TOC Removal

Physical Removal of Particulates

Coagulation, Filtration	Enhanced
Precipitative (Lime) Softening	Enhanced

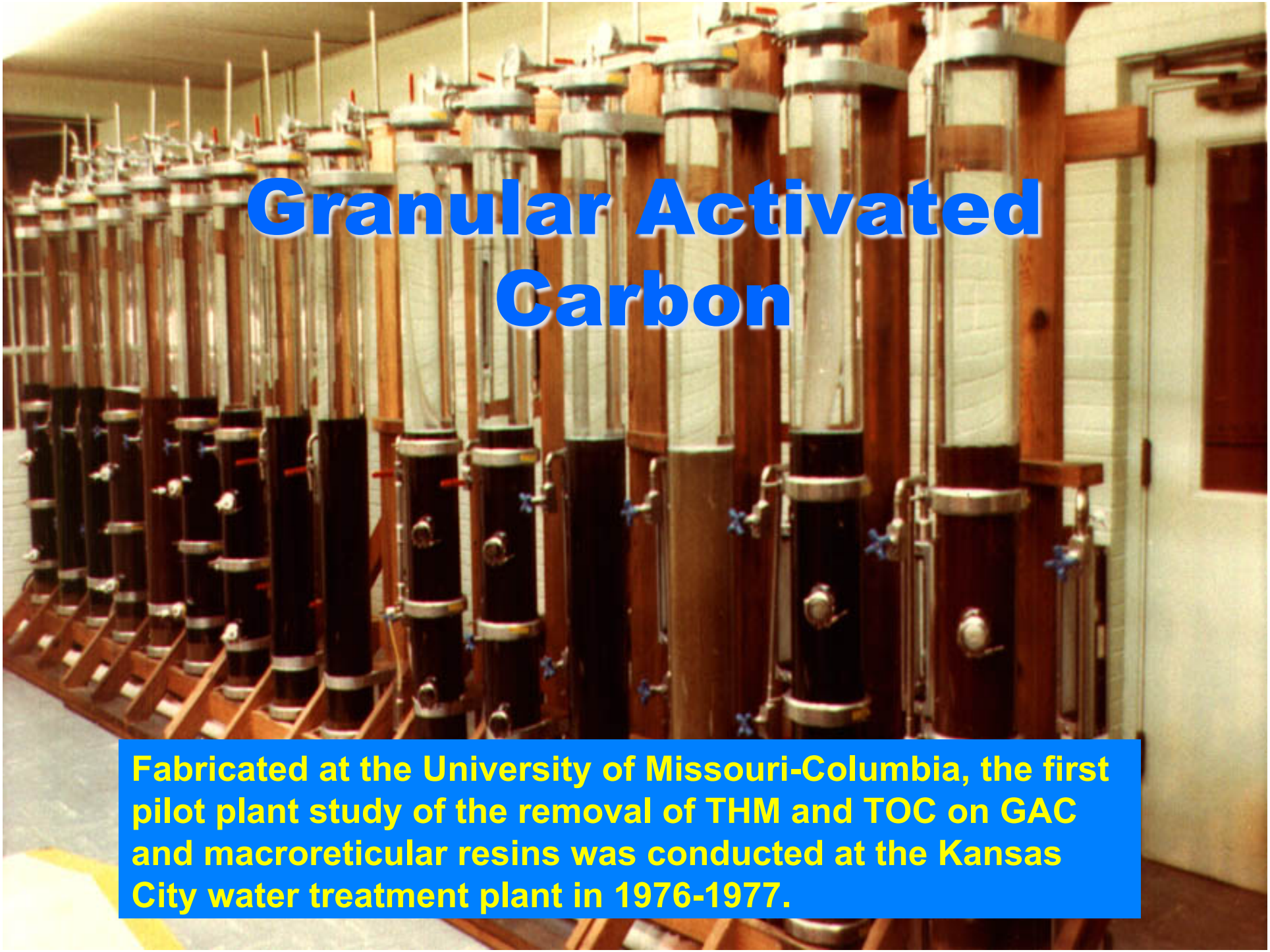
Adsorption

Granular Activated Carbon	GAC
Powdered Activated Carbon	PAC
Anion Exchange Resin	MIEX
Macroreticular Resin	XE340

