Robert Angus Smith and the Pressure for Wider & Tighter Pollution Regulation

Peter Reed
Leominster, Herefordshire
Robert Angus Smith and the Pressure for Wider & Tighter Pollution Regulation

- Further nuisances – sulfur waste, copper industry, cement works, potteries and ammonia
- Changes in regulatory framework
- Connection with public & occupational heath
Alkali Industry - Sulfur Waste

- Sulfur waste was produced during the 3rd stage of the Leblanc process
Leblanc Process

SULPHUR + NITRE + AIR + STEAM

SALT + SULPHURIC ACID

LIMESTONE + COAL + SALTCAKE

HYDROCHLORIC ACID

BLACK-ASH

ALKALI WASTE

SODA
## Composition of Sulfur Waste


<table>
<thead>
<tr>
<th>Constituents</th>
<th>Fresh Waste</th>
<th>Six Weeks Old</th>
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</thead>
<tbody>
<tr>
<td>CaCO$_3$</td>
<td>41.20</td>
<td>23.42</td>
</tr>
<tr>
<td>Mg SiO$_3$</td>
<td>3.63</td>
<td>1.78</td>
</tr>
<tr>
<td>Phos. Al (Fe$_2$O$_3$)</td>
<td>8.91</td>
<td>7.40</td>
</tr>
<tr>
<td>CaSO$_4$</td>
<td>2.53</td>
<td>4.59</td>
</tr>
<tr>
<td>CaH$_2$O$_2$</td>
<td>8.72</td>
<td>12.03</td>
</tr>
<tr>
<td>CaS$_2$</td>
<td>5.97</td>
<td>0.62</td>
</tr>
<tr>
<td>Na$_2$S</td>
<td>1.44</td>
<td>2.87</td>
</tr>
<tr>
<td>Water</td>
<td>1.73</td>
<td>10.59</td>
</tr>
</tbody>
</table>
Alkali Industry - Sulfur Waste

- Sulfur waste was produced during the 3rd stage of the Leblanc process.
- Native sulfur from Sicily was very expensive and supplies were controlled by the King of Naples.
- During late-1830s source of sulfur switched to iron pyrites, later copper pyrites.
- The waste contained almost all the sulfur from the sulfuric acid.
- Every ton of soda resulted in 1\(\frac{1}{2}\) to 2 tons of waste and by 1870s c 500,000 tons of waste produced annually.
- Several attempts made to regenerate sulphur – William Gossage (1837); Ludwig Mond (1861) & James McTear (1871).
- Final resolution was the Claus-Chance process (1888).
- The chemically-stabilized waste remains just below the surface in many areas associated with the soda industry.
Swansea Copper Industry

- Copper smoke: strong concentration of the toxic gases sulfur dioxide and hydrogen fluoride
- It has been called the “acid rain” scandal of its day
- Difficult to quantify but in the 1840s the French sociologist Frédéric de Pay calculated that c. 92,000 tons of sulfurous acid was released into the atmosphere by the Swansea smelters
- Ground deposition – included particles of copper, sulfur, arsenic, lead, antimony and silver
- Emissions of metals within 7 miles of the works estimated in the range 10 to 15 micrograms per cubic metre annual average
Cement Works

• Nuisances associated with Portland cement works.;

• Portland cement made by heating together lime and clay in specially constructed kiln at c. 1300 C.;

• Offending nuisances included: dust, volatile slats of potassium chloride, sodium sulfate and potassium sulfate and smell originating from organic matter in the clay;

• Prompted re-design of kilns (Hoffmann kiln);

• Dust remained a problem well into 20th century.
Potteries

- Potteries were regularly reported to Alkali Inspectorate;
- Nuisance was largely due to coal-burning for heating the kilns;
- Particular targets were kilns for salt-glazed pottery;
- In final 20-40 minutes of firing common salt was thrown over the pottery in a red-hot state to produce glaze;
- Accompanied by release of hydrogen chloride gas;
- On many occasions the atmosphere of Longton or Hanley was likened to that of Widnes.
Ammonia

- Ammonia liquor was produced as a by-product of the coal-gas industry;
Coal-Gas Manufacture
Ammonia

• Ammonia liquor was produced as a by-product of the coal-gas industry;
• Used in ever-larger quantities in ammonia-soda process, alum industry and in the manufacture of fertilizers;
• Reports to Alkali Inspectorate principally concerned ammonium sulfate works when the ammonia liquor was pumped from the gas works and the liquor could not be treated at the same rate as it was pumped;
• Deaths were recorded when blocked sewers were contaminated by overflow of liquor.
Changes in Approach to Regulation

