NATIONAL ALUMINUM PRODUCTION HERITAGE ASSOCIATION

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Early Aluminum Industry in the USA

This newsletter continues its mission of highlighting the people and places of the early aluminum industry. With this issue we highlight the history of aluminum in New York State and the Tacoma, WA smelter.

Aluminum Smelters in the Empire State

There was a time when the center for aluminum production in the United States was New York. The Empire State produced more aluminum than any other in 1891-1892, 1896-1940 and in 1943.

Between 1891 and 1959 seven aluminum smelters were built. Three used water from the Niagara River, three were on the St. Lawrence River, and one was in Queens.

The first Hall-Héroult smelter in New York State was in Lockport, NY. In 1891 the Cowles Electric Furnace and Aluminum Company [Cowles] began using technology developed by the Pittsburgh Reduction Company [PRC], at their plant in Pittsburgh.

Cowles acquired it by hiring back a skilled technician and supervisor, Mr. John Covert Hobbs. He had left Cowles in 1888 after Charles Martin Hall's contract there had ended. Mr. Hobbs had helped Hall to develop his early reduction cells at Cowles. He then went with Hall to Pittsburgh to develop the first PRC, a.k.a., "Hall" pots.

Cowles believed that the PRC had used their technology. So they used Mr. Hobbs' knowledge to build their own Hall pots.

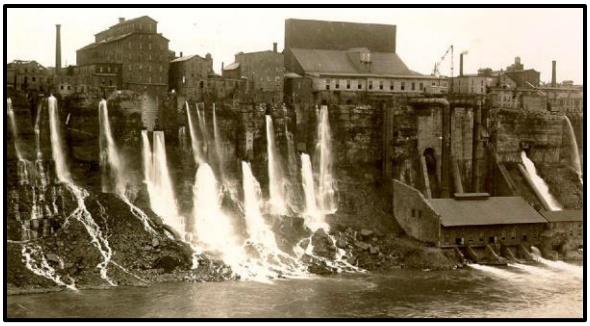
This was all before hydroelectric plants existed. Cowles used hydraulic power from a raceway that tapped Niagara River water flowing down the Erie Canal. This turned a water wheel and pulleys connected to a dynamo named *The Colossus* which generated 375 kilowatts of electrical power.

With low cost power Cowles sold aluminum at $1/lb. while the PRC sold at $1.50/lb. With inflation this equates to $78,500 vs. $118,000 per metric ton in 2026 dollars.

Cowles was sued after Mr. Arthur Vining Davis of the PRC made a midnight visit to Lockport to look through an open window of the Cowles reduction plant.

The PRC won the case and Cowles had to stop using Hall's technology in 1893. Their production of about 200 lbs/day, is what four Hall pots would have produced.

The next two smelters in New York State were built by the PRC in Niagara Falls, NY in 1895 and 1896 to access low cost power. With their combined output they produced more aluminum than any other state, and any other nation, between 1897 and 1933.



The Pittsburgh Reduction Company's Niagara Falls Lower Works (at right with chimney-style roof) and its own direct current power plant below

The Upper Works ran from 1895-1919 and the Lower Works operated from 1896-1949.

The fourth, fifth and seventh smelters in the Empire State were all built in St. Lawrence County. As had been the case at Niagara Falls, the PRC was the first customer for hydroelectric power from the St. Lawrence Power Company in 1902 and Alcoa was the first customer of Moses-Saunders power from the St. Lawrence Seaway in 1955.

In August 1903 the PRC began Massena Operations along the Grasse River and the Massena Power Canal. By adding more power from Cedar Rapids, Québec sixteen potlines were built between 1903 and 1938. In the late 1950s smelting operations fully shifted to the current site of Massena Operations, near the St. Lawrence River. Six additional potlines have been operated on this site, one of which, Potline 6, remains in operation to this day.

