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# The Control of Alkali Pollution in St. Helens, 1862-1890

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## SUMMARY

The attempts of Angus Smith and his colleagues to control alkali pollution after 1863 are usually seen as being a success. This study of St. Helens, Lancashire, once an important centre of soda production, shows that although the alkali inspectors were eventually able to limit the release of hydrochloric acid gas, they found great difficulty in curbing the generation of other noxious fumes, particularly hydrogen sulphide. Despite the intervention of the town council, prohibitive legislation and many critical reports, the manufacturers were reluctant to adopt a technique of sulphur recovery or to change the way they dumped their waste acid. Local economic importance proved to be sufficiently powerful to deflect regulation from any source.

## 1. INTRODUCTION

Studies of nineteenth-century urban air-pollution have illustrated some of the difficulties faced by local authorities once they attempted to regulate the emission of black smoke from factory premises (Ashby and Anderson, 1981; Brimblecombe, 1987; Bowler and Brimblecombe, 1990). This appears to contrast with the ease by which Angus Smith and his colleagues, the Inspectors appointed under the Alkali Act of 1863, were able to limit the release of hydrogen chloride gas into the atmosphere. Smith's conciliatory manner towards the manufacturers, and the existence of a cheap and technically simple condensing apparatus, are seen to have formed the basis of their success (MacLeod, 1965; Ashby and Anderson, 1981). It is further argued that once the value of his department was established, Smith was able to persuade his civil service colleagues to extend the terms of the Act to reduce the levels of emission and to embrace a number of other noxious vapours, although his effectiveness in this new area awaits a detailed assessment.

Most accounts draw heavily upon the Alkali Inspector's annual reports and the few surviving manuscript records of central government departments; as a

result, the local context in which the inspectorate worked is obscure. The history of the control of alkali pollution in St. Helens, Lancashire, some twelve miles to the east of Liverpool, shows that for much of the period under discussion, Smith's objectives were shared by the town council. This history indicates that his attempt to reduce the release of hydrochloric acid gas could be the cause of dispute, and that during the 1870s and 1880s he was unable to control the levels of other noxious fumes, particularly hydrogen sulphide.

## 2. THE CONTROL OF ALKALI POLLUTION, 1829-1870

Alkali production had begun in St. Helens during 1829 (Barker and Harris, 1959). Firms were attracted to an area with coal, good transport facilities to the saltfields of cheshire, a dispersed population and moribund township government. An Improvement Commission, formed in 1845, was not enthusiastic in sanitary matters. In 1855, Inspector William Ranger of the General Board of Health urged the Commissioners to suppress the nuisances caused by the chemical works and their heaps of waste (Ranger, 1855). This had encouraged them to employ the first full-time Inspector of Nuisances, but his authority was circumscribed and his impact slight. For nearly three decades, then, companies of all kinds enjoyed the benefits of unregulated production.

By the early 1860s the area had become the focus of several industries responsible for pollution of the most objectionable kind, including thirteen glass factories, six copper works, sixteen chemical works and several dozen collieries and foundries. The campaign which led to the calling of the House of Lords' Select Committee on Injury from Noxious Vapours (1862) originated with Lord Derby and other prominent landowners whose properties bordered the town (Dingle, 1982). They described how the clouds of hydrochloric acid gas released during the first stage of the Leblanc process for production of sodium carbonate (alkali) had blighted their vegetation and reduced their land values, and they recounted the expense and uncertainty of seeking compensation through the common law.

Before the Select Committee met a number of manufacturers drafted a set of controls in collaboration with Lord Derby, and the most important of these, which required that 95% of the acid gas should be condensed, was decided with the agreement of the trade (Dingle, 1982). However, a further influence encouraging co-operation appeared two months before the Bill was introduced to the House of Lords. In January 1863, the County Court sitting at St. Helens awarded damages of £11 to William Ratcliffe, a farmer, for the ruin of his crops by the fumes released by Newton, Keates & Co., copper smelters (SHN, 1863). The judgment undermined the long-standing defence that the harm caused by a single firm could not be separated from that which might be attributed to so many. It was Justice Wheeler's opinion that even if 50 firms were responsible for the pollution, a plaintiff might proceed against any one of them for the full sum; the

