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9. The stench of prosperity. Water pollution in the northern Netherlands 1850-1980¹

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In the north of the Netherlands, in the province of Groningen, is a region called "De Veenkoloniën" (The Ven Colonies). This area once provided the main energy source of the Dutch Golden Age: peat. During the period between the beginning of the 16th to the early 20th century the peat moors in this region were drained and cut away. In the second half of the 19th century the peat in the Veenkoloniën was almost gone². What remained was a unique landscape dominated by huge fields and straight canals. This landscape and the products it produced, potatoes and grain, formed the foundation for the agricultural industry that emerged during the second half of the 19th century. This industry was dominated by potato starch and strawboard factories.

The emergence of the agricultural industry in the Groninger Veenkoloniën caused a very serious problem: one of the worst episodes of industrial water pollution in the Netherlands. Both the industry and the government were aware of this very visible and smelly problem. For more than a century many attempts were made to end the water pollution in the Veenkoloniën. However, it was not until the early 1970s that political and technical developments made a final solution for the Groningen wastewater problem possible. This article

1. I wish to thank Tim Lovering for proof reading the manuscript. His comments and suggestions improved the article considerably.

2. Jan. W. DE ZEEUW, "Peat and the Dutch Golden Age. The historical meaning of energy-attainability", *A.A.G. Bijdragen*, 21, 1978.

will address the question of why it took more than a century to end water pollution in Groningen.

The essay will focus on the changing attitudes towards the industrial water pollution in the Veenkoloniën in the period between 1850 and 1980 and on how a combination of social, economic and technical developments, contributed to the final solution of the problem.

Prosperity, stench and foam

From the middle of the 19th century the agricultural industry in the Veenkoloniën developed rapidly. In a brief period of time, many potato starch and strawboard factories were established, attracted by the excellent waterways, raw agricultural produce and labour in the region. The factories brought jobs and prosperity but also stench and foam.

The first potato starch factories in the Veenkoloniën were opened in the 1830s but the great boom occurred after 1841 when Albert Scholten, a major industrialist, opened his first factory near Hoogezand-Sappemeer. The number of factories continued to increase to fourteen in 1885 and reached a peak of twenty-four in 1912. Hereafter the number of factories declined until only four remained in 1985. However, the amount of wastewater produced by these four factories was six times higher than the amount dumped in the canals by the twenty-two factories in existence in 1900. This was the result of the dramatic increase in production potential during the 20th century. In 1985, the potato starch industry processed fourteen times more potatoes than a century earlier³.

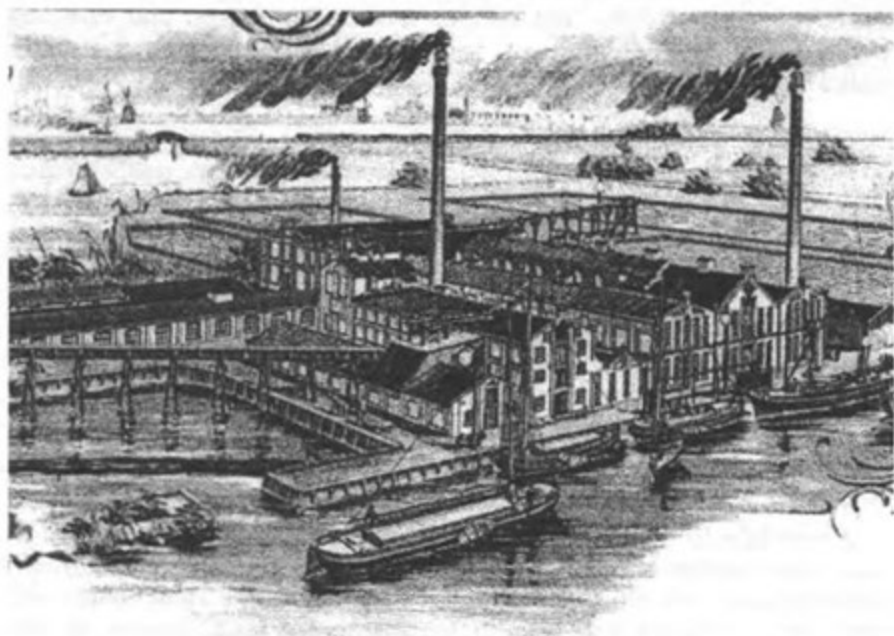
A similar development can be detected within the strawboard industry, although the peak of the number of factories was only reached during the 1930s. The production of strawboard has now entirely vanished but until the 1960s the Veenkoloniën had the highest output of strawboard in the world. After the 1960s the industry encountered extreme difficulties as a result of increasing competition from factories in low-income countries. The strawboard industry never recovered from these problems and in 1979 the last production line came to a halt, thus eliminating a huge source of water pollution. Because the strawboard industry produced less pollution than the potato starch factories the remainder of this article will focus on the starch industry.

