Roll gap per rotation optimization in a Radial Ring Rolling Process

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Abstract. Radial Ring rolling is a plastic deformation process where a seamless ring is obtained starting from an hollow circular preform: an Idle roll force the ring versus a Driver roll that impose the ring rotation. In particular the Idle roll applies a compression force on the ring so that a cross section reduction and a diameter expansion occurs. The main aim of the Driver roll is to impose an high rotational speed and guarantees and axial symmetrical deformation to produce a good quality ring.
Usually, in industrial environment, a constant rotation is set for the Driver roll, but this approach does not let a constant ring angular velocity because of its diameter expansion. In particular, the higher is the ring diameter the lower is its angular velocity. The main risk due to this constrain is the generation of a non-uniform ring geometry. An innovative approach is to design a driver roll speed law to obtain a constant ring rotational speed and control the ring deformation.
In this paper a FEM approach was followed to investigate the ring angular velocity and Idle roll speed in order to evaluate the correct roll gap per rotation parameter. Three different Driver roll speed laws and three constant Idle roll speed laws were investigated. Moreover, three different form factor W/H (width on height) have been tested. Results have been analyzed by a geometrical and physical point of view.