Date:December 10, 2015Subject:Expected Lifetime of piston skirtsEngine type:all

Caterpillar confidential: green

Nodular Cast Iron Piston Skirts

With distribution of our Service information 12/07 of August 2007 especially for M32 (C) and Service Information 0004com of November 2013 for all current engine models, we informed all operators about our recommendation to limit the lifetime of piston skirts made of nodular cast iron to 60,000 operating hours. Today, we would like to give an update about our continuous investigations about the durability of piston skirts.

The statements made in the earlier service information are still valid. Because of the aging process of nodular cast iron, the material's fatigue strength will decrease during operation. In theory, this means that every piston skirt will reach the time when its material's fatigue strength has decreased such, that under certain operating conditions, the load on the skirt becomes greater than the fatigue strength. This may lead to piston skirt failures.

We recommend exchanging nodular cast iron piston skirts at 60,000 operating hours to avoid a possible engine failure. At 60,000 hours, pistons have to be removed for overhaul anyway. This is also close to the time when, under a combination of unfavorable circumstances, the theoretical safety margin of the fatigue strength of the piston skirts' material under full engine speed and full engine load reaches a critical level. Based on the idea to keep the risk of failure as low as reasonably possible, we chose this rather conservative approach for our recommendation so far.

Through our Continues Product Improvement Process we have gained additional experience with engines with long operating hours. The experience made has led us to re-evaluate our current recommendations.

As mentioned in Service information 12/07, there are circumstances which may accelerate the decrease in fatigue strength of a piston skirt's material (e.g. engine over speed, light piston seizure/ piston jamming, wrong synchronization of generator sets, hydraulic lock, faulty assembly of piston skirt and piston crown, disruptions of the combustion process).

- As long as none of the circumstances mentioned above has occurred, and an engine is not operated permanently near the specified limits e.g. in terms of load and speed, the decrease in fatigue strength might be slower than expected, and the probability of a piston skirt failure shortly after 60,000 operating hours is low.
- A crack test of piston skirts performed by experienced personnel does not allow an authoritative forecast about the growth rate of a detected crack or the remaining safe lifetime of a piston skirt. But it can detect possible cracks at a very early stage.



Date:December 10, 2015Subject:Expected Lifetime of piston skirtsEngine type:all

Caterpillar confidential: green

Therefore it can be assumed that piston skirts may be operated beyond 60,000 operating hours if certain conditions are met:

- No deteriorating factors as mentioned above occurred over the lifetime of the piston skirt
- No wear limits of the piston skirt are reached
- Other components of the engine's running gear do not show unexpected wear patterns
- Crack test of the piston skirt's surface shows no indications in critical areas

For operators who choose to extend the lifetime of their pistons beyond 60,000 operating hours, we highly recommend to repeat the crack test at least at every scheduled maintenance interval.

At this stage, our experience with nodular cast iron piston skirts in operation for more than 90,000 hours is very limited. However, it is certain that the safety margin will continuously be reduced due to the decrease in fatigue strength over the lifetime. For a conservative approach, we therefore recommend not to go beyond 90,000 operating hours, even if all conditions above are met.

Please note that even if all conditions mentioned above for extending the lifetime are met, Caterpillar cannot guarantee a specific lifetime and does not accept any responsibility for piston skirt failures.

Steel Piston Skirts

Steel pistons skirts were only introduced in late 2003 and the current lifetime recommendation is 90,000 hours. We recommend not to extend operation beyond this lifetime until further notice.