3. G. MINDERHOUD, *Ontwikkeling en betekenis der landbouwindustrie in Groningen*, Groningen, 1925, p. 7-8; Ministerie van binnenlandse Zaken, *Verslag van de Staatscommissie tot voorbereiding van maatregelen tegen de verontreiniging van openbare wateren*, Den Haag, 1912, p. 186.

NUMBER OF STRAWBOARD AND POTATO STARCH FACTORIES
IN THE VEENKOLONIËN, 1885-1980⁴

Year	Strawboard	Potato starch	Total
1885	4	14	18
1891	5	17	22
1900	10	22	32
1912	13	24	37
1930	16	16	32
1960	14	5	19
1979	1	4	5

PICTURE 1 - SCHOLTEN'S POTATO STARCH FACTORY AT FOXHOL AROUND 1930⁵



4. E.J. VAN HOUTEN, *Anderhalve eeuw aardappelzetmeelindustrie*, Veendam, 1994, p. 6; M. DENDERMONDE, *Hoe wij het rooiden. De Veenkoloniale aardappelboer en zijn industrie*, Veendam, 1979, p. 57.

5. Collection Veenkoloniaal Museum Veendam.

The nature of the water pollution

The waste products polluting the canals in Groningen are not artificially produced chemicals but organic products, in particular albumin (protein). Organic pollutants are normally biodegradable but if the influx of organic pollutants becomes too high the cleaning capacity of the water will be compromised. This is caused by the fact that the degradation processes of organic pollutants need a lot of oxygen and with too many pollutants the oxygen levels drop dramatically. This stops the degradation process and causes so called "dead water" in which no life can be sustained. Fish and plants die and a slow rotting process produces stinking gasses that linger above the canals⁶.

The industries in the Veenkoloniën produced so much waste water that the canals in Groningen were turned into stinking open sewers, killing almost all fish and turning lead-based paint on window frames black in a single night. This did not go unnoticed and visitors to the Veenkoloniën described the canals as a stinking and boiling mass unsuitable for any household use or drinking water. In 1872 Anthony Winkler Prins, the famous minister, publicist and encyclopedist from the Veenkoloniën, gave a vivid description of the water pollution:

A nauseating stench rose from the canals. The watercourses were littered with dead fish floating on their backs, because the water was so filthy that it had become useless for animals and humans alike, even the pumps produce nothing but spoilt liquid⁷.

It was clear to the local population that the industry in the region was causing serious water pollution but most of them were not interested in solving the problem. The factories brought work and prosperity. That they also produced water pollution was a price the population was prepared to pay. But at the same time local and national authorities had become alarmed by the sharp increase in water pollution in the Veenkoloniën.

A health threat?

According to 19th century theories of disease and hygiene, the rotting waste products of the industries in the Veenkoloniën would certainly produce harmful gasses called miasmas. After 1860, when the new ideas of Koch and Pasteur became more wide spread, it was feared that the rotting albumin (protein) would produce harmful micro-organisms. The Health authorities for the province of Groningen shared these concerns and on several occasions they urged the local

6. Pier VELLINGA, *The environment. A multidisciplinary concern*, Amsterdam, 1995, p. 75-78.

7. Anthony WINKLER PRINS, "Het vuile fabriekswater", *Veendammer Courant*, 19 November, 1872. All translations are the author's.

authorities and the industry to take measures to deal with the water pollution. In 1859, the provincial authorities of Groningen asked Doctor Ali Cohen, Inspector of Health, to conduct a survey into the scale, causes and possible health risks associated with the water pollution in the Veenkoloniën. The report that resulted from this survey underscored the concerns about the possible health risks for the local population and formed the basis for the first legislation to counter the negative effects of water pollution in the Netherlands.

