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

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Atlantic City, NJ

Manchester Corporation's Problem

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

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

The Experiments

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

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- 1st 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

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!