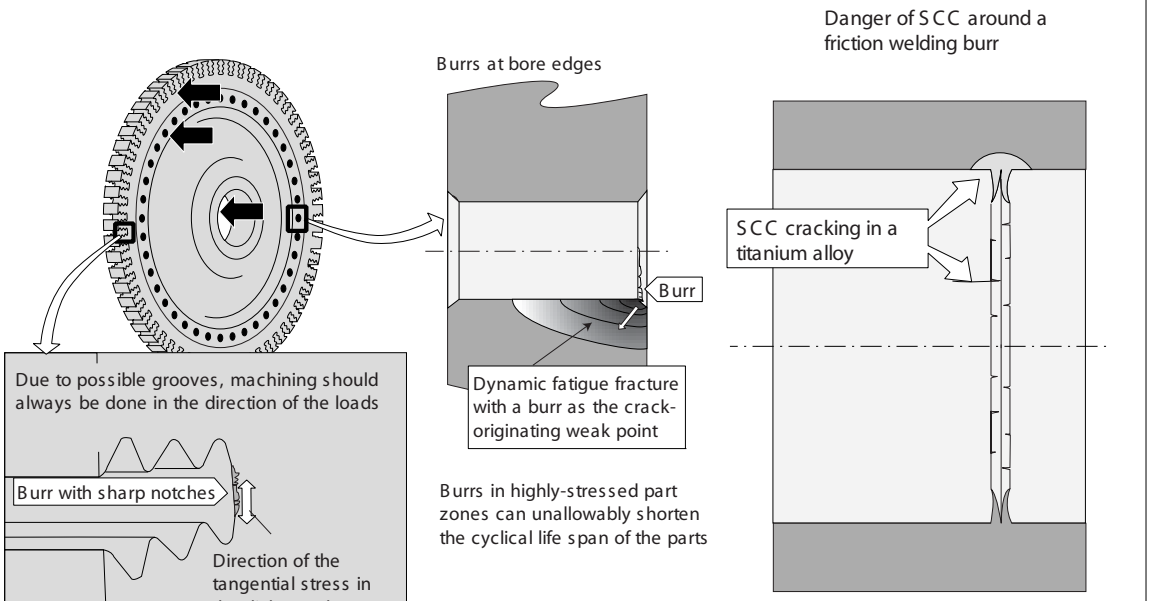
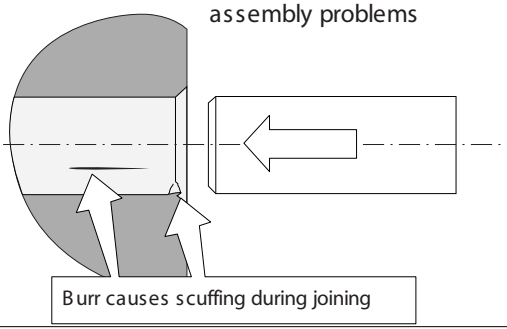
# Damaging effects of burrs on part behavior during operation:

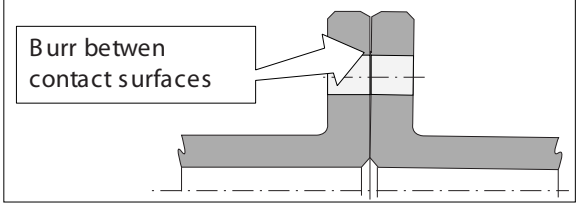
## 1 Reduction in the cyclical life span of rotor parts



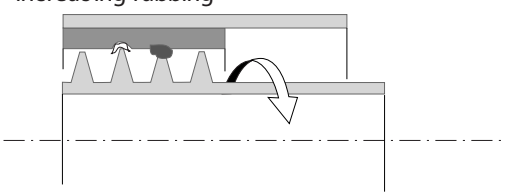

## 2 Loss of part function, such as during sliding motions (regulators, control systems). Damage to fitting surfaces: reduction in dynamic fatigue strength, assembly problems