Under the new legislation, any new factory that was built needed a permit that allowed it to discharge its wastewater into lakes and streams under the condition that air and water pollution and the loss of valuable minerals had to be prevented. This condition shows a shift in thinking away from a potential health threat and in favour of the extraction of economic valuable minerals from the wastewater. The industries were interested in that part of the wastewater that was called "waste". In their opinion waste was something that was useful for other purposes and could be extracted in a financially viable way. It was realised that a fortune in protein and minerals was wasted with discharging unpurified wastewater. It was thought that the proteins and minerals that were lost could be useful as feed or fertiliser⁸.

More reports

Ten years after his first report, Cohen published another report for the provincial authorities of Groningen. This was the first of four reports that surveyed the possibilities of purification of the wastewater of potato starch and strawboard factories. The reports focussed on the technical difficulties of the extraction of albumin, which was the most pollutant compound, from the wastewater. Cohen proposed three methods to extract the albumin from the polluted process water. The first method was to heat the polluted water to a temperature at which the albumin coagulates so that it could be scooped off the water. The second and most simple method was the extraction of albumin through filtering. Finally Cohen proposed to add chemicals to the wastewater in order to make the albumin precipitate after which it could be scraped off the bottom⁹.

Cohen's experiments showed that both coagulation and precipitation methods were good techniques for extracting albumin from

8. Ernst HOMBURG, "Schrikbeeld van Scheikundigen aard: chemische industrie, chemische wetenschap en het milieu 1800-1875", *Tijdschrift voor Geschiedenis*, vol. 109, 1994, p. 439-466.

9. L. Ali COHEN, "Waterbederf ten gevolge van aardappelmeel fabricage. De naaste oorzaken daarvan en de middelen daartegen aan te wenden. Derde rapport aan de Staten van de Provincie Groningen", *Nederlandsch Tijdschrift voor Geneeskunde*, 1874, p. 496-503.

wastewater. But he was not convinced that these methods could be practically and economically employed on a large scale. In his third report Cohen concluded that it would be much cheaper to let wastewater flow over a field, a so-called flowing field, before it was discharged into a canal. The idea was that the albumin and minerals would be absorbed and fertilise the soil. It was not an effective method but it was cheap and therefore flowing fields were in use until the 1960s¹⁰.

State intervention and experiments, 1897-1917

The start of the 20th century saw a renewed interest in Groningen's water pollution problem. In 1897, the government appointed a committee with the task to investigate the pollution of surface water in the province of Groningen and to propose measures to solve this problem.

The committee's report was published in 1901 and advised the government to introduce legislation that forced the industries to clean up their act. A water pollution bill was introduced in parliament in 1903 but it never came to a vote. The bill simply disappeared in a departmental drawer and was completely forgotten. Parliament was not interested in the matter and thought that jobs in the region were more important than clean water¹¹.

Although the report of the committee did not result in any legislation, the government realised that something had to be done. In 1908, the government appointed another commission dedicated to solving the water pollution caused by strawboard and potato starch factories. This commission built on the Cohen's work and concluded that the use of flow fields was a good and cheap method to purify the wastewater. The report also reviewed the filtration and coagulation methods Cohen had experimented with. The overall conclusion of the report was that good methods for the purification of wastewater from agricultural industries existed. It also concluded that the pollution of canals would not increase if new factories would be obliged to purify their wastewater. In addition, the commission proposed to gradually decrease the amount of polluted water discharged in the canals by building purification installations at existing factories, under the condition that the interests of the industries would not be compromised¹².

10. *Ibid.*

11. Verslag van de handelingen der Staten-Generaal. Zitting van 15 september 1903 - 23 juli 1904. Troonrede 1903. Ingekomen wetsontwerp 19 november 1903.

12. *Rapport der commission voor de reiniging van het afvalwater van stroocarton en aardappelmeelfabrieken*, Den Haag, 1912, p. 99-100, 169-171.

The ambivalence of the report possibly explains why the government ignored it. On the one hand, the report advised taking measures to limit the water pollution. On the other hand, the government had to act carefully in order not to compromise the interests of the industry too much. And even if the government introduced legislation to force the industry to clean up their act, the companies involved had already decided not to reconstruct their factories. One engineer involved in the potato starch industry commented that the construction of purification installations "would probably cost more than the value of the factories themselves and is for financially weak factories out of the question"¹³.

