

Complete Mixing Activated Sludge

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History

- Manchester (Ardern and Lockett)
 - Bury (Bolton)
 - Plug Flow Configuration
 - PhD at MIT
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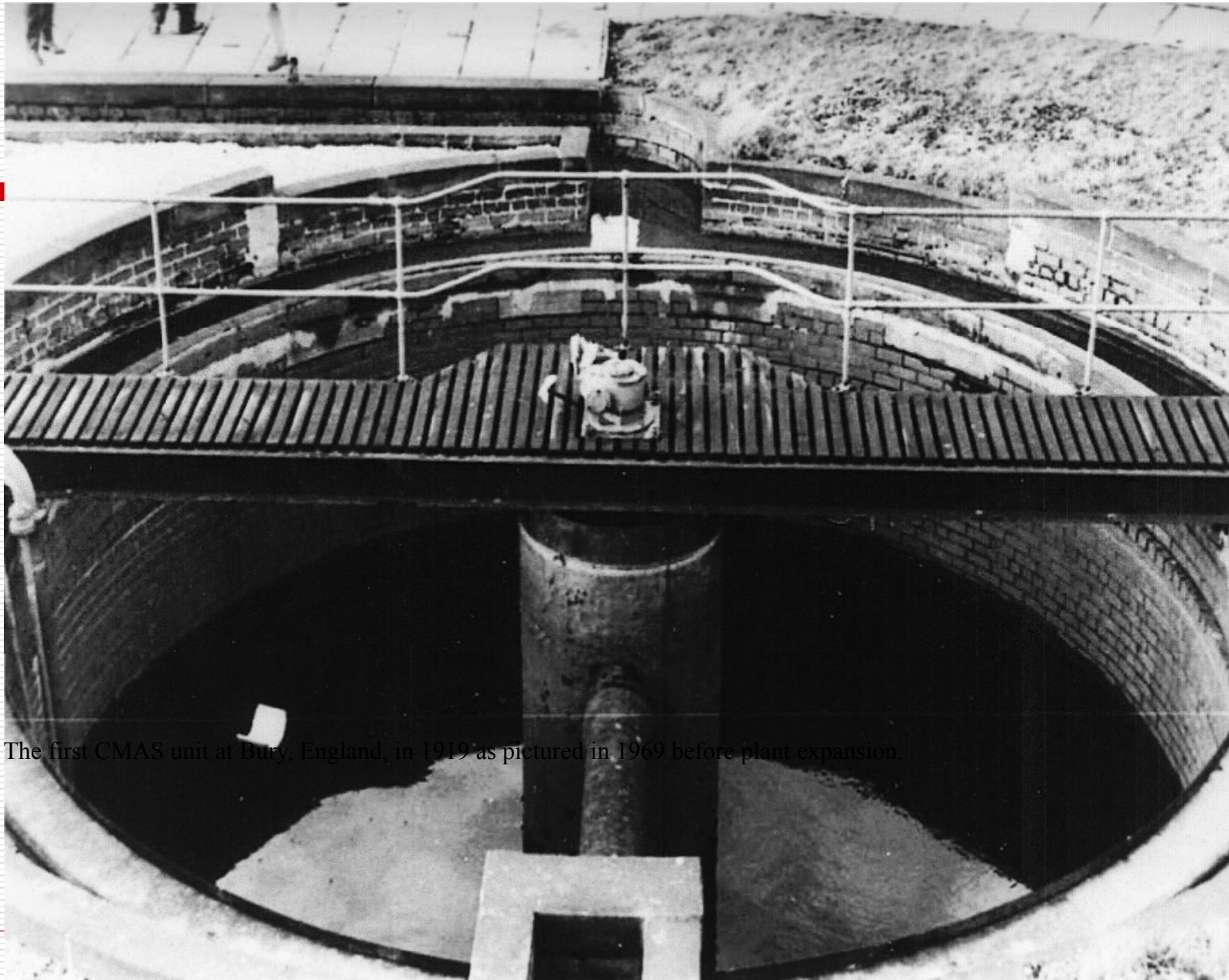
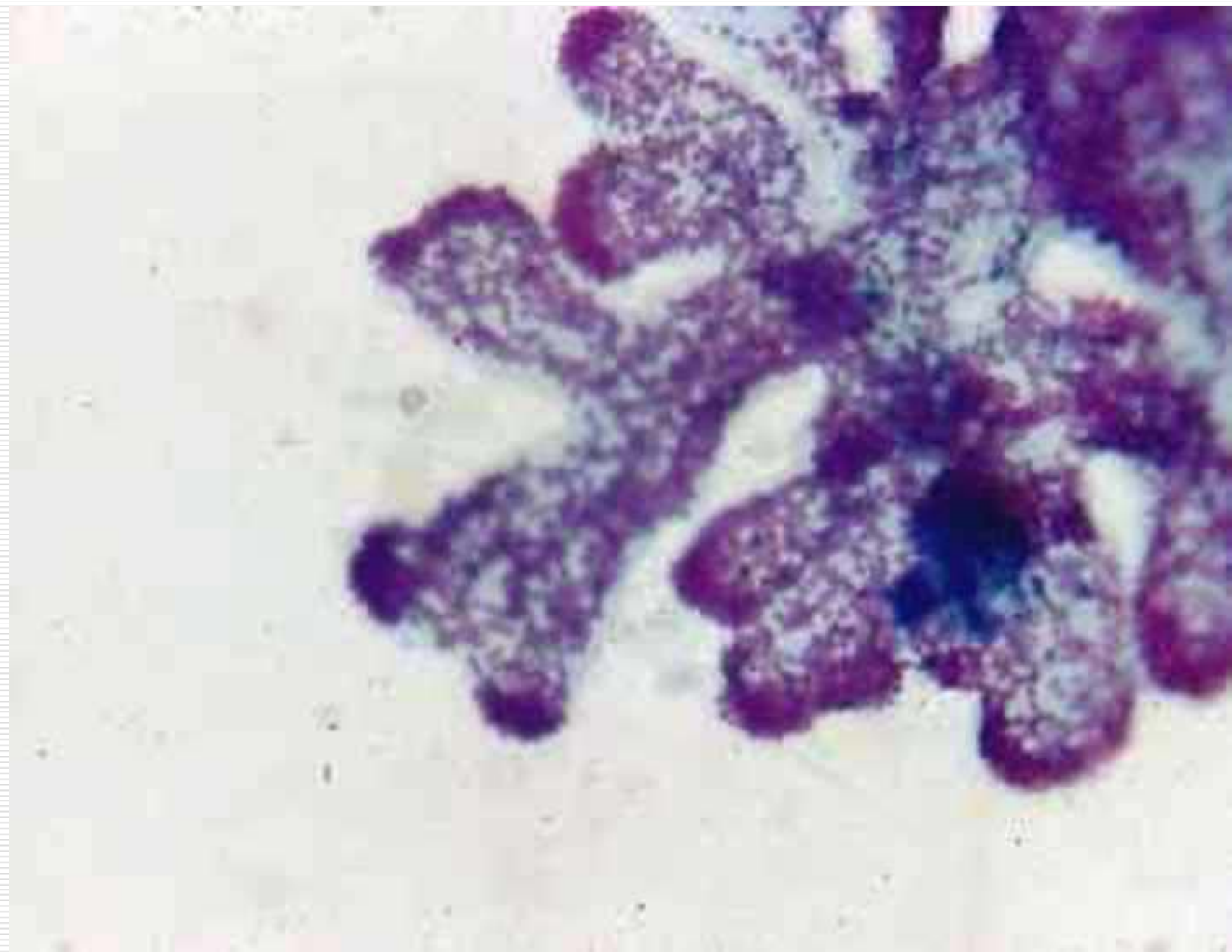


