This paper presents an experimental study of the cutting force and chip formation in the end milling of the nickel-based superalloy, Hastelloy C-2000. The experiment was conducted using two different cutting inserts under wet conditions - namely physical vapor deposition coated with TiAlN, and uncoated carbide. The assessment of machining performance is based on a design of experiment. New insight into the influence of the cutting process on the cutting force and chip formation are key measures of machining performance. The effect of the machining parameters on chip formation was examined through scanning electron microscope micrographs and energy dispersive x-ray tests. The cutting forces and chip formation analysis for different sets of experiments were examined and compared in order to establish the most suitable cutting conditions, through highlighting the drawbacks and by suggesting proper measures to be undertaken during machining performance, which might overcome the barriers of machining Hastelloy C-2000.