

Use Case for Novel Metal Surface Finishing Technology

Degree programme : BSc in Industrial Engineering and Management Science

Specialisation : Business Engineering

Thesis advisor : Prof. Dr. Cédric Bessire

Expert : Prof. Dr. Bastian Widenmayer

Industrial partner : Swiss Plasma Polishing, Biel/Bienne

Metal finishing is essential in diverse industries requiring high-tech surfaces, yet conventional methods are often environmentally harmful and unsuitable for complex geometries. Therefore, Swiss Plasma Polishing has developed a jet-based plasma electrolytic polishing (PEP) process — a precise, localized, and environmentally friendly method for surface finishing. This work aims to identify use cases with strong market potential for this technology.

Introduction and Objectives

Several high-tech industries rely on precise metal surface finishing processes for reasons such as hygienic design, abrasion and corrosion resistance, or visual gloss. However, due to limitations of current polishing methods, desired results cannot always be achieved. Swiss Plasma Polishing, with its expertise in PEP and PEP-Jet, provides a promising solution but still needs to find effective ways to enter the competitive surface finishing market. The goal of this thesis is to support Swiss Plasma Polishing in identifying the industries with the greatest interest in new surface finishing technologies, uncovering specific needs that PEP can address, and highlighting promising use cases that offer strong potential for a successful market entry.

Research Method

The thesis is focused on identifying promising use cases within industries likely to adopt PEP or PEP-Jet. This was done with a mix of different research approaches. First, desk research identified relevant application areas based on literature and PEP's unique properties offering clear advantages for specific components. Second, qualitative interviews validated these use cases, uncovered new opportunities, and clarified challenges in detail. The results, including pains and needs, are summarized in Figure 1. The insights contributed to actionable recommendations for a clear market entry strategy for Swiss Plasma Polishing.

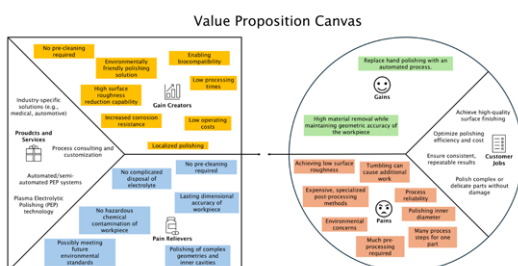


Figure 1: Value Proposition Canvas illustrating the identified pains and gains of current polishing technologies.

Results

The analysis of various industries and their surface finishing needs has revealed significant potential for the polishing technology in the food and pharmaceutical processing sectors. Common polishing challenges such as lengthy process chains, environmentally harmful methods, and unreliable procedures were identified—issues that PEP can effectively address. Moreover, specific use cases like 3D-printed complex spray balls for cleaning procedures in food processing industries illustrate how PEP can enable innovative manufacturing solutions. These industries also represent large, expanding markets with strong future growth potential.

Implications and Recommendations

The analysis shows significant interest and strong potential for the new PEP-Jet method in the market. For a successful market entry, Swiss Plasma Polishing should pursue two parallel strategies, both focusing primarily on the food and pharmaceutical processing industries. It should offer polishing as a service and act as a comprehensive solution provider, concentrating on specific use cases such as 3D-printed spray balls (see Figure 2) to clearly demonstrate PEP's ability to achieve the desired surface quality and functional results. Simultaneously, achieving these results in targeted use cases will help build valuable knowledge and credibility, enabling the company to expand polishing as a general service alternative to today's conventional surface finishing technologies across various sectors.



Simon Beat Kilchenmann
simon.kilchenmann@outlook.com

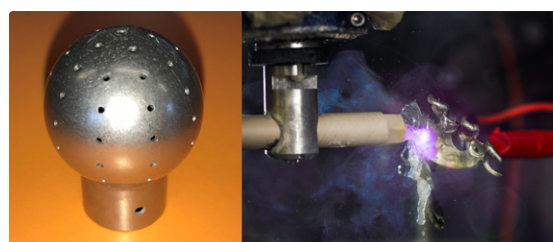


Figure 2: A 3D-printed spray ball (Ceramic AG) as a potential use case (left), and the PEP-Jet process in action (right).