In the meantime, the potato starch industry had been actively engaged in experiments with purification methods. This was not because they were afraid that the government would introduce legislation forcing them to put an end to their polluting practices, but because the industry believed that protein and minerals worth a fortune were lost through dumping its wastewater untreated. As a result the combined potato starch industry of the Veenkoloniën hired engineer Sjollema to develop economic methods to extract minerals and protein. Sjollema, in co-operation with the potato starch manufacturer Meijer conducted a series of experiments examining the extraction of protein from wastewater. These experiments were not successful because the extraction of albumin from wastewater proved more difficult and more expensive than expected. In 1910, the potato starch industry stopped financing the experiments. It was the war situation in Europe that revived the experiments in 1916. During that year, the minister of Agriculture urged the potato starch industry to renew their experiments. His objective was to increase the production of fodder to make the Netherlands self sufficient during a period of limited imports caused by the war. The Industry initially refused because they regarded the experiments as a financially risky business. It was only after the minister promised a —for that period— enormous subsidy of 90,000 guilders that the industry was prepared to co-operate¹⁴.

However, after the reconstruction of starch factory "Oranje" and the experiments had got underway, it became clear that the minister would not keep his promise. The subsidy was never paid and the experiments were terminated in the autumn of 1917. This refusal to pay the subsidy almost caused the bankruptcy of potato starch factory

13. Correspondence Sjollema with the Vereeniging van Aardappelmeelfabrikanten. Letter minister of Agriculture, 16 November 1916, Archives AVEBE, Rijksarchief Groningen (hereafter RAG).

14. Anon., "Bereiding van veevoeder uit het vruchtwater der aardappelmeelfabrieken", *Landbouwblad voor de Veenkoloniën*, April 1917, p. 1-2.

"Oranje" where the experiments had been carried out. But more important was the long-term effect on the water pollution problem in the region. The potato starch industry felt betrayed and for twenty years they did not allow any government involvement and the experiments were put on hold¹⁵.

The inter-war years

By the start of the 1920s, the solution to water pollution in Groningen seemed more remote than ever before. Almost all experiments were terminated and the industry continued to increase its production capacity. But there was a glimmer of hope on the horizon. In 1919, the *Co-operatief Aardappelmeel Verkoopbureau* (Co-operative potato starch trading bureau, hereafter A.V.B.), a company owned by farmers, was founded. In 1925, A.V.B. opened a laboratory that carried out research with the purpose of analysing and controlling the quality of its products. After several years, the laboratory started to do research into possible reduction of the amount of water used during the production process and the development of new techniques to extract protein from wastewater¹⁶. The research conducted by the laboratory was encouraging and A.V.B. started experimental extraction of protein in one of its factories. This was so successful that the government decided to subsidise the construction of extraction installations and the exploitation costs involved. By the outbreak of the Second World War in 1940, the subsidies were terminated but A.V.B. continued the experiments, despite the shortage of potatoes¹⁷.

The sewer pipeline

After the Second World War, there was not much time and money for experiments. The first objective of the industry was to repair the damage caused by the war and restart production. When the reconstruction period was over, A.V.B. opened a new laboratory that was fully dedicated to research, and quality control became the responsibility of the individual factories. But A.V.B.'s laboratory was not the only institute that studied the wastewater problem. During the war, the *Rijksinstituut voor de Zuivering van Afvalwater* (National institute for the purification of wastewater, hereafter RiZA) had developed a plan to solve the water pollution in Groningen for good. The RiZA engineers had reached the conclusion that purification of the wastewater of every individual factory would be a very expensive business.

15. M. DENDERMONDE, *Hoe wij het rooiden...*, op. cit., p. 268.

16. Annual Report AVB, 1928-29.

17. *Vertrouwelijke Rapporten inzake fabricage van veevoeder uit aardappelen*, 1936-1937, Archives AVEBE, RAG.

It was estimated that the annual amount of wastewater produced by the industry in the Veenkoloniën equalled that of a city of ten million people. It was also calculated that purification of all this water would cost more than 500 million guilders, an amount of money that was not available in the post-war Netherlands. In addition, the RiZA researchers were convinced that 100 percent purification of the industrial wastewater was almost impossible. It was estimated that just over 75 percent of all contaminating substances could be removed from the water. This meant that an enormous amount of polluted water, equivalent to a city with 2.5 million inhabitants, would still be discharged in the Groninger canals¹⁸. This was unacceptable for the engineers and therefore they developed an alternative plan and in 1946 the RiZA launched the idea of the sewer pipeline.