Oxidation

$KMnO_4$, O_3, ClO_2

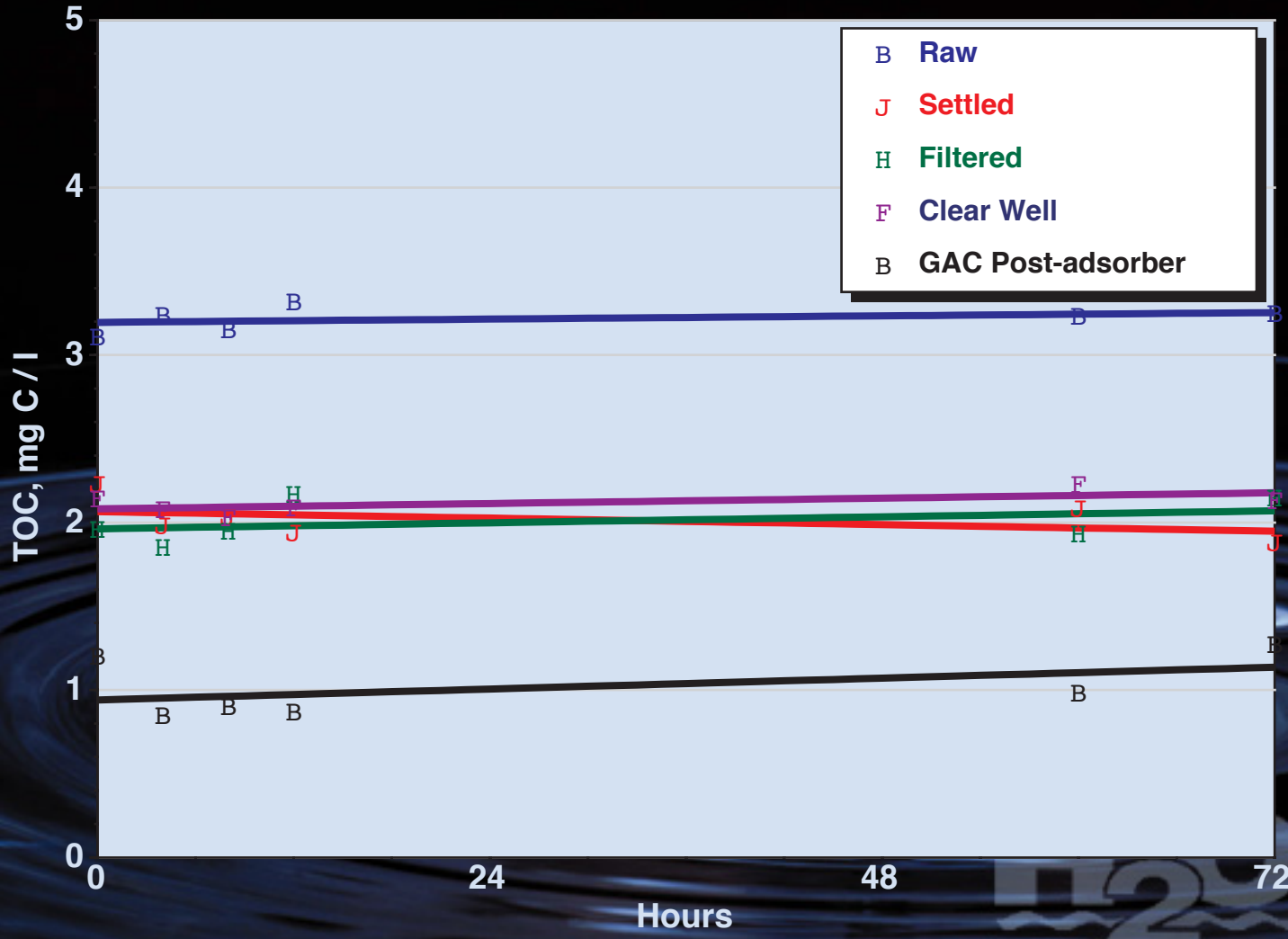
H2O'C ENGINEERING



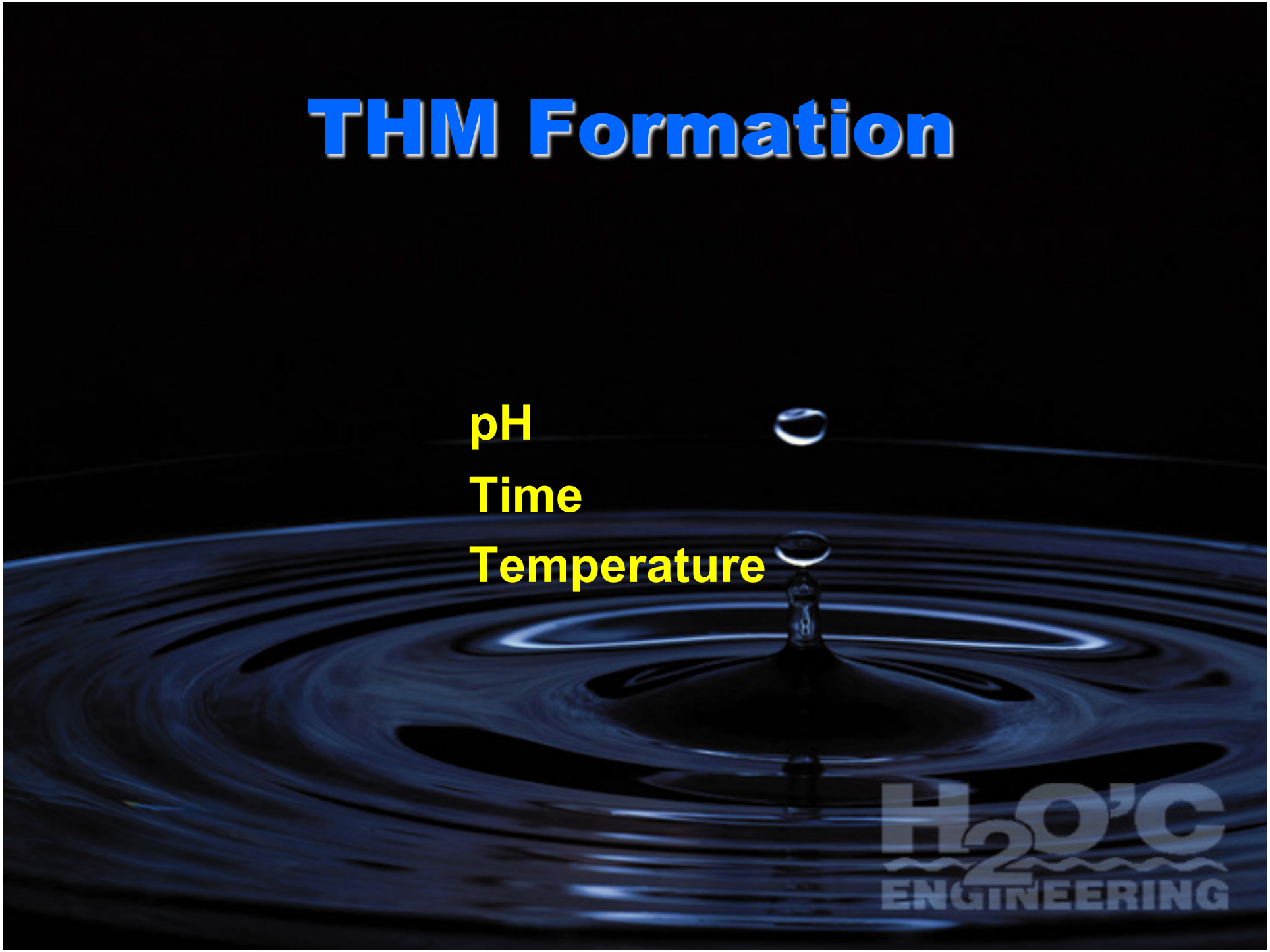
Granular Activated Carbon

Fabricated at the University of Missouri-Columbia, the first pilot plant study of the removal of THM and TOC on GAC and macroreticular resins was conducted at the Kansas City water treatment plant in 1976-1977.

