7. Michelangelo's Problem
(Work damaged by tool failure)

Let us go back several hundred years and watch the great master at work on a marble statue. Suddenly it goes „ping" and his chisel breaks. Let us hope the statue is not irreparably damaged, too. Anyway, the broken-tool problem has persisted to this day.

The way I see the problem:

We are talking here about tool damage and what it does to the work. Chipped lathe tools, broken drill bits, damaged edges of milling cutters and worn broaches are a hassle not merely because they disrupt production, need expensive replacements and add to the set-up time. The real problem is that they may damage the work by producing notches and burying small cutting edge fragments in the component being worked on. The cost of the damage may easily run into amounts around the price you pay for a nice car. Hopefully, the damage to the work can be repaired, which costs money, after the proper functional department has studied the case, which again costs money, and an absence-of-risk declaration has been issued, which again is a major expense.

The problem grows even worse when the tool damage is not noticed right away and the cutting action of the tool becomes erratic.

Among the factors ensuring that the life of rotating components, especially disks, will be as published is a uniformly optimal surface finish. But when during machining, the material was uncontrollably strain-hardened or unfavorable internal stresses were set up, this will be difficult to detect and evaluation and repair of the damage will become difficult. If the damage is confined to a local dent, the operator would be ill-advised to remove it in the next cutting operation, even if there is enough material to allow this. We can never safely judge the full consequence of the damage beyond the optical impression conveyed by a dent or notch. An important thing to do also, before focused remedial measures can be taken, is carefully inspect the damaged tool and see what caused its failure. Suppose the tool failed because its insert was not the right material or not firmly seated. If that is the case, further tools or machines may be affected and the costly problem liable to recur. It will therefore be necessary to submit not only the damaged component but also the tool for assessment. If you are uncertain, consult your inspection station.

In short: With Michelangelo, if worst came to worst, it was only his purse that suffered, namely when his client refused to accept the piece of art. Not so with us, for whom the safety of customers trusting our products is the foremost concern. Therefore, if we encounter a broken tool, business-as-usual is not the proper practice.

Things to remember:

- When cutting conditions change, significant surface strength properties may also be affected So when a tool fails, assume that the work suffered, too, until demonstrated otherwise.

- When a tool fails, consult your inspection station. If at all possible, keep the tool that was involved in the damage and submit it to assist in the identification of the cause.

- Submit the damaged components “as is” (do not attempt to rework unless so instructed) by your inspection station. Chances are that the damage, if caught early, can be repaired without amending the serviceability of the component.

- We keep and eye on our tools, machines and the surfaces they produce to see how they’re doing, and when we note deviations and changes, we take appropriate action. This is an important part of the inspection accountability assigned operators.

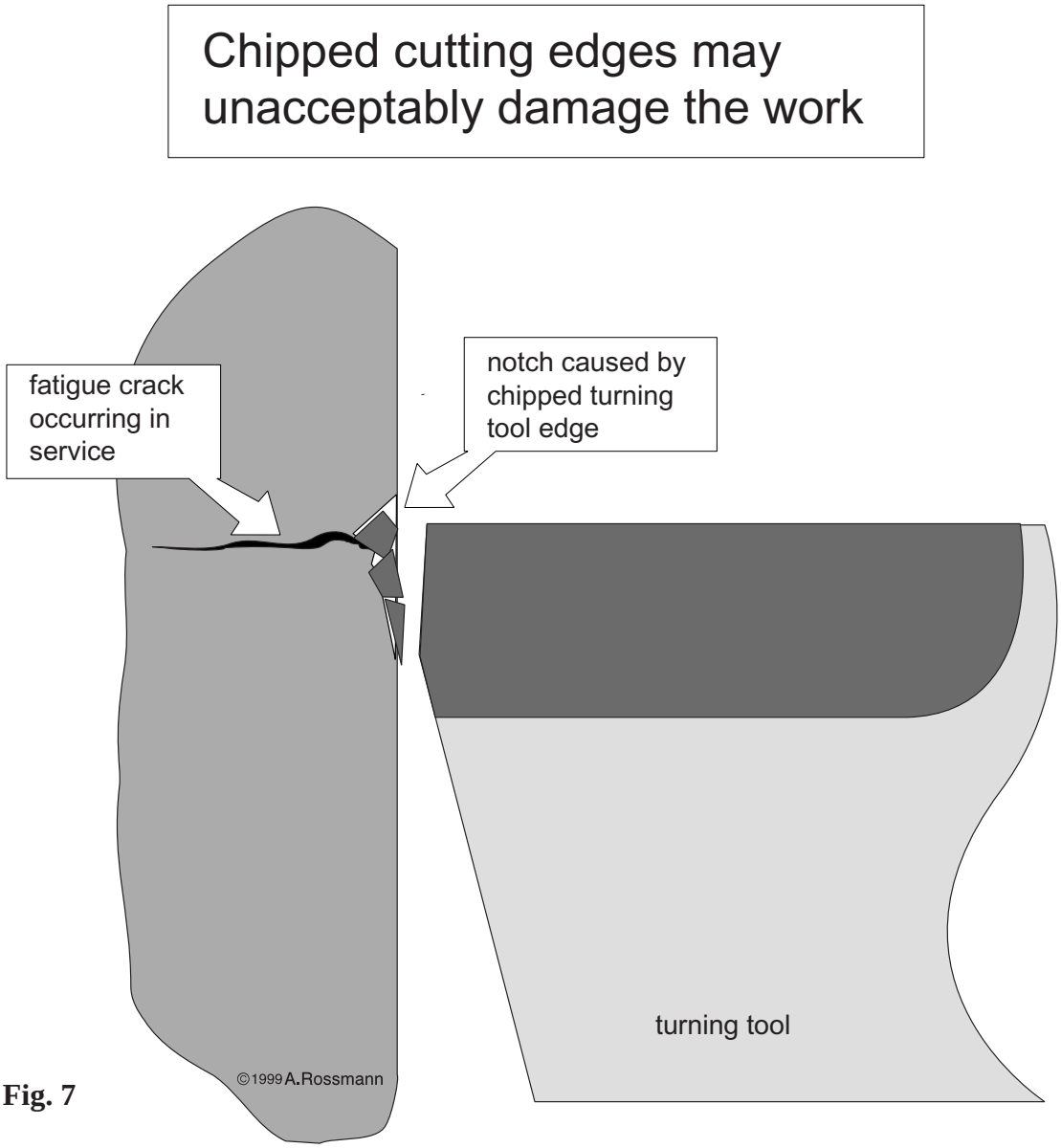

Fig. 7

Chipped tools may be the death of high-cost components. A buried tool fragment may become a stress raiser that starts a fatigue crack in subsequent service. Often, close dimensional tolerances will bar repair. Tool failure, therefore, must be prevented. A high-quality tool is one of the possible solutions. In itself, that may appear expensive but nevertheless is a good investment when it reduces the scrap rate.