Hot stamping with high strength steel is becoming more popular in automotive industry. In hot stamping, blanks are hot formed and press hardened in a water-cooled tool to achieve high strength. Hence, design of the tool with necessary cooling significantly influences the final properties of the blank and the process time. In this paper a new method based on systematic optimization to design cooling ducts in tool is introduced. The optimization procedure was coupled with FE analysis and a specific evolutionary algorithm. Through this procedure each tool component was separately optimized. Subsequently, the hot stamping process was simulated both thermally and thermo-mechanically with the combination of optimized solutions.