GAC Post-Adsorption for TOC



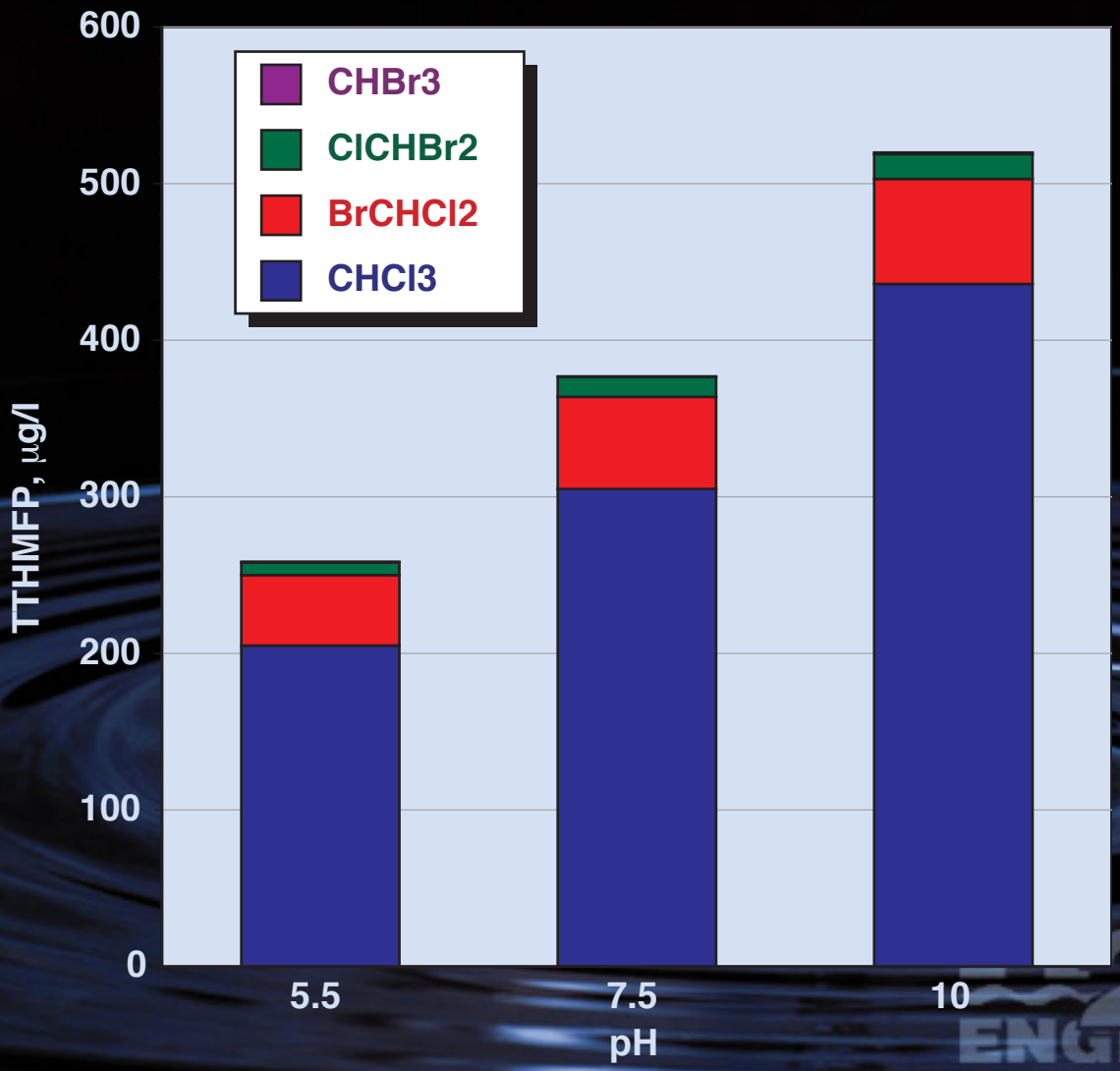
THM Formation



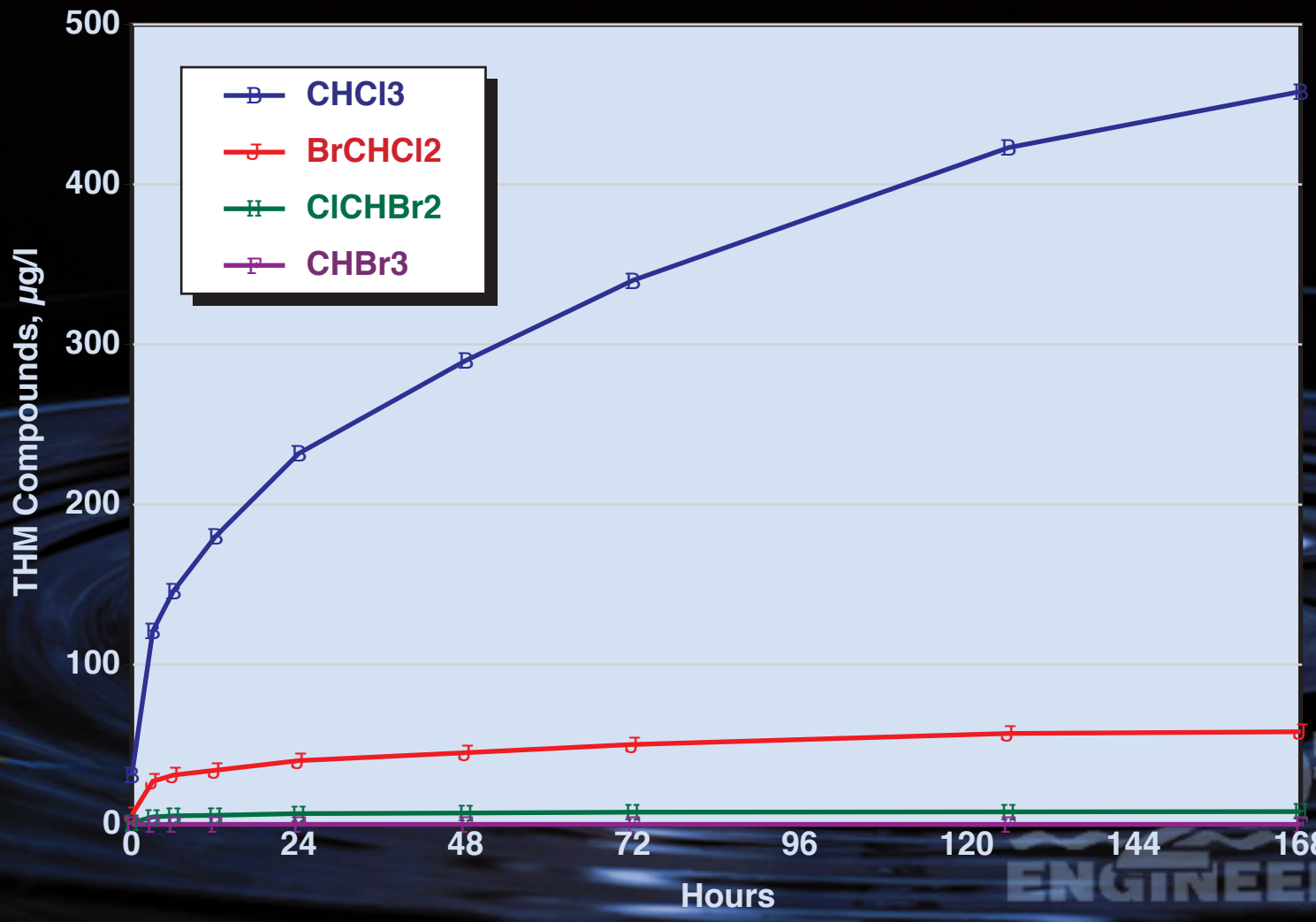
