# Enhancement of Filter Bag Life in EGA's GTC

**Abdulrahman Flamarzi[1], Mohamad Abdulghafor[2], Auhood Al Jasmi[3] and Bharat Gadilkar[4]**

1. General Superintendent - FTP/GTC
2. Senior Manager- FTP /GTC Plant Optimization. & Refurbishment
3. Senior Supervisor - FTP/GTC
4. Senior Technician - Process Control

Emirates Global Aluminium, Abu Dhabi, United Arab Emirates
Corresponding author: abfalamarzi@ega.ae
https://doi.org/10.71659/icsoba2025-al061



**Abstract**

Gas treatment centre (GTC) is essential for treating hydrogen fluoride (HF), sulphur dioxide ($SO_2$) and particulate emissions from aluminium smelting process, using dry scrubbing and wet scrubbing before they are released into the atmosphere. Recently, Emirates Global Aluminium (EGA) has encountered early filter bag failures (in less than one year), which compromised the efficiency, emissions control and cost-effectiveness of the GTC. This paper investigates the causes of early filter bag failure, including factors such as fine alumina, high filtration velocity, dust load and flow patterns in the bag houses. By analysing these factors, EGA developed short-term strategies to mitigate early failures and improve the overall performance and longevity of the filter bags. This paper will share the actions taken to mitigate temporarily the short bag life, which helped to improve the bag life by 6–12 months. Now EGA is aiming to establish long term actions to normalise filter bag life to typical three years.

**Keywords:** Filter baghouse, Alumina and gas distribution, Abrasion, Filtration area, Filter bag life.

## 1. Introduction

The filtration bags within a Gas Treatment Centre (GTC) are crucial for the abatement of particulate matter and HF emissions derived from aluminium reduction processes. At Al Taweelah, six GTC units equipped with 116 000 filter bags, with a filtration surface of 283 000 m², have recently encountered premature degradation, reducing their operational lifespan from an anticipated 2.5–3 years to less than one year as shown in Figure 1. This increased maintenance expenditures and operational interruptions, thereby posing significant challenges to operational efficiency, financial stewardship and adherence to environmental regulations.

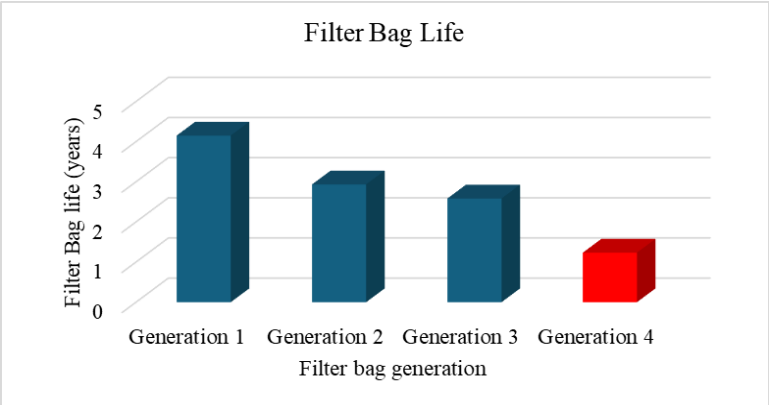


**Figure 1. Graphs representing bag lifespan deterioration.**

## 2. Root Cause Analysis (RCA)

An internal EGA team and external experts (from original equipment supplier (OEM) of filter bags and consultants) engaged in a comprehensive multilayered investigation, where various aspects of the filtration system were analysed. The team examined material degradation by analysing the composition and wear patterns of used filter bags, ensuring that any contributing weaknesses were identified. Operating conditions, such as temperature, humidity and pressure, were monitored continuously to establish any correlations with the premature failures. Moreover, the particulate composition was studied meticulously to understand how the nature of the dust and gas interacted with the filter materials.

The collaboration with external experts brought additional insights, leveraging cutting-edge technologies and methodologies. They deployed advanced diagnostic tools to map out the exact points of failure and employed computational fluid dynamics (CFD) simulations to visualise gas flow and particulate distribution within the GTCs. These techniques provided a clear picture of the internal dynamics, enabling the team to pinpoint the root causes of the issues.

The findings from this extensive investigation revealed several key factors responsible for the premature filter bag failures described below.

### 2.1 High Gas Flow and Velocity

Excessive gas flow velocity can result in abrasion and subsequent deterioration of the filter bag material. To address this issue, EGA embarked on a comprehensive measurement campaign and analysis of gas flow rates from the pots, individual filter compartments, and the stack. The outcome revealed minor imbalances in the gas flow rates from the pots and individual compartments, suggesting the need for recalibration and optimisation to mitigate localised wear and enhance the overall performance of the filtration system.

### 2.2 Uneven Flow Patterns

Due to localised damage observed in the filter compartment, EGA validated the gas flow patterns in both the design and current condition (Figure 2). To investigate the causes of uneven gas flow, factors such as scale formation, alumina and gas deflector conditions, alumina distribution and gas flow behaviour were reviewed. The finding was that there was a lot of scaling on the gas deflector which could contribute to interrupt the gas flow profile and cause uneven gas distribution, causing localised stress on certain filter bags and reducing their lifespan. Moreover, it was investigated if the OEM designed the compartments have some zones with higher velocity compared to other zones.

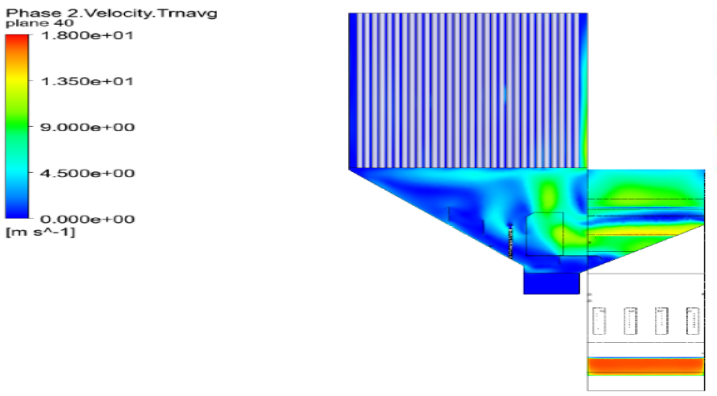


**Figure 2. Simulated gas flow velocity.**