This plan, which aimed to put an end to the water pollution in the Groninger canals, was simple but not exactly elegant. The engineers proposed the construction of a network of pipelines that would carry the wastewater of the entire agricultural industry in the province of Groningen to the Eems-Dollard estuary. It was thought that the self-cleansing capability of this body of water was big enough to deal effectively with the wastewater. The people in the Veenkoloniën were in favour of the plan because it would put an end to the stench and foam. The RiZA elaborated the plan during the 1950s and in 1960 a final plan was presented for the construction of a 140 kilometre long pipeline. A network of three branches would connect all the factories to the main pipeline that would carry the polluted water to the Waddenzee¹⁹.

The original plan was never carried out because in the years following its presentation the sewer pipe encountered increasing resistance. In Germany, the plans for the sewer pipeline were observed with growing suspicion. Already during the 1950s the government was warned that the German interests had to be taken into consideration, but the warning was ignored. By the mid-1960s, when the construction of the sewer pipeline was about to begin, the German government protested loudly and demanded that the Dutch government would reconsider its decision. The Germans feared that if the Dutch started discharging the enormous amounts of wastewater from the Veenkoloniën the oxygen levels in the Eems-Dollard estuary would drop by at least 50 percent. If the Germans wanted to discharge a similar amount of water, the self cleansing capability of the estuary would be compromised. The conflict over the sewer pipeline almost

18. J.J. MOERKERK, "Problemen rondom het Groningse afvalwater III", *Nieuwe Rotterdamse Courant*, 18 January 1957.

19. C. WINKLER, "Maatregelen tegen de waterverontreiniging in the provincie Groningen", *Water Bodem Lucht*, vol. 1, 1961, p. 17-19.

caused a diplomatic crisis between the Netherlands and neighbouring Germany²⁰. But developments in the Netherlands prevented this conflict from further escalation.

Alarmed by the possible consequences of the construction of the sewer pipeline for the Waddenzee, a group of farsighted conservationists established the *Landelijke Vereniging voor Behoud van de Waddenzee* (National Association for the Protection of the Waddenzee, hereafter LVBW). The Waddenzee is a large area of tidal wetlands off the northern coast of the Netherlands and harbours a unique and fragile ecosystem. In 1966, the LVBW wrote in a letter to the provincial authorities that the discharge of large amounts of industrial wastewater into the Waddenzee would be extremely harmful to the flora and fauna of the area. They asked the authorities to reconsider their decision²¹. The whole movement gained respectability when a group of professors and students of the University of Groningen wrote a letter to the provincial government in which they said that they were concerned about the consequences of the sewer pipeline for the Waddenzee²².

