CASE STUDY

Arsenic Removal Well Water
Location: Salamanca, Mexico

Technology: Catalytic Carbon & TitanSorb

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INTRODUCTION

Watch Water is a global leader in providing the most effective solutions for water and waste water treatment. This case study focuses on how our client benefitted from using our knowledge and were successfully able to remove arsenic from water.

Well water, which is typically seen to be a safe and independent water supply, can disappointingly contain huge amounts of **arsenic**, presenting a substantial health danger to people who consume it. Long-term exposure to arsenic-contaminated water can cause a variety of health problems ranging from skin lesions and respiratory problems to cardiovascular diseases, cancers as well as growth abnormalities in children.

CLIENT BACKGROUND

Our client VESTPA SA DE CV in **Mexico** faced the challenge of treating well water contaminated with arsenic to meet water purification standards. According to the Mexican regulatory standards at that time, arsenic should be limited to **0.025 mg/l** in drinking water. This limit reduced further down to 0.010 mg/l later on, matching up with the European standard for arsenic in water. To tackle this issue, the company conducted a treatability study to explore effective removal methods.
This study was conducted in 2016 and involved testing three technologies:

- Oxidation and Coagulation-Flocculation
- **Catalytic Carbon** Adsorption (Watch Water)
- **TitanSorb** Adsorption (Watch Water)

RAW WATER

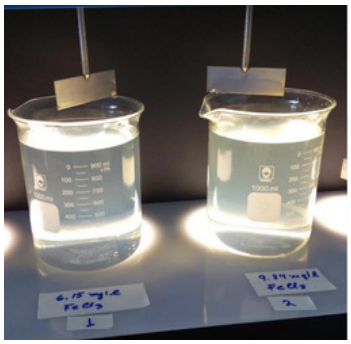
According to the data provided by the client, arsenic was quite above the permissible amount.

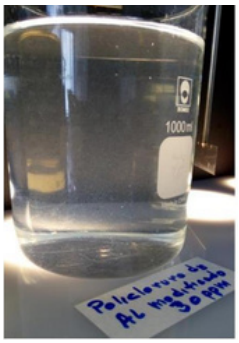
Arsenic = 0.082 mg/l
pH = 8.17

Iron could not be detected in raw water, which is crucial for making final decision to select the type of coagulant to be used.

OXIDATION & COAGULATION-FLOCCULATION

Oxidation, followed by coagulation-flocculation and filtering, is a typical method for removing arsenic from water; however, its efficacy is controlled by the presence of other elements in the water, such as iron and organic matter.





Because iron was not available in this case, an iron-based coagulant (ferric chloride) was used first, followed by high molecular weight anionic polymer-based flocculation. As an oxidant, calcium hypochlorite was utilized. Due to inefficacy of ferric chloride, another test with Aluminum Polychloride was also conducted which reduced the arsenic to 50%, but it was still not enough to satisfy the standards.

CATALYTIC CARBON ADSORPTION

The first adsorption study was done using our **Catalytic Carbon**. Catalytic Carbon is made using the highest capacity activated carbon which is catalyzed **iron-hydroxide**. This catalyst further enhances the adsorption of contaminants. Catalytic Carbon is the only available Carbon in the market which is regenerable. The researchers also investigated arsenic removal using adsorption.
A 400 ml sample of catalytic carbon was made, cleaned, and rinsed. The pH of the sample was adjusted to match our suggestion of 6.8-7.0, and the water was run through the catalytic carbon column. The pH adjustment is required because the clearance % falls significantly beyond the acceptable range. This is mostly due to the interference of silica, which may compete for adsorption sites.

TITANSORB ADSORPTION

Another adsorption study was done using our Titanium dioxide (**TiO2**) based adsorber in granular form which we call **TitanSorb.** The testing procedure was similar to that of Catalytic Carbon, with faster flow rate through the column and lesser contact time.
Again here, the pH adjustment was recommended, but there was still a window to increase the flow rate even further.

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RESULTS

- The Oxidation and Coagulation-Flocculation: When ferric chloride could not provide required results, Aluminum Polychloride was used instead. While arsenic removal was **possible** (not sufficient), the method's **high operating cost** and **specialized requirements** deemed it less feasible for the project's scope.

- **Catalytic Carbon** Adsorption: The catalytic carbon demonstrated a significant reduction in arsenic levels, proving its efficiency. Adjusting pH and flow rate could further enhance results. The Arsenic contact was reduced down to 0.0029 mg/l which is more than **96%** reduction. With proper pH adjustment, an empty bed contact time as low as 4 minutes was also feasible.

- **TitanSorb** Adsorption: Titansorb yielded results similar to catalytic carbon, reinforcing the effectiveness of both methods. The percentage of Arsenic reduced was quite similar while offering higher flow rate. With proper pH adjustment, an empty bed contact time as low as 3 minutes was also feasible.

Catalytic Carbon and Titansorb were both identified as effective solutions for arsenic removal from well water.

CONCLUSION

VESTPA SA DE CV successfully evaluated different strategies for removing arsenic from well water in this treatability research. **The utilization of Catalytic Carbon and Titansorb proved their ability to fulfill regulatory criteria while also delivering efficient and cost-effective solutions.** Further optimization and adaption to situations in the real world offer the possibility of providing communities with safe, arsenic-free water.

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