- pH
- Time
- Temperature

H2O'C ENGINEERING

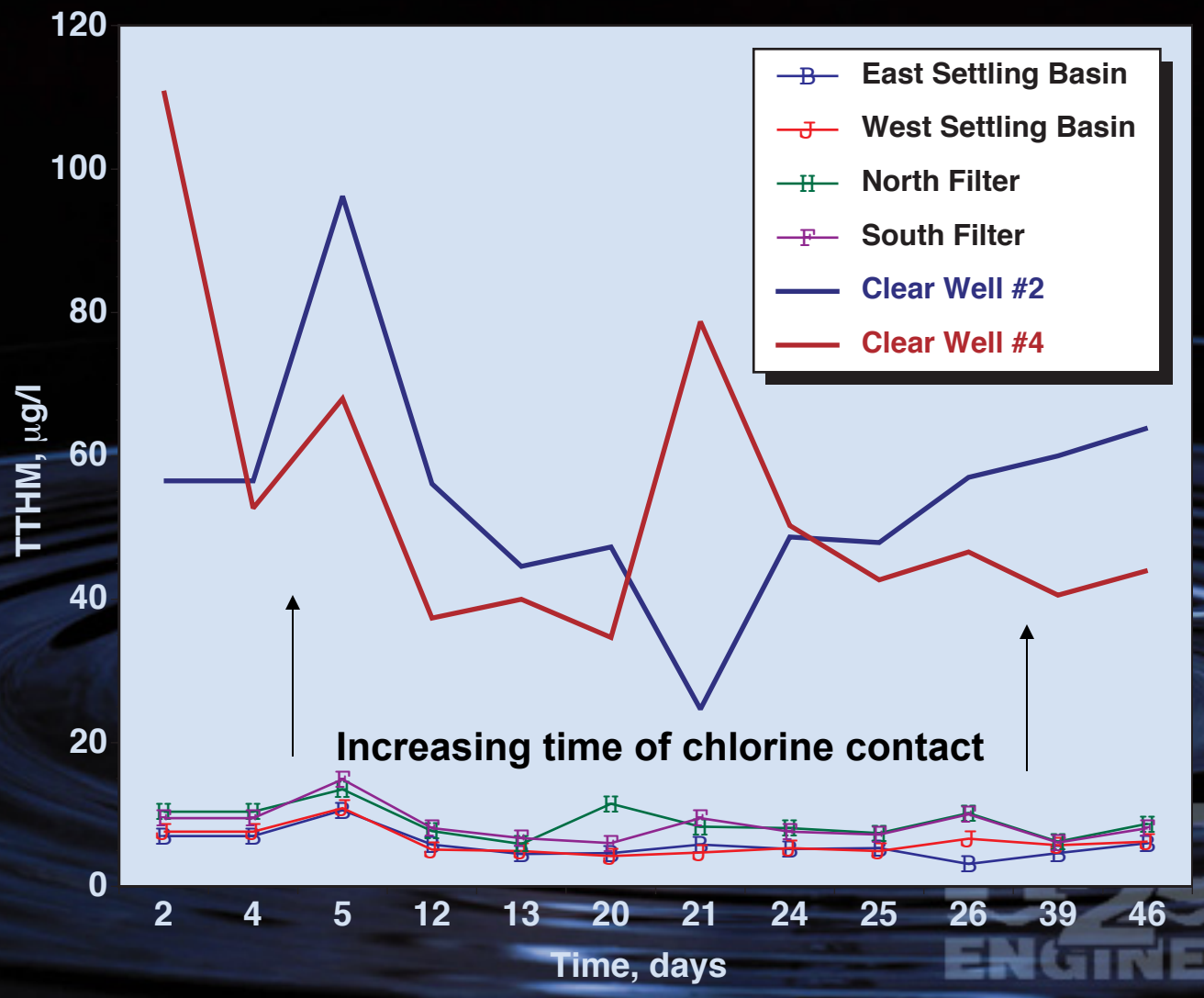
Effect of pH on TTHMFP - St. Louis, MO



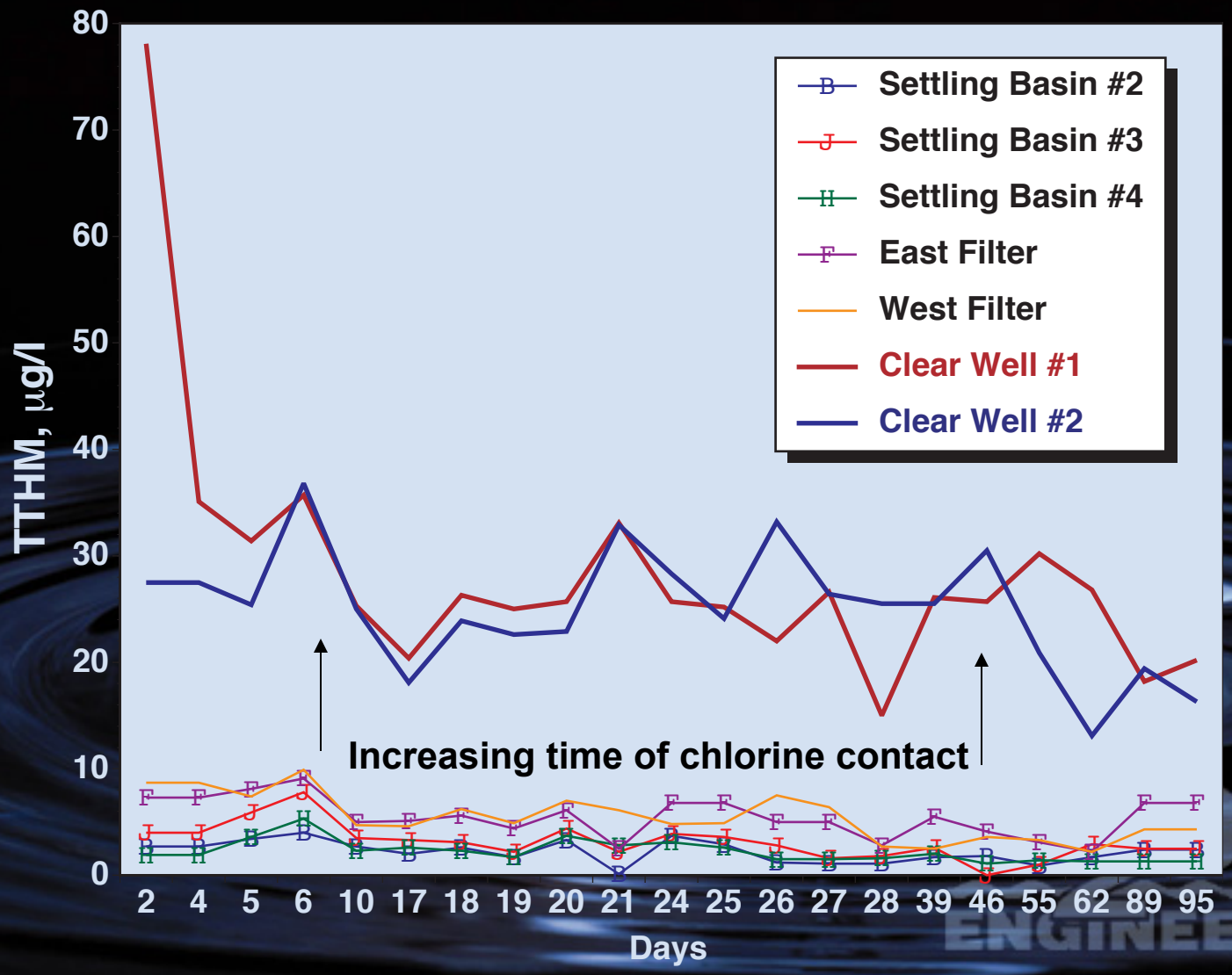
Rate of TTHM Formation
Mississippi River - St. Louis