- **Best practicable means**
  - Manufacturers to employ “best practicable means” available to reduce pollution

- **Central regulation – for and against**
  - Central regulation retained but contrary to role of Local Government Board

- **Notification of pollutants for regulation**
  - Minister able to make order extending processes & gases

- **Enforcement by legal prosecution**
  - Switch from persuasion to legal enforcement which was opposed by Angus Smith
Connection with Public Health and Occupational Health

- The 1848 Public Health Act allowed towns where the death rate exceeded 23 in every 1000 to set up Local Boards of Health; could also appoint a Medical Officer of Health.
- The MOH’s role was to tackle the insanitary conditions prevalent in towns that became centres of epidemics with cholera, typhus and smallpox.
- Few court cases because of importance of industry to local economy and for local employment.
- In 1845 William Bevan, a surgeon and registrar in Swansea, argued that copper smoke acted as a prophylactic against contagious diseases. A similar view was expressed in 1928.
- Henry Hussey Vivian was so convinced of the benefits of sulfurous copper smoke, he gave his workers dilute sulfuric acid to drink during a cholera outbreak.
- LGB had overall responsibility for Poor Law, Public Health and the Alkali Administration as well as other functions of local government, though main emphasis was on Poor Law administration.
- John Simon as medical officer to the LGB was very clear in his own mind about the health effects of noxious vapours whether on the community or in the workplace.

Environmental Chemistry: A Historical Perspective
Quotes from John Simon

‘I think the expression ‘injurious to health’ in many of these discussions has been used in a sense to impose upon the person who is charged with the duty of protecting health, an obligation to prove that typhoid fever, or smallpox, or dysentery, or ringworm, or something of that kind, some definite disease that we name in our catalogue of diseases, is produced by those vapours.’

‘I have no doubt but that people resident in them [noxious vapours] in many cases get fairly used to them, but to a great many people they are constantly troublesome. Every population includes a certain proportion who will have sensitive bronchi; those sensitive people are frequently very much troubled with these vapours as an effect on health, although not the production of disease. I think that those who are fighting for public health may claim the legislature that any pollution of the air such as may make a common nuisance either in stink or in dust, or which cause coughing, shall be called a nuisance injurious to health, and come under the Sanitary Act.’

*Report of Royal Commission on Noxious Vapours 1878, 26*
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- In the 1870s a series of reports, ‘Effluvium Nuisances arising in connexion with various Manufacturing and other Branches of Industry’ by Dr Ballard, form part of the Annual Report of the Medical Officer of the LGB.
- Report draws on a very wide range of sources of information in its very thorough coverage of the noxious vapours associated with chemical processes in industry and their effects on health.
Occupational Health

The public and even manufacturers were not-well informed about long-term effects of industrial work on health. Two examples from the alkali industry:

For furnace-men working in an atmosphere of hydrogen chloride gas -
‘The workmen either wear a flannel muffler tied over his face, or he bites a piece of flannel between his teeth and breathes through it’.

Bleach Packer working in an atmosphere of chlorine –
‘The bleach packer wraps his face in a roll of flannel, the flannel being drawn over his mouth and leaving his nostrils free. These layers of flannel stand out some three inches beyond his face, and have to be of just the right dampness to prevent the gas reaching his lungs. He then puts on leather goggles to protect his eyes, and ties a piece of paper round his trousers to keep the bleach from attacking them.’

A. P. Laurie, Chemical Trades (1902), 571 and 576
Occupational Health

• Only with the appointments of Dr Arthur Whitelegge as Chief Inspector of Factories in 1896, and of Thomas Legge as the first Medical Inspector of Factories in 1898 that a concentrated effort began against industrial disease.

• The 1895 Factory and Workshop Act required the notification of industrial diseases for the first time, including lead, arsenic and phosphorus.
Conclusions

• Under the leadership of Robert Angus Smith and his successor, Alfred Fletcher, by 1906 the extant regulatory framework was to remain in place for most of 20th-century with retention of central administration, speedier addition of offending nuisances, use of legal prosecution and adoption of best practicable means.

• Better connection between Alkali Inspectorate and those concerned with public health and occupational health.

• By 1956 Inspectorate was responsible for 1,794 processes operating in 921 works in England & Wales, and for 116 processes in 82 works in Scotland.

• Today, Inspectors work as Her Majesty’s Inspectorate of Pollution within the Environment Agency.
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Q & A

Peter@peternreed.plus.com