Photo 1: The first CMAS unit at Bury, England, in 1919 as pictured in 1969 before plant expansion.

Dale Brook Bleachery

- HoHoKos, NJ
 - Lab Study
 - Pilot Study - 10 Cell Design
 - Design -4 Parallel Units
 - Build - 3 in Series!
 - Flipped back to 3 in parallel, added 4th
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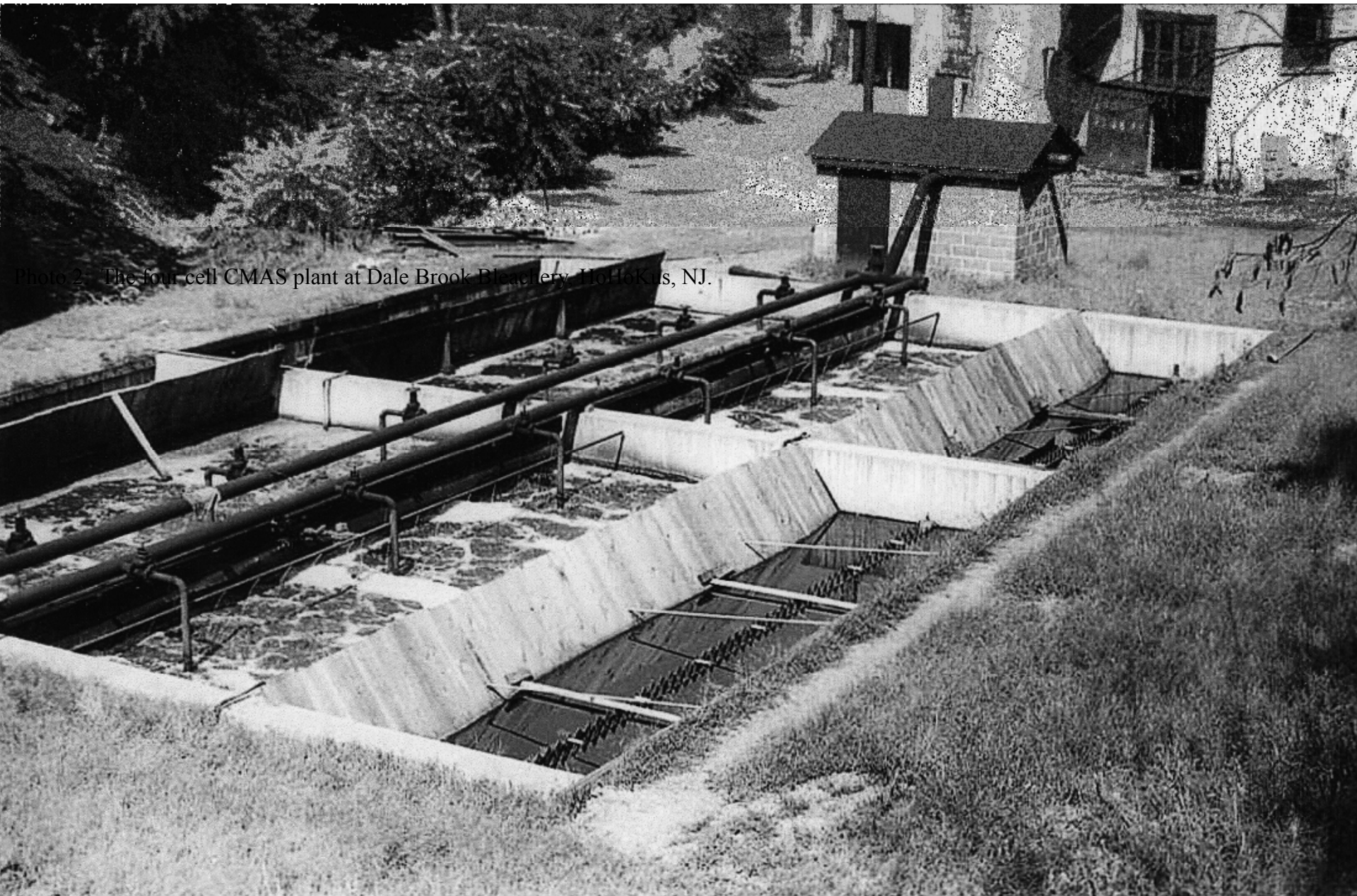


Photo 2 - The four cell CMAS plant at Dale Brook Bleachery, Hightstown, NJ.

Dale Brook Results

	Influent	Effluent
pH	6.0	7.8
COD (mg/l)	860	65 (92%)
BOD ₅ (mg/l)	420	3 (99%)

CMAS vs Plug Flow

- ❑ High and declining reaction rates vs low reaction rate
 - ❑ Reaction rate determined by effluent concentration
 - ❑ Stability often trumps everything else
 - ❑ Takes concentrations below toxic levels instantly
 - ❑ Industrial applications, then municipal
 - ❑ Very important to nitrification systems
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Subsequent History

- ❑ Helped other industrial discharges implement CMAS
 - ❑ Kansas Pig Farrowing Operation
 - ❑ City of Lawrence-mid 70s CMAS
 - ❑ Full Scale Sodium Sulfite D/R Test-proved complete mixing
 - ❑ PACT Process at DuPont Chambers Works
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Summary

- ❑ Part of the long and honorable tradition of researcher/consultant
 - ❑ Data driven observational approach led to CMAS
 - ❑ Idea was non-traditional and counter intuitive
 - ❑ Best of all, it works!
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