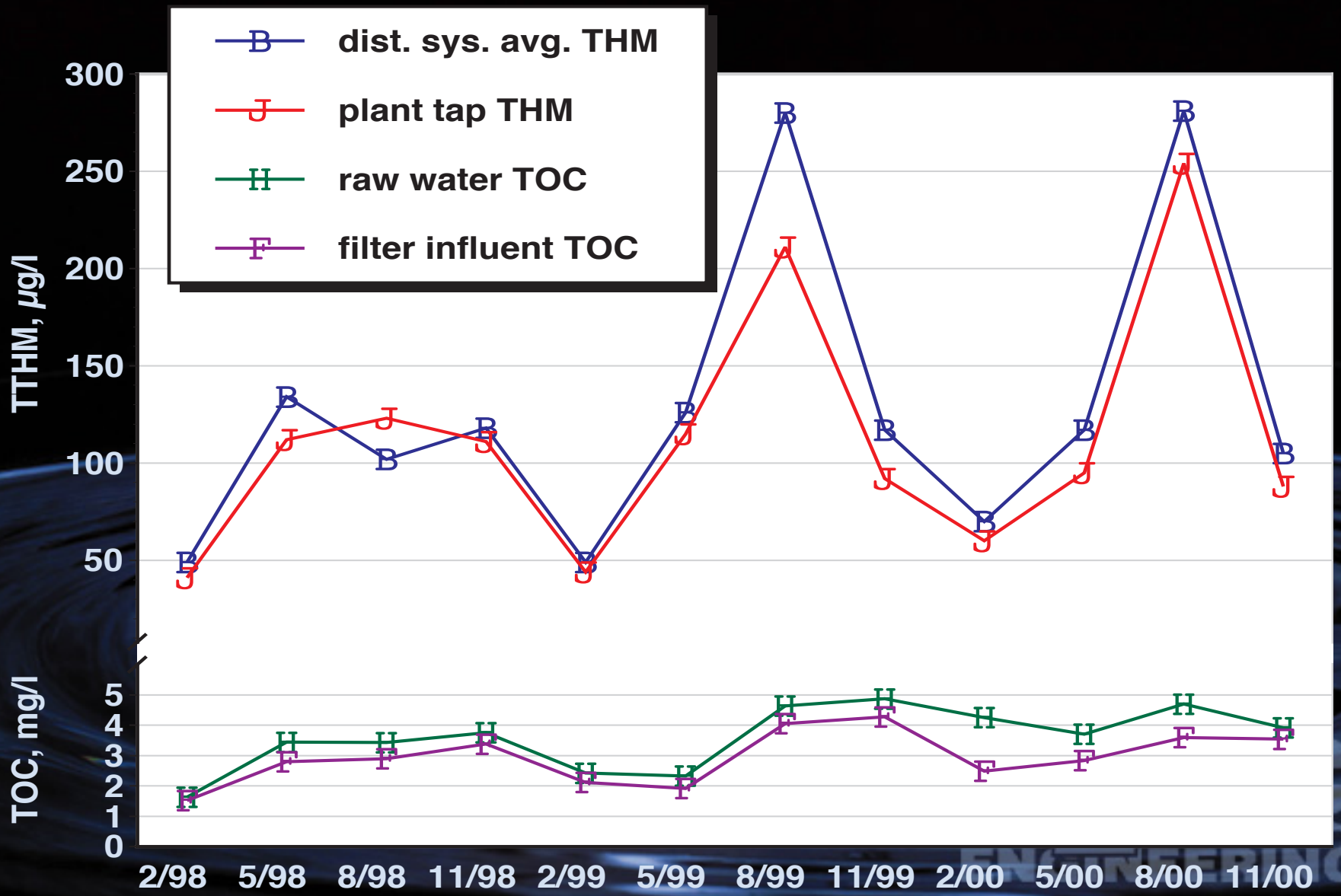
TTHM Formation During Treatment



TTHM Formation During Treatment



Seasonality of THM Formation



Effects of Temperature on TTHM

TTHM, µg / l	Winter	Summer
> 100	0	3
80-100	0	6
