely nasty effects which are especially pronounced emerge:*

- Hydrogen embrittlement *(volume1, Ill. 5.4.4.2-1; and volume 4, Ill. 16.2.1.8.3-7): During the galvanic cadmium plating process from experience an especially high danger of embrittlenet exists.*

- LME, SMIE *(volume 4, Ill. 16.2.2.3-11): The sketches in the upper frame show a compressor disk (volume 4, Ill. 16.2.1.8.3-8) with a Ni-Cd plating. The* ***Ni-barrier layer*** *has to avoid the* ***metallic contact of the cadmium with the steel disk****. This did not work in the shown case. It came to a crack formation and the fracture of the disk.*

Stress corrosion cracking during burnishing *(volume 1, Ill. 5.4.2.2-4):* ***Gears*** *get their typical* ***brown colour*** *with a process in hot brine. Have the gears sufficient high internal tension stresses at the surface, this can trigger crack formation (lower sketch; volume 4, Ill. 16.2.1.8.3-11). Because of this danger this* ***process was banned*** *in the last years, at least by some OEMs.*

Ill. 21-11*: It strikes, that frequently later investigations at many heavy incidents come upon similar cases which can be assesses as* ***parallel cases****. They merely had not comparable serious consequences*
*Here also a connection exists with the problem of the „****single case****“ (volume 1, Ill. 2-3.3).*
Not seldom little differences of the cases are taken as reason to classify every as single case. Thereby the connection with other cases with quite similar failure mode is not identified or will be denied. Seemingly the ***classification as a single event****/case has an additional, however very risky benefit. It is believed, because a follow-up is ruled out, measures, remedies and reports can be avoided.*
Therefore at ***incidents with similar failure modes*** *it should be* ***insistently looked for the connection****. This is the key and the chance to* ***find the real failure mechanism*** *and to* ***identify the causative influences****. This is the requirement for targeted, promising remedies and measures. This counts not at least for a repair.*
Our particular attention should apply for effects which strike while comparing the cases. For example a ***seemingly discrepance*** *like more severe failures at components with less operation hours. Also* ***agreements*** *like a concentration of the failures at distinctive operators give hints. (Ill. 21-9).*

Note: Parallel cases are a big chance to identify the real causes of failures. So they are a precondition for successful repairs. Important are **differences which influence the failure mode** unexpected by comparing the cases.