

Customized Descaling Robot Arms Still today, Descaling Robot Arms improve Health and Safety while increasing productivity

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Abstract

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Over the years, Mecfor's Engineers came to a thorough understanding of the Bayer process having dealt with many customers' requests to find optimized solutions for their descaling operations. In fact, Mecfor has designed customized solutions for almost every type of reservoirs that can be found throughout the process. Alumina producers are facing operational challenges where Occupational Health and Safety, productivity and maintenance costs criteria are putting stress on the final cost/ton sold. Everyone knows that alumina production capacity decreases as residue and scale build in production vessels, whether it be on a digester's shell or a thickener's wall. Nevertheless, descaling operations often delay or limit operations because of the necessary downtime required to perform this maintenance operation. The purpose of this paper is to highlight the many advantages of descaling a reservoir, such as a desilication tank, bauxite digester or red mud thickener, with a remotely controlled descaling robot arm, rather than by installing scaffolding and having workers manually remove the scale with jackhammers or using a remote-controlled vehicle. In large tanks, such as thickeners and washers, remote-controlled vehicle can work well. In other instances, both methods generally present hazards and create damages. For 25 years, Mecfor has designed, manufactured and commissioned many descaling robot arms for various vessels' model. Mecfor's field of expertise reveals that the use of a descaling robot arm dramatically improves the workers' working conditions, greatly reduces downtime required to perform this critical operation, and also improves production capacity. Furthermore, Mecfor descaling robot arms are highly adaptable to a variety of reservoir configurations and sizes and integrate many descaling methods.

Keywords: Desilication and Descaling, Bayer process, robot arm, alumina production, Health and safety.

1. Introduction

In the early 90s, customers were concerned about descaling operations performed on large thickeners. Plant management would no longer allow operators to go inside reservoirs to remove the scale manually as this operation was unsafe. The normal descaling procedure involved the installation of scaffolding inside the tanks, and workers had to remove the red mud residue with jackhammers. Depending on the configuration of the reservoir, this descaling operation could also require that the descaling be carried out in confined spaces with poor ventilation. Needless to say, the workers were subjected to intensive physical labor in difficult conditions, which in turn posed major safety hazards. Clients sought for improved working conditions by integrating mechanized solution to reduce human exposure to dangerous work environment.

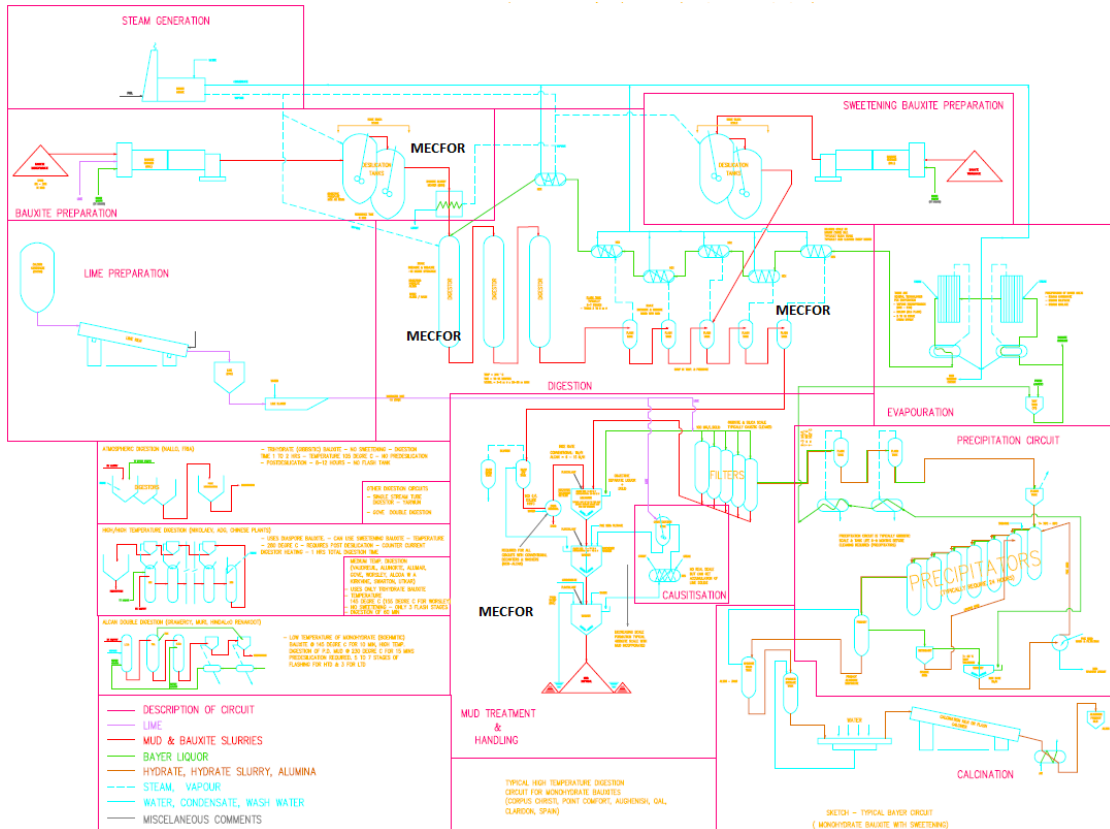


Figure 1. Bayer process: Alumina production.

While studying the previous descaling procedures, it became clear that the alumina production and capacity were also at stake. The downtime required to perform descaling operations on a large reservoir was between four to six weeks and required two to five workers. In addition, the descaling time was often extended due to unforeseen scale conditions. Such delays disrupted and extended the entire descaling program and resulted in even more scale accumulations within the operating vessels.

Several factors were taken into account during the concept development. The chosen equipment had to be user-friendly, reliable, accurately positioned, and it had to significantly reduce downtime while improving the operators' working conditions. The challenge was definitely worth it as it resulted in downtime being reduced from over four weeks to less than one week, and only one or two workers were required to perform the descaling duties. The operators remotely controlled the robot arm from a comfortable and ergonomic state-of-the-art station.

Nowadays, more descaling methods can be looked into, but robot arms were found to be the safest and most efficient one. Mecfor Descaling Robot arms can come with either a mechanical or water jetting solution. Also, our Electrical Engineers can automate the descaling process sequences. All these aspects are studied and discussed with the client when working with Mecfor.

2. Mechanical or Water Jetting

Descaling technologies have been upgraded and improved. Mecfor's design has been adapted to many descaling methods, such as high-pressure water jets 20 000 psi (1400 bars), hydraulic hammer and flails. Although all descaling methods have their own merits and limitations, the flail method presents undeniable advantages for pressure vessels. Since the flail's chains remove scale in a manner completely different than the perpendicular and direct impact of a conventional