60-80	0	19
40-60	3	53
<40	97	19

H2O'C ENGINEERING

THM Removal

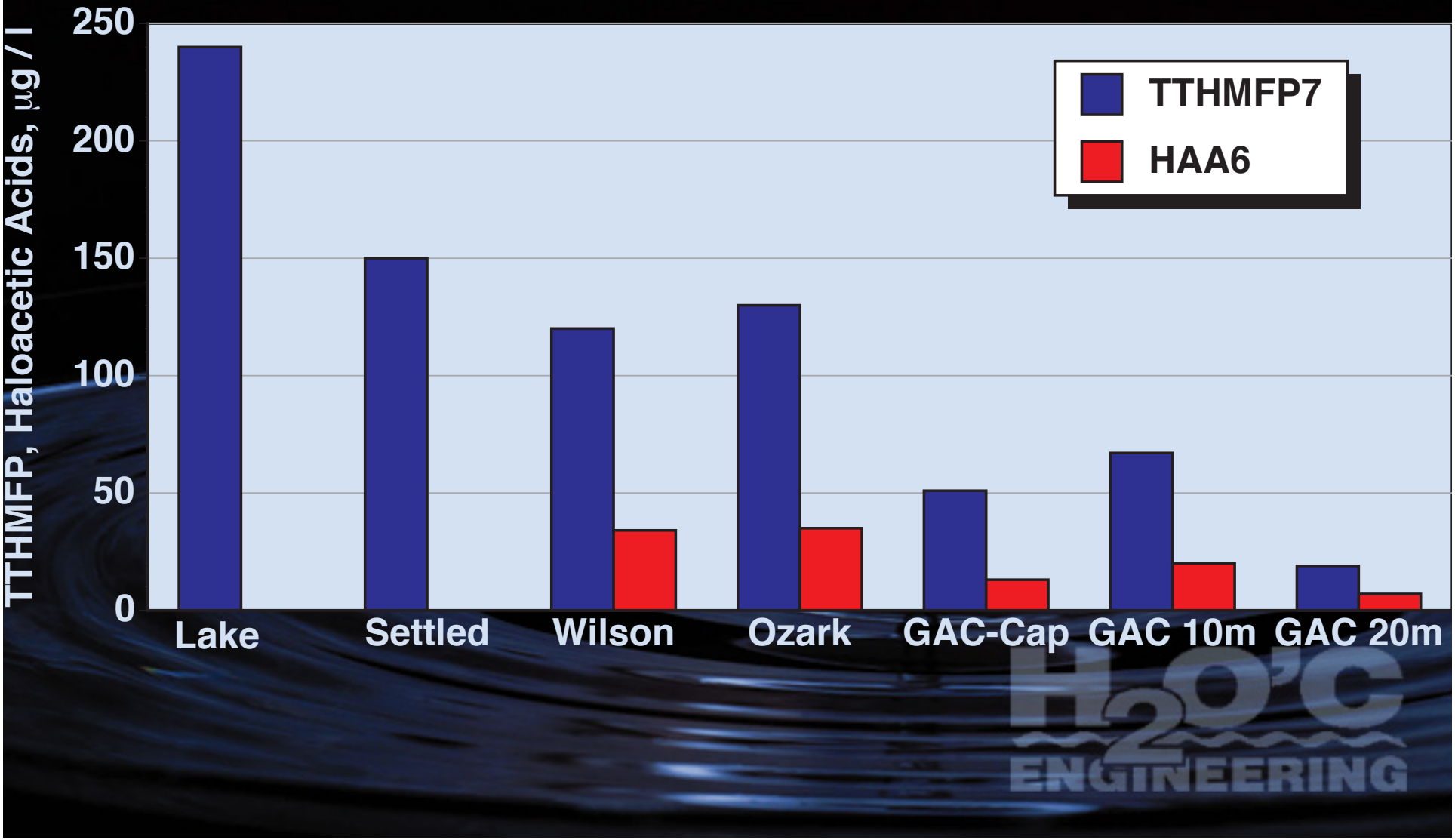
Aeration

- Air stripping

Adsorption

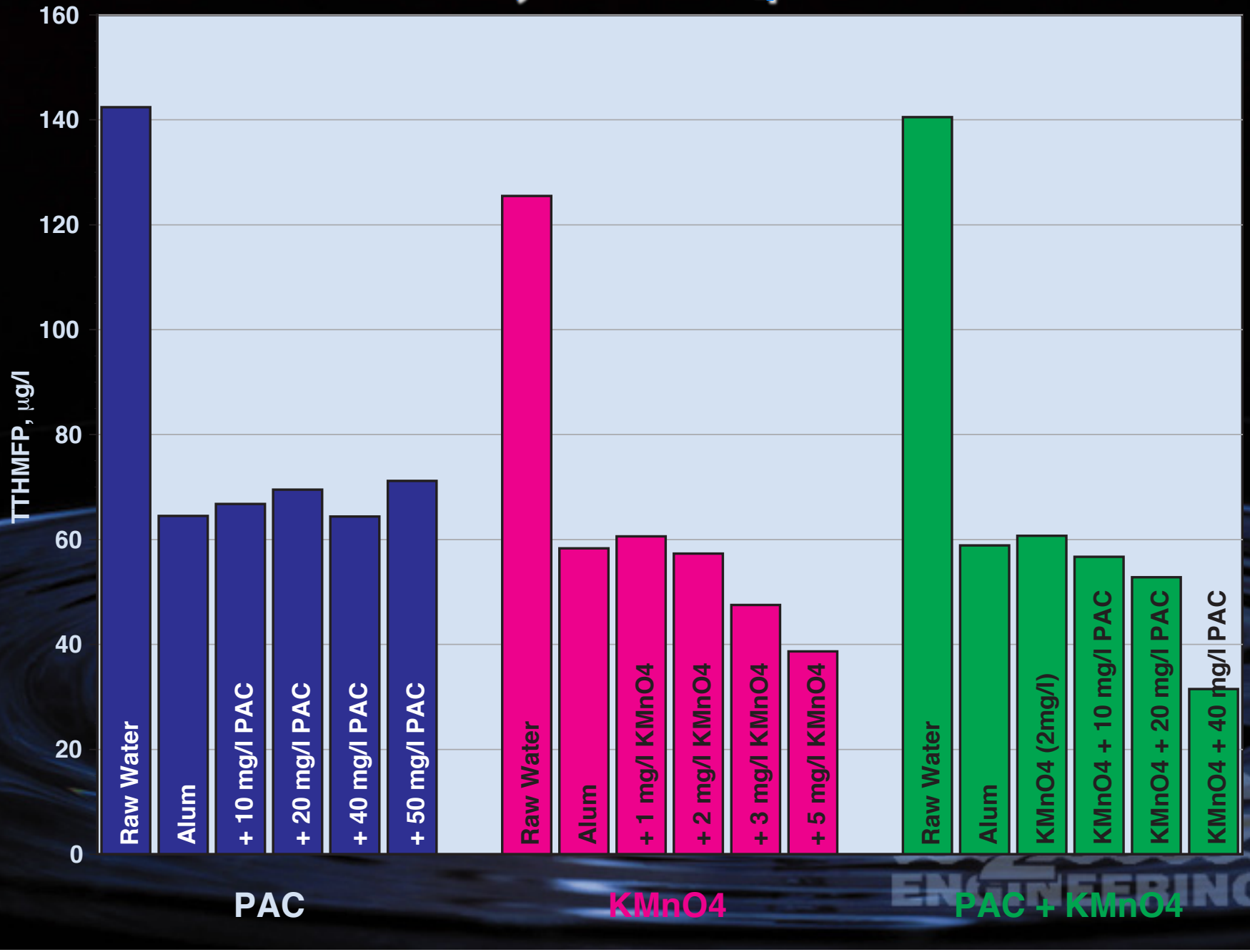
- Activated Carbon
- Synthetic Exchange Resins