onus then rested with the defendant to recover his costs from the other defaulters. An action begun by Mr. Tipping, the owner of the Bold estate, begun in July 1863 against a second copper smelting firm, Sweetland, Tuttle & Co., was to be confirmed by the House of Lords in July 1864, and in November the following year an injunction obliged the works to close (SHN, 1906). This produced a flood of writs from landowners to be defended at the Summer Assizes in 1865. There, however, Sergeant Wheeler's decision was overturned, and the Court of Appeal eventually confirmed that a company could only be held accountable for damage which could be shown to have originated with its own actions.

The period when the law appeared most threatening to the copper smelters coincided with the passage of the Alkali Act and the creation of the Inspectorate. It was, therefore, very much in the manufacturers' interests to work closely with Lord Adderley in drafting the Alkali Works Act (1863), particularly as he had made it clear that by so doing he would bow to their request that they be detached from all other nuisance legislation (Hansard, 1863). Smith's descriptions of his unwillingness to turn to the courts but rather to seek the co-operation of the manufacturers seemed further to reinforce the trade's advantageous position (RAI, 1864).

The Alkali Act placed St. Helens in the western district, under the eye of Alfred Fletcher. The intention to avoid coercive measures was to be short-lived, and the first two prosecutions for failing to reach the statutory level of condensation were against firms from the town (RAI, 1866; RAI, 1867). It is unlikely that Fletcher acted independently of his superior, and although Smith's motives are not certain, he may have felt it necessary to demonstrate his new authority. Although David Gamble, the most prominent local alkali manufacturer, had been amongst those who had made the covert agreements with Lord Derby, he found the idea of inspection objectionable (PP, 1862). He was aware that waste products were carelessly disposed of in St. Helens. The temptation to allow acid gas up a furnace chimney continued, whilst the condensed acid was usually poured away into the Sankey Brook or one of its tributaries. Again, the sulphur-rich 'tank waste' was piled into huge heaps which covered many hectares.

The reluctance to accept outside interference may have been bolstered by the trade's importance to the town. For a while after incorporation in 1868, political power remained in the hands of the major employers. An alkali manufacturer sat as Mayor for the first five years of the new borough's life, and others held the chairmanship of the major committees. The same gentlemen dominated charitable bequests, they contributed nearly 9% of the rateable value, their employees and their dependents accounted for one-sixth of the population and their products contributed vital raw materials to the glassworks. Any suggestion that their disposal methods be disrupted saw them respond by predicting the ruin of the local economy. Finally, before the 1870s, there was no organised protest against the pollution within the town. With a largely labouring population, St. Helens had no sanitary association, no medical charities nor any other group associated with the middle-classes which might have opposed the fumes, and although the editor

of the *St. Helens Newspaper* made the occasional swipe against any new or pungent smell, his was usually a voice in the wilderness (SHN, 1863b).

### 3. THE PROBLEM OF HYDROGEN SULPHIDE

The new requirement to condense hydrochloric acid gas helped to escalate a second problem. Although some of the acid formed was converted into chlorine for the preparation of bleaching powder, much of it was poured away into the Sankey Brook and its tributaries, where it mixed with the greeny-yellow liquid which oozed its way from the thousands of tons of alkali waste piled along their courses (MOH, 1873). The result was the generation of hydrogen sulphide gas, the presence of which could be detected up to eight miles away from the stream. The stench was said to be capable of turning even the strongest stomach, and in hot weather it was claimed that it could make sleep impossible.