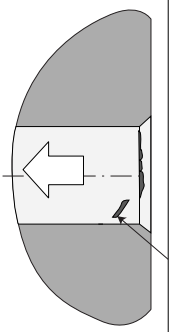

## 3 Problems on contact surfaces: notches, poor pressure distribution




## 4 Origin of labyrinth damage: wear, self-increasing rubbing



## 5 Separated burr in a cross-section with throughflow



A burr breaks off in a cross-section with a throughflow (air, oil, fuel):
- Fouling of the media
- Bearing damage
- Blockage of nozzles and filters
- Damage to parts in the flow system (e.g. bearings, combustion chambers, turbine blades)
- Signals at magnetic plugs
- Damage to slide seal rings
- Stiffness and jamming
- Loss of part functions (regulator)

**Ill. 16.2.2.2-6**

***Illustration 16.2.2.2-6:*** *Burrs can have a damaging effect on the* ***operating behavior of a part****, as well as other parts. The following examples show this. One case, in which a burr affected the flow and thereby also influenced damages that occurred, is shown in Ill. 16.2.2.2-6.*

***"1" Reduction of dynamic fatigue strength:*** *Burrs can cause an unallowable decrease in LCF and HCF strength (Ill. 16.2.2.2-3, Example 16.2.2.2-1). In some cases, this can affect the cyclical part life.*
*Highly stressed disk zones (left diagram) must be given special attention due to their geometry, which is complicated for deburring and* ***edge rounding*** *(Ill. 16.2.2.2-8). The affected areas include disk slots (fir tree, dovetail) and bores (Ills. 16.2.1.1-9.1 to -9.6). The right diagram shows a case in which cracking occurred during friction welding, and was evidently connected to cracking in the friction welding burr. It is suspected that the small cracks in the burr acted together with hand sweat to cause SCC in this titanium part (Ill. 16.2.2.3-16).*

***"2/3" Assembly problems and mechanical damages:*** *Joining movements between fitting surfaces (e.g. running a clamping bolt into a disk bore) can create burrs, as well as* ***grooves and galling marks*** *(Ill. 16.2.2.2-2). If* ***cold welding (galling)*** *occurs, considerably higher joining forces can be expected ("2"). If the required axial force is reduced to the point that it prevents contact from occurring, it can lead to dangerous bearing overstress and/or settling movements during operation. If grooves are created by the joining movement, a dangerous reduction of the dynamic fatigue strength can be expected in case of forces acting crossways. Diagram "3" shows a case in which burrs prevent* ***contact between flanges and fitting surfaces. Settling of the flanges*** *during operation possibly during non-steady conditions in which the fastening changes, leads to* ***imbalances and vibrations****. Shavings of burrs between flange contact surfaces can* ***move due to relative movements and create notches.***

***"4" Cause of labyrinth damage:*** *Experience has shown that shavings and burrs in new labyrinths can initiate or promote self-increasing rubbing that can lead to catastrophic failure of the labyrinth ring (Volume 2, Ill. 7.2.2.-4).*

***"5" Burrs as a cause of damage in sections with flow-through: Foreign objects from broken burrs*** *that are carried by a flowing medium can cause damages to other parts.*
*If these particles enter into* ***roller bearings*** *and are impressed or rolled over, they can fatigue the roller surfaces and bearing races.*
*Bearing damages can also be caused by partially blocked oil nozzles and filters. Reduced oil flow leads to damage through overheating and metallic contact of the roller surfaces. Even displaced* ***fuel nozzles*** *can threaten engine safety if the fuel jet shifts and causes* ***local overheating*** *of the combustion chamber and housing (Volume 3, Ill. 11.2.2.2-9).*
*Burr particles between sliding surfaces such as in* ***gear pumps*** *or* ***regulators*** *(e.g.* ***sliders****) can cause blocking.*
*If wheel vanes and metering bores in* ***regulators*** *(hydraulic, pneumatic) are displaced, it will affect their function.*
*Cooled* ***hot parts*** *are especially sensitive to even minor reductions in the cooling air flow. This situation can occur if the* ***cooling air bores of turbine blades****, which have a diameter of only a few tenths of a millimeter, become partially or completely blocked. It is sufficient, for example, to shift a dust-removal bore to the blade tip (Ill. 16.2.2.3-9).*
*Even if burr particles are caught by a* ***magnetic separator****, a warning indicator in the cockpit may require* ***emergency measures*** *and create a dangerous situation.*