

Paper ID: MT452

**The 3rd International Conference on Mechatronics and Automation
Technology (ICMAT 2024)**

Analysis of the Causes of Fouling in Ceramic Ultrafiltration Membrane in the Heating Network Water Supplement Treatment System of Thermal Power Plants

Zheng XIE¹, Jin LIU and Desheng CUI

¹ Huadian Water Technology Co., Ltd, China;

Email:2082801501@qq.com

Introduction



The pore size of ultrafiltration membranes ranges from 20 to 50 nm, which is small enough to remove most particles and colloids. Additionally, they only require low driving pressures to effectively ensure the safety of the treated water. However, the narrow pore size can trap or adsorb macromolecular pollutants in the solution, and the ultrafiltration membranes can react with pollutants in the water, leading to reduced pore sizes, blockages, or even damage to the membrane structure. This results in decreased permeation flux, severely hindering the advancement of membrane technology and the development of the membrane industry. Membrane fouling has now become a major issue restricting the application of ultrafiltration technology in human life. Therefore, finding effective solutions to the problem of membrane fouling is of significant importance.

Issues in the Actual Operation of Ultrafiltration Membranes

List of operational data

Analysis of Actual Operation Issues of Ultrafiltration Membranes

Analyze from seven aspects combined with actual operation

Solutions to Actual Ultrafiltration Membrane Fouling Issues

The analysis of the actual fouling problems of ultrafiltration membranes indicates that issues one to four are related to pre-treatment, issue five pertains to valve material problems requiring material replacement, and issues six and seven involve design considerations that need to be revised. Below are solutions proposed in three areas addressing the above issues.

Method 1

Pre-treatment
Technology to
Control
Ultrafiltration
Membrane Fouling

Method 2

Replace valve
material to control
ultrafiltration
membrane fouling

Method 3

Change the
imperfect design
to control the
blockage of the
ultrafiltration
membrane

Conclusion

According to the actual situation, the whole system was modified and summarized as follows: 1) The pretreatment section was adjusted, the pH value was adjusted to 7.5, the PAC dosage was corrected as adjusted to 5mg/L, and the GT value of the coagulation and stirring was controlled to 50000. 2) The valve material at the final alkali dosing point was changed to 316 stainless steel, and the valve material at the acid dosing point was changed to Hastelloy B. 3) During the chemical cleaning of the ultrafiltration system, the water return pipe and the concentrated water return pipe were designed separately, a pressure gauge was added to the concentrated water return section of the ultrafiltration frame, and a sampling valve was set on the backwash upper discharge pipe of the ultrafiltration frame.

References

- [1] Liu Qiang Zhang Liguo, A Brief Discussion on the Application of Ultrafiltration Membrane Technology in Environmental Protection Engineering Water Treatment, Leather production and environmental technology, May 2024
- [2] DONG Bingzhi, WANG Hongwu, FENG Jing, et al. Influence of coagulation pretreatment on UF membrane flux[J]. Environmental Science, 2008, 29(10): 2783-2787.
- [3] WANG Yufei. Research on coagulation-membrane filtration drinking water treatment technology based on "post-flocculation" control[D]. Tianjin: Tianjin University, 2017.
- [4] CAO Hongwei, CHENG Jianfeng, WANG Zhimin, et al. Existing problems and solution for desalination station in a Shandong refinery[J]. Industrial Water Treatment, 2020, 40(8): 116-119.
- [5] J.W. Hutcheson, "Control Valve Handbook", Second Edition, Instrument Society of America
- [6] WANG Yufei. Study of coagulation-membrane filtration technology for drinking water treatment based on re-flocculation control[D]. Tianjin: Tianjin University, 2017.