TTHMFP and HAA Removal on GAC

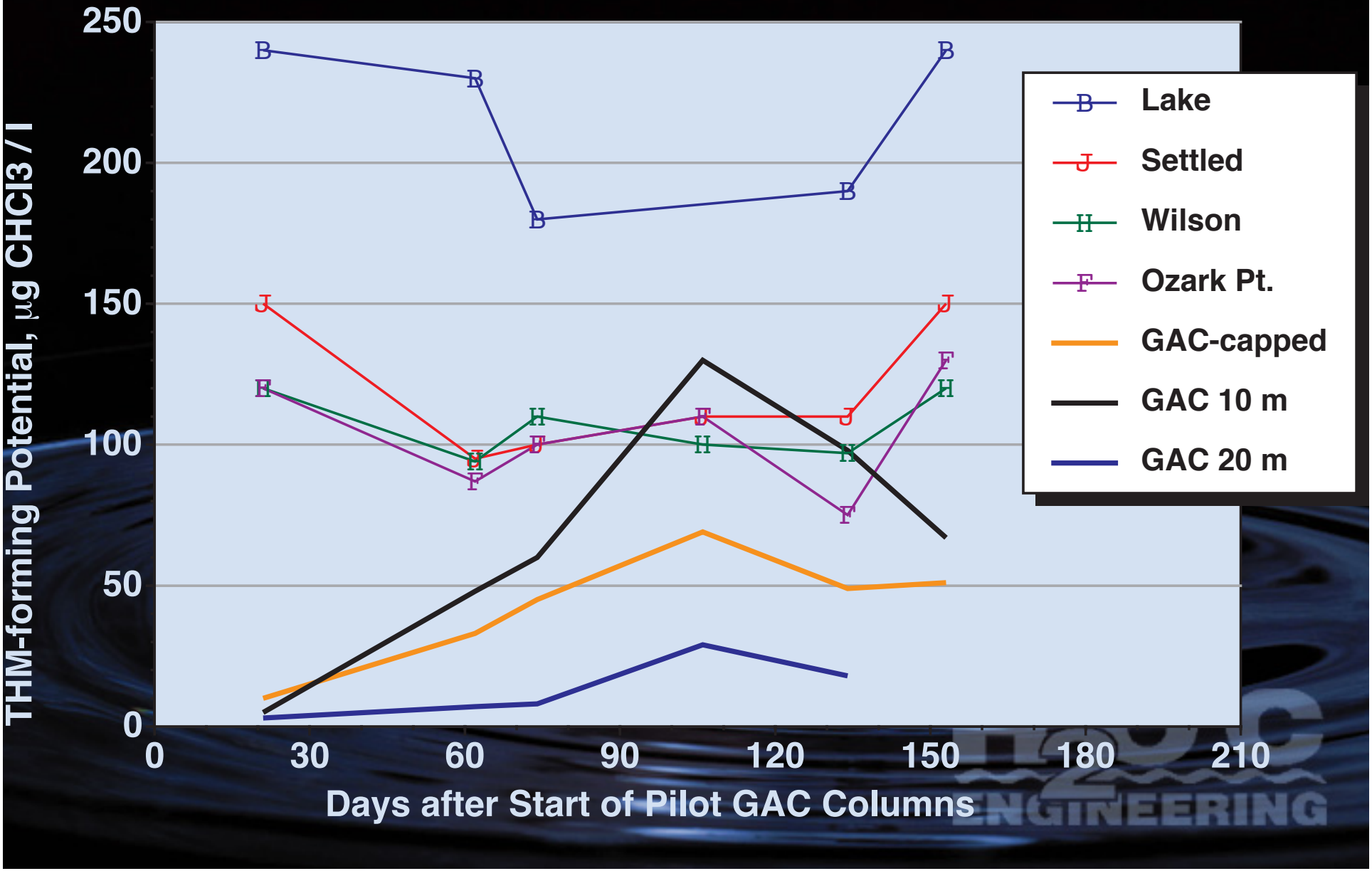


H2O'C ENGINEERING

Effect of PAC, $KMnO_4$ on TTHMFP



GAC Post-Adsorption for TTHMFP

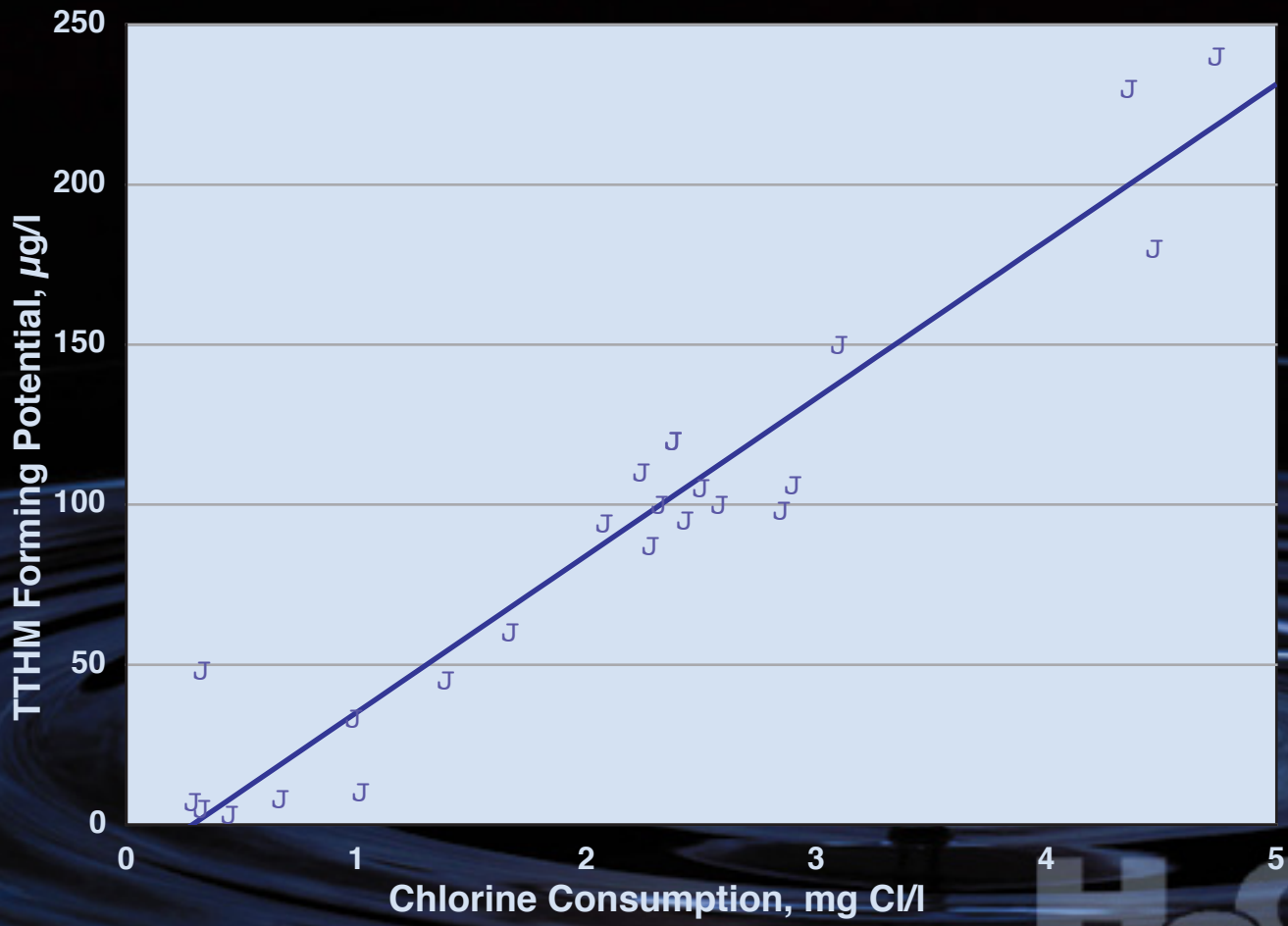


Trihalomethane Formation Potential (TTHMFP)

Determination of maximum potential for TTHM formation after seven days in distribution system

- **Add chlorine to water in excess of seven day chlorine demand**
- **Measure TTHM after seven days**

TTHMFP and Chlorine Consumption



H2O'C ENGINEERING

Dechlorination

Sulfur Dioxide	SO_2	^	SO_4^{2-}
Sodium Sulfite	$Na\ SO_3$	^	SO_4^{2-}
Activated Carbon	C	^	CO_2