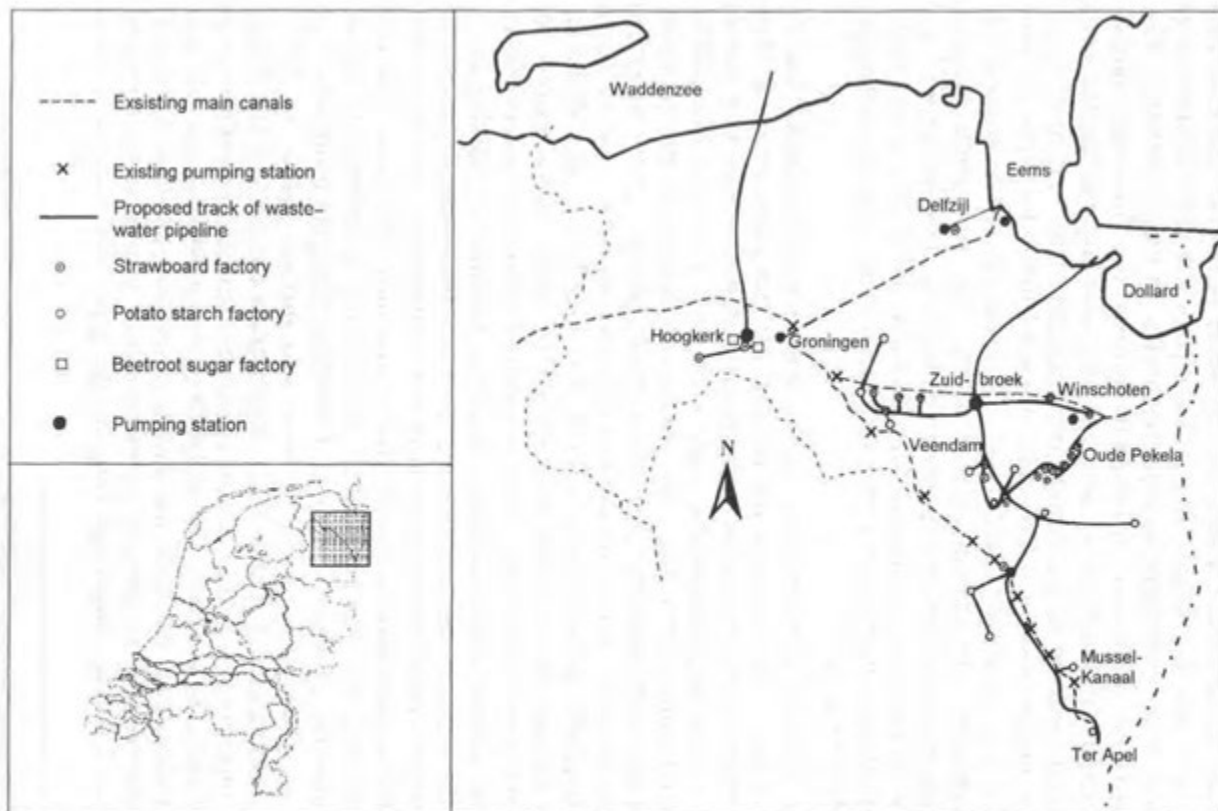
However, the general opinion in the Veenkoloniën was not concerned with the negative effects of the sewer pipeline for the Waddenzee. The local population was no longer prepared to tolerate the stench and foam and as a result spontaneous action groups sprung up all over the region by the late 1960s. They demanded that the water pollution of the canals would stop immediately and any delay in the construction of the pipeline was viewed with suspicion. The local population was not interested in the effects of the sewer pipeline on the Waddenzee. This was underscored by a headline that appeared in a regional newspaper in 1968: "Purification installation not needed in Veendam. Discharge though pipeline"²³. When the initial protests did not speed up the construction of the sewer pipeline the action groups resorted to the tactics of civil disobedience and called on the population not to pay their taxes as long as the factories polluted the canals. However, the government began to question its own idea and started to consider alternatives. The result was that much more foam would flow through the canals of the Veenkoloniën before a solution was implemented.

20. Gino HUISKES, *De visschen vergeven; geschiedenis van de watervervuiling enzuivering in Drenthe*, Assen, 1995, p. 45-46.

21. Minutes Provinciale Staten van Groningen, 23 November 1966, Bibliotheek RAG, Inv. No. S.242.

22. HUISKES, *De visschen vergeven*, p. 46.

23. "Zuiveringsinstallatie in Veendam niet nodig. Afvalwater lozen via persleiding", *De Noord-Ooster*, 26 September 1968.



LOCATION OF THE GRONINGER VEENKOLONIËN AND THE PLAN FOR THE SEWER PIPELINE TO THE WADDENZEE

Government pressure and reorganisation

The national government did not really listen to the local protests because it did not like half measures and wanted to deal effectively and thoroughly with the water pollution problem. In 1969, the Dutch government announced a new law on water pollution. The core idea of this law was the adage "the polluter pays". It gave surface water supervisors the possibility of imposing levies on water polluters. This proved to be an effective instrument to force the Groninger agricultural industry to purify its wastewater. The new law was not the most important concern of the strawboard industry. This branch of industry was mainly pre-occupied with structural difficulties. By the time the new law came into effect, most of the strawboard factories in the Veenkoloniën had already closed down. The remaining factories changed to less polluting raw materials such as recycled paper²⁴ and the last strawboard production line closed in 1979. The water pollution problem in itself played little role in the demise of the Groninger strawboard industry²⁵.

