by Claude Nahum

progress, we told ourselves that this time we would get to the end of a Le Mans Classic. 'This time we will make sure we bring the car to the end', we would say.

At the end of March the second gearbox had still not been done and was waiting for new shafts to be manufactured.

These were finally ready in Charlotte at the end of May and the second box was to be shipped at the beginning of June. This was cutting things very fine, since Trevor wanted to have 2 valid boxes for Le Mans and one had already been used at Goodwood. The cars were to leave for Magny Cours on the way to Le Mans on 2nd July.

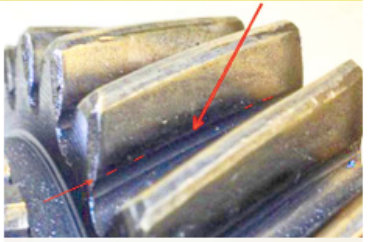
It was during my visits on a Tuesday evening during that first week in June that, while talking about the damaged gears he was showing me on his work-bench, something attracted my attention. All the gears/teeth that failed had done so along a stress fracture that looked like it always started at the same level, along an imaginary line near the root of the teeth.

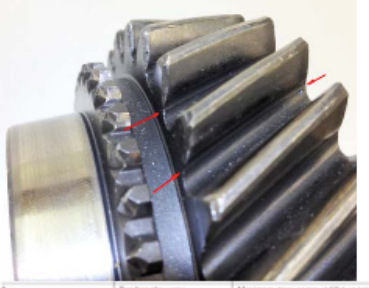
Using a magnifier with an inbuilt lamp, I examined one gear after another to see whether it had been damaged. They all had a line which was anything but imaginary. Some were more visible, others less so, but they all had a clear line, as can be seen below and right.

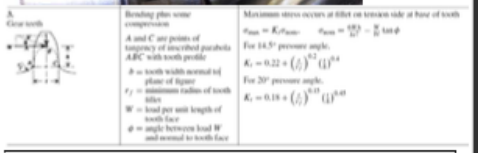
I knew by experience that the line, and especially the way I guessed it had been created, constituted a definite stress raiser. Such stress raisers or 'notches', depending on their sharpness, or how small the radius is, can increase stress concentration by 3 or 4 times. In other words, reduce by the same factor the load that the teeth can take or the number of cycles they can stand before failure.

As can be seen from the figure below, the maximum stress occurs at the root of the tooth (exactly where the 'fault' line existed on our teeth). A notch, fault, step or irregularity at that point was critical and reduced the load-carrying capacity to one third to a quarter of the design rating.

Photos: Claude Nahum







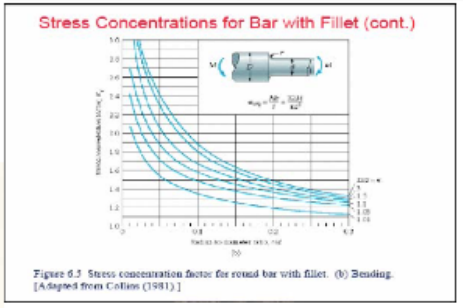
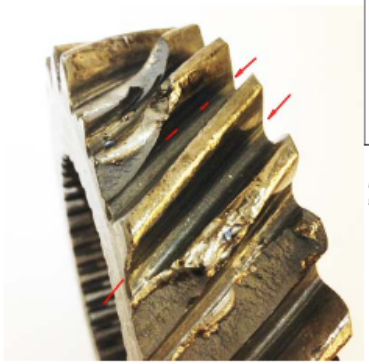


Figure 6.5 Stress concentration factor for round bar with fillet. (b) Bending. [Adapted from Collins (1981).]



The continuing story of Claude's work to achieve reliability, and the result in the 2014 Le Mans Classic, will appear in the next issue.