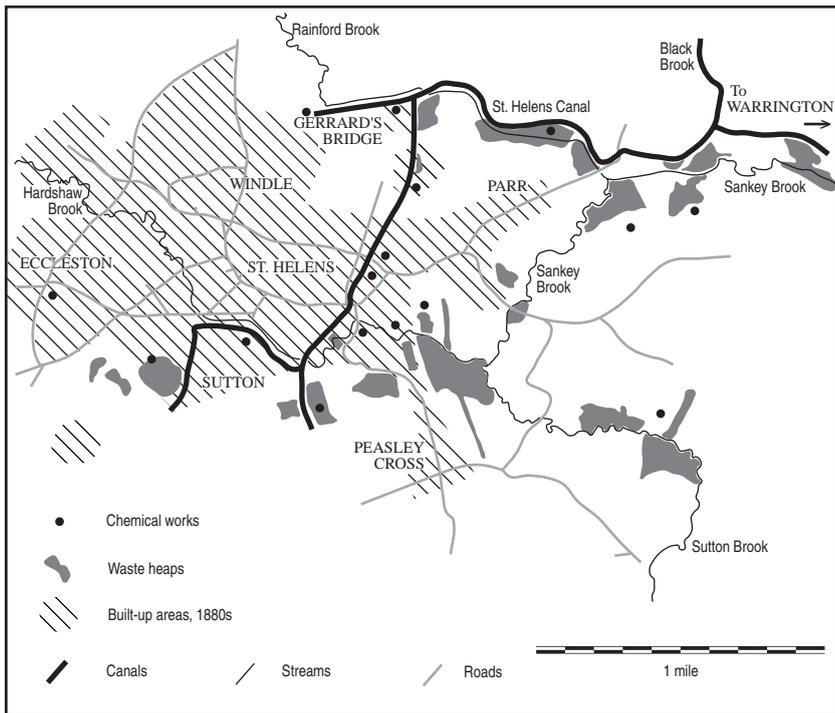


FIGURE 1

Location of alkali works and waste tips relative to watercourses in St Helens during the mid 1880s (Clerk 1884)

Such pollution was to be the first problem considered by the new council after the Royal Commission on the Prevention of Pollution of Rivers had exposed its scale (PP, 1870). This had encouraged the directors of the London and North Western Railway Company, who owned the rights to take water from the brook in order to feed a canal, to insist that clauses be inserted into the St. Helens Improvement Act (1869), requiring the council to cleanse the waters within two years (SHIA, 1869). Although several schemes of neutralising the acid were toyed with, no improvement took place. As the deadline approached, the first local protests appeared against the presence of hydrogen sulphide. In 1871, the owner of the St. Helens Flint Glass Company suggested to the Mayor that the brook should be culverted and ventilated by tall poles (SHN, 1871). During the municipal elections of 1872, councillor Barton argued that the brook was a hazard to health (SHN, 1872), and the following year councillors William and Richard Pilkington complained that the acid threatened the water supply to their glassworks, and that the smell was harming the health of some of their tenants (SHN, 1873).

It was the borough's first Medical Officer of Health, Robert McNicoll, who was responsible for placing chemical pollution high amongst the council's concerns. One of the earliest meetings of the Health Committee he attended saw him report upon the deleterious influence of hydrogen sulphide upon the community (SHN, 1873b). He suggested that whilst it was doubtful that the death-rate of the districts worst affected by the gas was any higher than those where the smell was less, he thought that the rate of sickness was significantly greater, particularly amongst infants (MOH, 1873). He proposed that the manufacturers should be forbidden to use the brook as a drain, and in June 1873 the relevant firms were asked to stop dumping their acid. However, taking their cue from national nuisance legislation, the council agreed that the ban would begin only once the manufacturers had found an arrangement satisfactory to their circumstances. The lee-way this provided became a licence to do nothing.

The impetus was maintained into 1874 with the passage of a new Alkali Act which required 'the best practicable means' to be used to prevent the escape of a number of noxious gases. McNicoll wrote a second report which stressed the link between chemical pollution and poor health in order to press the council to act (SHS, 1874). His remarks were supported by the borough's medical practitioners, and all involved received the applause of the press (SHN, 1874).