The effect of the new law on the potato starch industry was far more serious. The investments needed for the purification of their wastewater were an almost unbearable burden for the two potato starch producing companies AVEBE (former A.V.B.) and Koninklijke Scholten-Honing (KSH). The only solution seemed to be the construction of the sewer pipeline to the Waddenzee and the government had announced that the levy to use the pipeline would be low so that it was affordable to use. These statements made the potato starch industry believe that the pipeline would be built. Unfortunately for them, the government had changed its mind about the sewer pipeline without informing the industry. With no warning, it decided to reduce the capacity of the pipeline by 50%. This meant that not all wastewater could be transported to the Waddenzee and that a considerable amount still had to be discharged into the canals. The government had carefully planned its strategy and in addition to the reduction of the pipeline's capacity it announced a plan to impose high levies on discharging polluted water into surface waters by 1973²⁶. This combination of higher taxes and smaller capacity of the wastewater pipeline forced the potato starch industry to start purification of part of its wastewater. The old idea of extracting protein and minerals was revived, not with the aim of preventing the loss of valuable raw materials, but to prevent water pollution. It now seemed feasible to succeed where others had failed in the past. This was due to tech-

24. The polluting process of de-inking did not take place in the Veenkoloniën.

25. Tjarko van Dijk et al., *Uut stro zet. Honderd jaar strokarton in de Groninger Veenkoloniën*, Veendam, 1985, p. 61.

26. M. DENDERMONDE, *Hoe wij het rooiden...*, op. cit., p. 269-270.

nical advances, especially new membrane technology and biological treatment, which made it possible to extract virtually all the protein and minerals from water²⁷.

Technology was not the bottleneck anymore, but it was not possible for the industry to clean their wastewater due to political and financial problems. Both the investments in new purification technology and the high environmental taxes went far beyond the financial means of the combined companies. Apart from these problems, the deep economic recession of 1973 put both AVEBE and KSH in a problematic financial position. The financial difficulties for KSH were made even worse due to a failing glucose adventure in Great Britain. KSH had bought and reconstructed a huge factory for extracting glucose from corn in Tilbury. This operation became a financial disaster, and in combination with the bad economic situation led the company to the brink of bankruptcy. In the meantime the Dutch government had raised the levies on dumping unpurified wastewater to an almost unrealistic height. This was the final straw for KSH and in the autumn of 1977 the company collapsed²⁸.

In the meantime the discharge of polluted water into the canals continued because the sewer pipeline was not built and the industry had no choice but to discharge its wastewater in the canals. This led to more widespread protests against the stench in the Veenkoloniën than ever before. One of the results was that the population started to dump their domestic waste in the canals, justifying their actions with the slogan: "if they are allowed to pollute, so are we"²⁹. By late 1970s the pressure on the government became such that it decided to build a temporary sewer pipeline to relieve the population of the stench.

This development did not mean that the government gave in to the population by opting for the easy solution, *i.e.* the pipeline. With KSH on the verge of bankruptcy, the authorities seized this moment of weakness to impose its will. Two of the government departments involved in the KSH-drama, the department of the Interior and the Finance department, managed to change the bankruptcy into a suspension of payment. Under pressure from the department of Agriculture, KSH consecutively received enough financial aid to survive until the spring of 1978. This aid was provided to create sufficient time to give a chance to the negotiations between AVEBE and KSH about a merger of the two companies. The negotiations between AVEBE and KSH were successful and in June 1979 KSH's starch division was

27. *Jaarverslag KSH*, 1975-76.

28. *Jaarverslag KSH*, 1976-77.

29. Pamphlet of the "Neutraal Aktie Comité" to the citizens of Pekela, 1 Oktober 1973, Municipal Archives Pekela, Inv. no. 1277.

taken over by AVEBE³⁰. The merger was an important step in solving the water pollution problem in the Veenkoloniën because the entire Dutch potato starch industry was now concentrated in one company that could be more tightly controlled by the government. This made it possible to impose more effective wastewater purification measures on the potato starch industry.

PICTURE 2 - POLLUTED CANAL COVERED WITH BLACK FOAM³¹



The department of Agriculture had several political reasons for actively supporting AVEBE and the merger with KSH's starch division. In the previous decades, AVEBE had received considerable financial aid from this department to finance its research into techniques for purifying their wastewater. KSH received hardly any government subsidies during this period. The choice to support AVEBE instead of KSH had a strong political background. AVEBE was a co-operative company owned by many potato-farmers based in the Veenkoloniën. In addi-

30. *Jaarverslag* AVEBE, 1978; *Jaarverslag* AVEBE, 1979; HUISKES, *De visschen vergeeven...*, *op. cit.*, p. 82.

