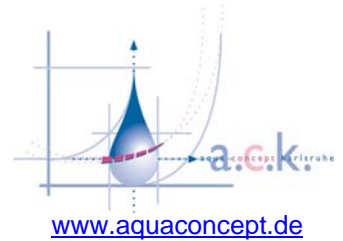


Continues nickel-recycling with integrated electrolyt-purifying

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Abstract The costs to process nickel electroplating in general metal finishing nearly doubled since 2006. The Enviolet®-UV-Oxidation unit gives an integral process solution for reduction of costs, improvement of quality and for environmental protection while operating nickel electroplating lines. This special process converts used rinse water into a complete new process solution. Furthermore the electrolyte is continuously purified from degradation products. As by-product rinse water of a high quality is produced, which flows direct into the first rinse of the plating line. This reduces the consumption of de-ionised water.

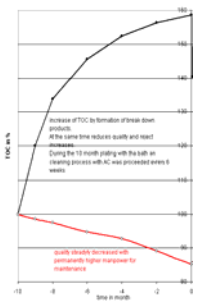


Fig1: Accumulation of TOC during the plating process.

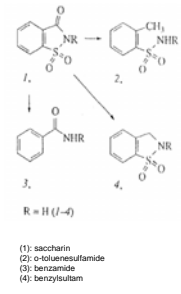


Fig2: Products of major cathodic reactions of saccharin, formed during Ni deposition [7].

Introduction On the 9th of May 2007 the index for nickel noted at 51.800 \$/t, this date marks the actually all-times high. Therewith the course has doubled since 2006 [1]. Although in an intermediate term, by raising the world wide mine production, a small relaxation is expected. All producers and consumers world wide , especially the asian stainless companies, work on reasonable capabilities for substituting the nickel [2]. In general metal finishing the Enviolet®-System is an approved method. Against first doubts due to negative effects on the additive systems, the practice clearly proved the efficient function for bath recycling [3, 4].

Problem While running nickel electroplating lines evaporation losses and drag-out are unavoidable. Without the Enviolet®-System a recirculation of rinse water is limited, because different process steps (Dull-; Bright-; Semi Bright- and Satin-Nickel) include different additive-systems. These additive systems cannot be mixed with each other. Furthermore every nickel electrolyt underlies a phenomenon often described as "bath-aging"; initiated by accumulation of degradation products of the additive system [5]. The consequences of bath-aging are diminishing layer characteristics (e.g. decreasing ductility, decreasing throwing power and increasing residual stress) and rapidly increasing reject rate (Fig. 1, 2).

Solution The Enviolet®-unit (Fig. 3) oxidizes the organic components in an exothermal process (1). The chemical energy of this process is used to concentrate the nickel up to plating conditions. The regained plating solution (2) complies as Watts's basic electrolyte of highest quality and can be used for all nickel applications (Dull-; Bright-; Semi Bright- and Satin-Nickel)[6,8]. As by-product rinse water of a high quality is produced, which flows direct into the first rinse of the plating line. A heat recuperation (3) optimizes the energy balance by multiple use of the reaction heat. The nickel plating line will cause no more waste water. All nickel goes to production and not to waste water. The used rinse water will either be regained to fresh rinse water or will be concentrated up to plating conditions (Fig 4).

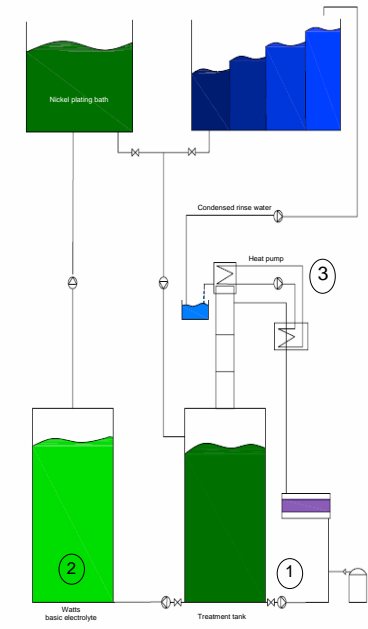


Fig3: Scheme of Enviolet®-UV-Oxidation system

Economic data from US motorcycle manufactory (chromium plating)

Electrolyte: Semi-Bright nickel	V=38m ³
Electrolyte: Bright-Nickel	V=38m ³
Electrolyte: Micro-Porous-Nickel	V=9,5m ³
Investment:	ca. 250.000 €

Saved costs: ca. 375.000 \$/year

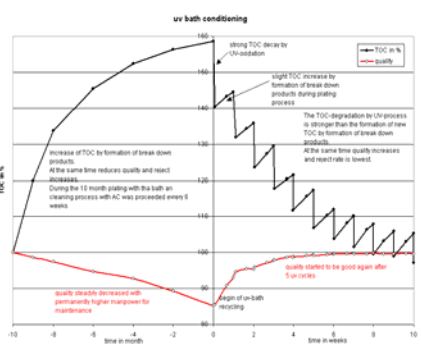


Fig4: Correlation of TOC and Quality

Economic potential Conditional on the high costs for nickel and nickel sulphates the return on investment depends on plant size and throughput. ROI will take place between 9-12 months. Furthermore the underlying benefit of the Enviolet®- treated electrolyte is best: constant best ductility, uniformly most effectiv throwing power, constant a minimum of residual stress and steady production with a minimum of reject rate. An investment of highest value for every nickel plater.

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 [2] Dow Jones Neuss GmbH; Bereich Business Newsletter; Baseler Arkade
 Wilhelm-Leuschner-Str. 58, D-40228 Frankfurt
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