Smith was party to these events. In his annual report for 1874 he was to use a series of statistical comparisons, including information taken from St. Helens, in order to challenge the idea that chemical fumes were associated with good health and that exposure to them reduced the impact of infectious disease by disinfecting the air (RAI, 1874). Such an argument had often been employed by manufacturers in St. Helens, where one had claimed that working amidst chlorine gas helped to promote a peculiarly vigorous health, and that the congested lungs from which many of his labourers suffered was the result of their intemperance (SHN, 1874b). In September 1875 an inquiry was begun by the Manchester and

Salford Sanitary Association (with which Smith was associated) into the possible injurious effects of the gases released from chemical works (Gibson and Farrar, 1974). This had encouraged McNicoll to present one of the first papers to the newly formed North-western branch of the Association of Medical Officers of Health (which met in Manchester) which restated his views (Allen, 1906).

His remarks were passed on to Dr. Ballard of the Local Government Board, then in the early stages of compiling an account of the effects of industrial pollution (PP, 1878-1879). Ballard travelled to St. Helens in February 1876, where he met McNicoll and Smith. A few weeks later the Board wrote to the council concerning the volume of hydrogen sulphide in the air. They commented that this was now capable of amelioration, and they required details of the steps the Health Committee intended to take. (SHS, 1876).

McNicoll prepared a third report, this time upon the techniques of sulphur recovery from alkali waste. Witnesses to the Select Committee in 1862 had agreed that a satisfactory process had yet to be devised (PP, 1862b). However, during 1867 Ludwig Mond completed work on a method of treating the solid waste, and four years later James Mactear of Tennants & Co., St. Rollox, Glasgow, patented a technique capable of dealing with its drainage (Hardie, 1950). The council replied to the Board that they intended to ask the manufacturers to adopt Mactear's process, that they would begin to supervise the laying down of the heaps and to tighten further the bye-laws prohibiting the release of acid (SHN, 1876).

The council's request for action was again ignored. It required the appointment of the Royal Commission on Noxious Vapours to convince the alkali manufacturers that they needed to act (SHN, 1876b). In January 1877 they agreed to halt draining their acids into the brook (Minutes, 1877). David Gamble explained to the Commissioners that this was because he and his colleagues had increased their production of bleaching powder. As a result,

there are really so many who are turning no acid into the brook, or can, upon a very short notice, cease to turn acid into the brook, that they have been induced to agree to [the] resolution, and, in fact, to a memorial to the town council, to say they are *willing to be compelled* in future not to do so (PP, 1878b). [Emphasis added]

Their motives were suspected by those councillors who saw the resolution as no more than a cosmetic decision, and it was announced that the ban would be strictly policed (SHN, 1877). Further pressure to enforce it came from the Royal Commissioners themselves, for in July 1878 the council was instructed to supply them with details of all of their work in this matter completed so far (Clerk, 1878).

What was Smith's position here? He was hostile throughout towards the manufacturers' agreement and sceptical of their ability to maintain it. This is best revealed in the remarks he made as the Inspector appointed under the Rivers Pollution Prevention Act (1876). In 1881, he reviewed different methods of

sulphur recovery and described the need to help clear the Sankey Brook by using Mactear's process (PP, 1881). The manufacturers, however, remained impervious to his suggestions. His suspicion of them proved to have been well-founded, for although the volume of acid released was initially much reduced, the tests completed by the borough's Nuisance Inspectors showed that it had gradually crept back to its former level (SHN, 1880).

The initiative had fallen victim to a sharp depression in the Leblanc alkali trade, the result of growing competition from ammonia soda (made by the Solvay Process) and a fall in the price of bleaching powder (Richardson, 1968). In St. Helens, conditions were at their worst over the winter of 1878-1879. Three of the longest established firms were bankrupted and there was widespread distress. Municipal expenditure was curbed and concern was expressed that if any regulations were too rigorously applied, then the community would suffer further. Councillor Riley, for example, warned of 'a mania against deleterious substances [which would] keep new manufacturers away' (SHN, 1880b).

