Critical review of electrochemical honing (ECH): sustainable and alternative gear finishing process. Part 1: conventional processes and introduction to ECH

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Surface characteristics of gears affect the various performance characteristics of the gears such as load carrying capacity, service life, operating performance, wear characteristics, transmission characteristics and noise generation characteristics. Surface characteristics of a gear have two major components namely (i) *surface quality* which includes surface finish, micro-geometry (i.e. form and location errors), tooth flank topology and wear characteristics; and (ii) *surface integrity* aspects which includes microstructure, microhardness and residual stresses. This paper discusses here in Part 1 conventional gear surface finishing processes and their advantages and limitations, and introduces the electrochemical honing (ECH) process to improve the surface characteristics of different types of gears, working principles, mechanism of material removal and equipment details. Part 2 will give a review of past work, and discuss effects of various process parameters on surface characteristics and finishing productivity (i.e. material removal rate), advantages and limitations, and its other applications. This review paper aims to establish ECH as one emerging alternative, economical, productive and sustainable gear finishing process.