

Ardern and Lockett Redux: What They Told Us About Activated Sludge

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Manchester Corporation's Problem

- Population Increasing
 - Trade Wastes Increasing
 - Davyhulme running out of room
 - Treatment Works Stinks
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Potential Solution

- ❑ Dr. G.J. Fowlers trip to Lawrence Experiment Station: Aeration and Biological inoculation
 - ❑ Reuse of sludge: a counterintuitive idea
 - ❑ Trip back on the Lusitania
 - ❑ Grand Hotel (Manchester): Experiments on the Oxidation of Sewage Without the Aid of Filters
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The Experiments

- Removal of oxygen demand/nitrification
 - Temperature and Settling
 - Other Treatment Works
 - Physical Observations
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Removal of Oxygen Adsorption and Ammonia

- ❑ Experiment 81: 1 volume sludge/4 volumes of sewage
- ❑ Sludge has been previously “Activated”

Time (hr)	O ₂ Ads. (ppm)	NH ₄ (ppm)	NO ₂ /NO ₃ (ppm)
0	133.7	37.1	---
3	20	28.0	1.0
6	13.7	20.0	5.2
9	12.0	11.4	9.2

Temperature and Oxygen Adsorption



Temp Celsius	0 Hr	3 hr	6 hr	9 hr
5	139.4	30.9	27.2	28.3
15	139.4	19.7	14.0	11.7
13	103	15.1	13.1	10.9
20	103	16.3	13.1	10.3
30	103	19.1	14.9	18.9

Other Treatment Works

Raw Sewage	Moss Side – Sample A	Withington-1 st Sample	Gorton	Macclesfield
O ₂ Ads. (ppm)	98.3	51.2	154.3	125.7
NH ₄ -N (ppm)	60	27.8	57.2	38.0
% Removals				
O ₂ Ads. (ppm)	85	80	92	89
NH ₄ -N (ppm)	81	97	75	74
Reaction Time (hrs)	12	9	9	9

Observations

- ❑ Dark brown colour
 - ❑ Well flocculated; supernatant clear
 - ❑ Rapidly settles despite low specific gravity; less than 5% solids after settling
 - ❑ Can filter sludge with fine grade strainers
 - ❑ 30 million organisms per cc
 - ❑ Protozoa present
 - ❑ 35% mineral matter in activated sludge
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Conclusions

- ❑ Activated Sludge effectively treats raw sewage
 - ❑ High Oxygen Demand and Ammonia removal
 - ❑ Nitrification Occurs
 - ❑ Sensitive to Temperature
 - ❑ Uses much less land than conventional treatment
 - ❑ Can be turned over to engineers for development!
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