The Aberdare Commission had revived interest in the appointment of a resident alkali inspector. This had first been mooted during 1874 (SHN, 1874c), and Gamble repeated the request to the Commissioners in 1878 (PP, 1878c). Then it had been Fletcher's opinion that the rail link between his home in Liverpool and St. Helens made a resident unnecessary (PP, 1878d). The matter reappeared when it was feared that legislation would place the responsibility for beginning any prosecution into the hands of the local authorities (MacLeod, 1965). The cause of the council's anxiety lay with the proceedings begun against the owner of the St. Helens Lead Smelting Works for releasing a mixture of sulphuric acid and arsenic into the air. Although the emissions were thought to be both dangerous and new to the town, the decision to prosecute was an uncomfortable one, and it was felt that an independent inspector could not be challenged on the grounds of prejudice (SHN, 1880c). A further reason was the unhappiness of some councillors with Fletcher. In July 1880 the Health Committee had queried his inactivity over an escape of hydrochloric acid gas. His reply, which implied that they would be better employed in trying to control other nuisances, was regarded as impertinent (SHN, 1880d). More important were the fogs which began in November. Dr. Ricketts complained to the Health Committee after stumbling across a gentleman retching in the street and at finding children and old people struggling to breathe (SHN, 1880e). The following winter Dr. Jamison was a successful candidate at the municipal elections. He had committed himself to work for the appointment of a resident alkali inspector and for the adoption by the council of those clauses in the Public Health Act (1875) intended to curb the smoke nuisance (SHN, 1881). Finally, Matthew Arnold's description of St. Helens as a 'hell hole' drew matters to a head (SHN, 1881b). A conference between manufacturers and councillors held at the end of December 1881 saw the former shamed into pledging themselves to try to reduce the volume of coal smoke they released from their works (SHN, 1881c).

The Alkali Act of 1881 created four new inspectors, and the council requested that one might be based in St. Helens (SHN, 1881d). The Local Government Board refused to consider this unless the council agreed to pay half the salary, thereby duplicating the settlement reached with the council at Widnes (Clerk, 1881). This encouraged a deputation of councillors to travel to London where they argued that Fletcher's base was too far away, and that many gases continued to be released in the dead of night when he was absent. The Board agreed that Inspector Ballard should be based in the borough, initially for three months, in order to work from, as well as within, the town (Clerk, 1888).

Smith had opposed this from the beginning. He considered that the council sought to use Ballard as little more than a superior Inspector of Nuisances, whose job would be to lie in wait in order to catch defaulters out. If that was what they desired, he argued, then they should contribute half the salary. To Smith, Ballard's real purpose, to help spread good working methods, would be lost.

It is from this point that Smith began to turn his closest attention onto St. Helens. He had described to the Royal Commissioners that it had become 'absolutely essential' to render innocuous the drainage from waste heaps (PP, 1878e). The Alkali Act of 1881 strengthened his hand for it required that the acid and the alkali wastes should be kept separate (Alkali Act, 1881). In October 1882 he had written to the Leblanc manufacturers and suggested that they should combine in order to begin to extract sulphur, describing such a step as 'urgent' (RAI, 1883). He interpreted their failure to reply in any manner acceptable to him as indicating

a disposition to oppose my interpretation of the clauses, and on this I consider it necessary to insist; and if attention is not paid, I can only suppose that it will be requisite in some manner to require that the persons addressed show cause why they allow the flow of yellow liquor to continue...

The alkali manufacturers must either be legally compelled to act, or allowed more time. I feel unwilling to have the responsibility of longer delay.

He was unable to follow up his warning. Already ill, Smith was to be dead within a few months. His replacement as Chief Inspector was Alfred Fletcher who decided to allow this matter to progress far less dramatically.

### 3. FLETCHER AND ST. HELENS.

The council regarded Ballard's presence in St. Helens as a success. He worked closely with the members of the health department and from July 1883 the nuisance inspectors were instructed to contact him directly if any discrepancies were discovered (SHN, 1883). The way the waste heaps were laid was closely supervised (RAI, 1884-1885), and by 1885, McNicoll could describe that the only acid escapes which had been noted were accidental (MOH, 1886). Not

surprisingly the Local Government Board's decision to reorganise the Inspectorate was opposed by the council. Towards the end of 1887 Ballard received instructions to move to Chester. Fletcher was asked to reconsider but he refused, denying that the change would mean that the borough would be adversely affected (Clerk, 1887). A separate appeal to the Board also failed. They referred to the temporary nature of the original agreement, and closed their case by outlining the decline of the alkali industry in the town which had reduced the need for Ballard's presence (Clerk 1888).