31. Collection Veenkoloniaal Museum Veendam.

tion, AVEBE was the region's largest employer with over three thousand people working in its factories and hundreds of farmers producing potatoes for the company. This made AVEBE, in contrast to KSH, a typical company from the Veenkoloniën. The bankruptcy of AVEBE would have caused massive unemployment in the Veenkoloniën and this was politically unacceptable in an economic weak province such as Groningen. Afraid of losing their influence and electorate in Groningen, the political parties involved had no choice than to support the department of Agriculture's decision to give AVEBE financial aid³².

Now that the whole potato starch industry was concentrated in one company, AVEBE —under supervision of the government— drew up a plan that aimed at the total purification of its wastewater. The scheme not only aimed at clean water but also at the extraction and economic use of the pollutants. In order to do so AVEBE completely reconstructed its factories, reorganised the company and concentrated its industrial activities in only four locations. The success of this reorganisation depended on continuous financial support from the government until the entire operation was successfully concluded³³. It took AVEBE six years to reconstruct its factories and reorganise the company but by 1985 all its wastewater was purified before being discharged into the canals³⁴. After more than a century the population of the Veenkoloniën could finally breathe fresh air again and the temporary sewer pipeline could be closed.

The tortuous road of 130 years pollution history

The 130 years covered in this article can be divided in four periods. During each of these periods the water pollution in the Groningen Veenkoloniën was perceived in a different way. Initially the pollution was regarded as a general health treat to the local population. Around 1870, the focus of attention shifted from a possible health risk to a concern about the loss of albumin and minerals, thus transforming the water pollution issue into a raw material problem. The potato starch manufacturers were aware that with the discharge of wastewater into the canals, a huge amount of potentially valuable minerals and protein were washed away. The attempts to solve the problem of water pollution in the Veenkoloniën failed because the technology to remove the pollutants in an economic feasible way did not yet exist and therefore most experiments were terminated around 1915. In addition, the government did not keep to its promise to sub-

32. H. NIENHUIS, "Over AVEBE en de zorg voor de boeren voor de toekomst", *Marquetalia*, May 1982, p. 27-53.

33. E.J. VAN HOUTEN, *Aardappelzetmeelindustrie...*, op. cit., p. 53.

34. P.J.R. BÜGEL et al. (eds), *De AVEBE, een Venkoloniale industrie*, Groningen, 1985.

sidise the experiments which caused a lasting distrust among the potato starch industry.

Because of the troubles in the previous decades, the potato starch industry lost its appetite for solving the wastewater problem. But the newly founded A.V.B. started small-scale experiments with the extraction of protein from potatoes and its research laboratory conducted a series of experiments throughout the 1930s. After the war both industry and the government abandoned the idea of protein extraction and decided to transport the wastewater from the Veenkoloniën by pipeline to the Waddenzee and discharge it there. This way the industry and the inhabitants of the Veenkoloniën would be liberated from a smelly problem. The pipeline plan transformed the water pollution from a resource problem into a refuse problem, inaugurating the third phase in the water pollution history of the Veenkoloniën.

When the pipeline plan was muted the modern concern for the environment had not yet arrived but during the first environmental wave during the 1960s the idea of the sewer pipeline generated increasing opposition. Protests and changing insights with regard to nature and the environment caused the government to reconsider the plan for the pipeline. It realised that the use of the Waddenzee as a giant sewer was not a good and elegant solution. The alternative was purification of all wastewater in the factories and in order to achieve this the old idea of protein and mineral extraction was revived. But this was not an objective in itself and it became linked with the water pollution issue, turning it into a combination of a resource and an environmental problem during the final phase of the water pollution in Groningen. By means of legislation, environmental levies and technical measures the government forced the industry to clean up its wastewater by extracting valuable substances.

We may conclude that the water pollution in the Veenkoloniën was solved as the result of a combination of developments. These include the rise of modern environmental awareness, the availability of new technology, the reorganisation of the potato starch industry, and, last but not least, the compelling pressures from the government. The decision of the government to give aid to AVEBE provided the company with the time and the means to deal with the water pollution problem. This led in the end to clean canals and the preservation of jobs in the region which shows that industrial activity and environmental considerations are not necessarily detrimental to each other.