

# A Study on Serrated Chips Formation in Drilling Ti-6246

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## Abstract

Until now, there are two theories how this serrated chip formed, both argued with their evidence. One is the adiabatic shear theory, which suggests that serrated chips are caused by periodic thermoplastic shear instability happening within the primary shear zone. Another theory is called periodical crack theory, which explains that serrated chips result from cracks initiating periodically from the free surface of the chip and then propagating to the tool tip. This research is an attempt to reveal chips formation mechanism in drilling Ti-6246. Different heat treatment toward the Titanium blocks was carried out prior to drilling. Cutting speed, feed rate and depth of drilling were varied in three levels. Bare eyes observation shows that drilling with higher feed rate, lower cutting speed and with coolant application result in the segmented chip. Whereas, low feed rate, and high cutting speed result in long curly chips. When drilling deeper, a zigzag chip was resulted regardless the machining parameters applied. Further observation using SEM on these chips revealed that basically the chips are the serrated type. The chip is consisting of segments and a shear plane in between. Chips also experienced shear deformation at the bottom area where chips in direct sliding on the rake side of the tool. None of the observation shows that the crack of the chips initiated from the free surface of the chips then propagated to the tool-chip surface.

Keywords: chips formation, serrated chips, Ti-6246, SEM