It cannot be doubted that the problems of chemical pollution in St. Helens at the beginning of the 1890s were significantly smaller than those found a quarter of a century before, but an important factor lay with the decay of the Leblanc method of production rather than regulation. The development of the Solvay process during the 1880s, and the eventual collapse of the price of bleaching powder after 1889, proved to be killer blows to local firms. The trade's response was the formation of the United Alkali Company in November 1890, of which all heavy chemical firms in St. Helens became part. The new board of directors was dominated by manufacturers based in Widnes who set about rationalising their company. Periods of short-time working were followed by closure, and by the mid-1890s, a third of the Leblanc works in St. Helens had ceased operating (Barker and Harris).

The industry was to bequeath a massive problem to the district. Little action had been taken against the sulphur content of the solid waste. By the late 1880s, the most practical technique of sulphur recovery was that developed by Alexander Chance (Chance, 1888), but his methods had only been slowly introduced to St. Helens. In 1890 only two manufacturers were operating his system (RAI, 1891), and neither had found it easy to work the furnaces. Others refused to make a similar investment until the risk was much reduced (SHN, 1890). While Fletcher had been sympathetic, he had pressed the firms to act. In 1890 he returned to Smith's critical remarks of nine years before and suggested that sufficient time had now elapsed to make the desulphurisation of solid waste obligatory, and he received the assurance of the United Alkali Company that all new waste would begin to be treated within the next six months (RAI, 1891b). However, the tens of thousands of tons of old waste was to be left untouched until the twentieth century (RAI, 1895).

#### 4. CONCLUSIONS

During the 1860s and 1870s the character and extent of alkali pollution in St. Helens was revealed by two major government investigations, whilst its damaging effects upon the community's health was explored by the Medical Officer. These joined the regular condemnation of such conditions by Angus Smith. Although the judicious enforcement of legislation had helped to encourage the

condensation of hydrochloric acid gas, his conciliatory methods were unable to stir the soda makers to reform the circumstances which allowed the stench of hydrogen sulphide to fill the air.

The repeated protests of the manufacturers at the absence of any alternative acceptable to them, and their warning that the price to pay for new regulation was the decay of the local economy, may have been sufficient to delay vigorous action by the council. This is a familiar story, but why was Smith apparently so ineffective? Firstly, there was the scale of the problem. In their representation to the Local Government Board in 1881, councillors showed that nearly 2,600 cubic metres of waste had already been laid down which already covered over 50 hectares. Geography did not favour the simplest solution, adopted in the North-east, where such material was dumped at sea, and it accumulated within the borough's borders. Secondly, although Smith sought to work with the manufacturers, he was trying to do so at a time of deepening economic troubles, particularly during the early 1880s, and asking them to adopt expensive and uncertain technical remedies. Thirdly, at crucial points he found his position undermined when his opinions were disregarded by his superiors at the Local Government Board. Smith was also unable to switch to coercive action as easily as he had after 1863, for his weaponry was inadequate. From 1881, it was an offence to allow acid and alkali wastes to mix, but the inspectors faced massive difficulties in apportioning responsibility for the drainage from heaps which were of such a size and which were decades old. Finally, we have the complexity caused by the peculiar association of water- and air-pollution. Whereas the Local Government Board was eventually able to use its powers of loans sanction to push the council towards diverting sewage and other pollutants away from the Sankey Brook, the alkali inspector had no comparable lever under his control.

Three areas of research might be suggested which could place these events into a wider context. The first is to discover whether the problems the alkali inspectors faced in St. Helens from the 1870s were duplicated in the other districts under their supervision. Secondly, an examination of the work of the Alkali Association and other trade groups might prove fruitful, as might the third, an investigation of those combinations of sanitary authorities formed in areas adjacent to the centres of chemical production. Thus far, the control of alkali pollution has been portrayed as being the direct concern of only the Inspectorate and the manufacturers. It is possible that opposition to the 'monster nuisance of all' had a far broader base than hitherto thought.

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