



**CWT**  
CLEAN WATER TECHNOLOGY

# Petroleum

## GEM System helps China National Petroleum Corporation (CNPC) Dushanzi Petrochemical To Optimize Wastewater Pretreatment Performance

Our client, CNPC Dushanzi Petrochemical Ethylene Factory, has 4 production lines of styrene-butadiene rubber. The factory adds sodium polycarboxylate + calcium chloride during the production process. This improves the dispersion of the compounding ingredients in the rubber, shortening the mixing time and improving the physical and mechanical properties of the rubber.

Polycarboxylate is a negatively charged surfactant and dispersant with a hydrophobic molecular backbone and hydrophilic side chains. This unique molecular structure encapsulates the gel particles through the action of spatial site resistance, electrostatic repulsion and solvent chains. It is difficult for colloidal particles to aggregate and merge until they are stably dispersed in the solution.

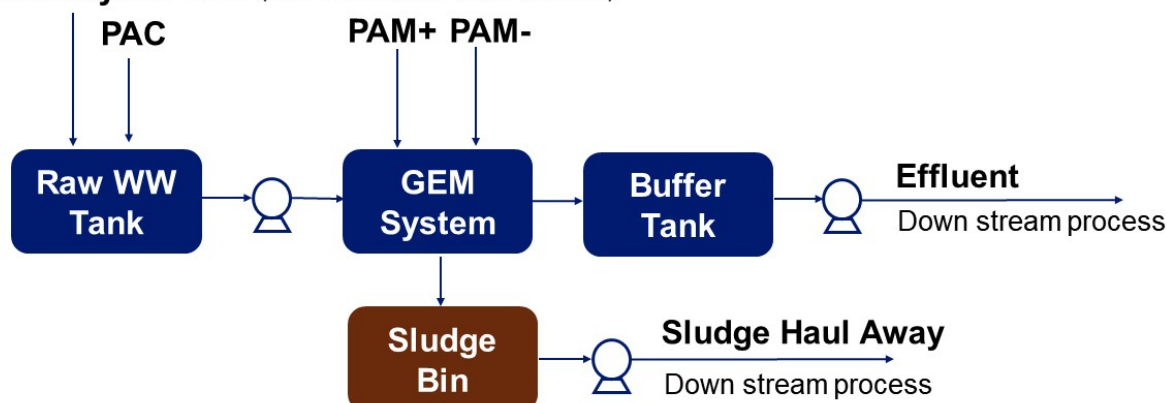
The wastewater discharged from the factory contains polycarboxylates and microfine rubber particles, resulting in the failure of the downstream wastewater treatment facilities to work properly. Polycarboxylate makes the aeration tank produce a large number of bubbles. This ensures that the rubber particles adsorb the oil slick to maximize the oil skimming device's effect.

CNPC's Dushanzi Petrochemical Ethylene Factory has been looking for technology to overcome this wastewater treatment problem for a long time. Finally, in 2015 Clean Water Technology had the opportunity to participate in the retrofit project, for which the GEM System treatment solution was carefully prepared. At the end of the year, the client's long-standing wastewater pretreatment problems were successfully solved!

For this project, CWT uses the GEM (Gas Energy Mixing) System by adding PAC (polymerization aluminum chloride), cationic PAM (polyacrylamide aluminum chloride) and anionic PAM. Consequently, the steady-state system of wastewater is destroyed and polycarboxylate and microfine colloidal particles are removed from the wastewater.

Wastewater Treatment Process Flow:

**Polycarboxylate WW** (50m<sup>3</sup>/h x 2 sets. Total: 100m<sup>3</sup>/h)



**CWT | Industrial Wastewater Leaders**  
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**Table 1 - GEM System Chemical Dosage**

| CATEGORY      | PAC                        | CATION PAM                   | ANION PAM                     |
|---------------|----------------------------|------------------------------|-------------------------------|
| Specification | Aluminum oxide $\geq 28\%$ | Molecular weight $\geq 800w$ | Molecular weight $\geq 1200w$ |
| Dosage        | 200mg/L                    | 20mg/L                       | 14mg/L                        |

**Table 2 - GEM Treated Water Quality Data**

| ITEM     | Inlet polycarboxylate mg/L | Suspended Inlet water SS mg/L | Effluent polycarboxylate mg/L (Target value 2) | Suspended in the effluent | Main pollutant removal rate |
|----------|----------------------------|-------------------------------|------------------------------------------------|---------------------------|-----------------------------|
| Sample 1 | 88,4                       | 106                           | 0.64                                           | 6                         | >99.2%                      |
| Sample 2 | 108                        | 120                           | 0.22                                           | 8                         | >99.5%                      |
| Sample 3 | 100,7                      | 107                           | 0.17                                           | 10                        | >99.8%                      |
| Sample 4 | 128,6                      | 110                           | 0.92                                           | 6                         | >99.2%                      |

GEM System Installation



Comparison of GEM Influent and Effluent Sample





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CWT meticulously selects top-quality chemicals, tailoring their optimization to match the removal rates of key pollutants. The process culminates in delivering clients with consistently exceptional results.

Impressed by the GEM System's unique, stable, and outstanding performance, Dushanzi Petrochemical successfully resolved its wastewater pretreatment challenges that they had experienced for several years. Just one year later, they acquired a second GEM System (Model GEM System 150/300) for the Phase 2 project.

CWT remains dedicated to addressing clients' wastewater treatment needs, moreover in delivering tailored treatment processes and equipment to ensure optimal solutions.

Sludge Collected in The GEM System Sludge Hopper