The fifth smelter, Plancor 226-NY, was built near Massena by the U.S. War Department on government land in 1942. It operated N-40 type pots until January 1944 as a Defense Production Corporation [DPC] plant. It, and the land, was sold to Alcoa as war surplus in 1950 and later became the site of P-75 and P-225 pot lines. The N-40s shut in 1975 and the P-75s shut in 1986.

New York's sixth smelter was also a DPC plant, in New York City, Queens. This smelter only operated for fifteen months in 1943 and 1944 before being shut. It was the largest of nine DPC plants, with eight, N-40 potlines. It had cathode bus and transformer windings of silver which was on loan from the US Treasury and returned immediately after the war.

The seventh smelter in New York State was the Reynolds Metals Company's, St. Lawrence Reduction Plant. It operated from 1959 until 2015. This was the only Søderberg type smelter built in New York State. A large customer was the General Motors Casting Plant that received molten aluminum directly from the smelter.

Richard S. Reynolds had urged the U.S. Congress to increase domestic production capacity in 1937 following a visit to Hitler's Germany. Reynolds then built four Søderberg smelters and purchased two surplus DPC smelters prior to building their seventh reduction plant near Massena.

It's not well known, but no other state, or nation, except France has produced primary aluminum longer than the Empire State has, over these past 135 years.

by Stephen J. Lindsay

Tacoma's DPC/Kaiser Smelter

There were nine Defense Plant Corporation smelters built during WWII. Eight were similar to the N-40 potlines at Massena and in Queens. One that was built and operated by Olin Industries in Tacoma, WA was very different.

Plancor 245 in Tacoma was the only DPC smelter with Horizontal Stud Søderberg pots. Two other HSS plants, had also been built in the USA before WWII by Reynolds Metals Company, in Listerhill, AL and in Longview, WA.

Olin and Reynolds had both licensed HSS technology from a Norwegian company, Electrokemisk. There were 2 potlines of 25 kiloamperes, with 120 pots per line. Production started in September 1942 at 15,000 tons/year.

Horizontal Stud Søderberg pots at Tacoma, WA

The interest of Olin Industries in building this smelter was tied to their affiliated, processing plant in Marysvale, UT. Olin sought to enter the primary aluminum business by creating its own vertically integrated supply chain.

Alunite ore was fed to the Kalunite process that produced low density, fine grain alumina plus a valuable fertilizer, potassium sulfate. Olin, a diversified company, set up Kalunite, Inc. as an affiliate, with the U.S. Government footing the bill for both the alumina plant and the smelter.

The plant in Utah successfully produced about 2.5 million pounds, 1,250 tons, of alumina that was used at the Tacoma smelter, supplying a minor fraction of the smelter's alumina needs.

The Kalunite process proved to be too expensive to compete with the Bayer process of alumina production. The plant shut down in 1945 and the Tacoma smelter was idled at the end of August 1945 following Hirohito's declaration that Japan would surrender.

In 1947, the Tacoma smelter was purchased by The Permanente Metals Corporation, which changed its name to Kaiser Aluminum & Chemical Corporation. It re-started operations on October 31st of that year.

In 1950, Tacoma acquired equipment from the Riverbank, CA DPC smelter to boost its production capacity. The pots were enlarged from 25 to 50 kA in 1952. Loads were eventually boosted to 65 kA and a 70 kA VS Søderberg section, called Line 3, was added to the end of Line 2 increasing plant capacity to 38,500 tons/year.

Market surplus and labor issues idled the smelter from 1958 to 1964. In 1968 Line 4, a 93 kA HS Søderberg potline, was added raising production to 81,000 tons/year by 1969. Tacoma also had a cell development potline, Line 5, with less than 20 pots in it.

Kaiser – Tacoma smelter in 1968

After a long and bitter strike/lockout and the sale of the Bonneville power rights the plant permanently closed in June 2000.

by Stephen J. Lindsay, with acknowledgements to Mr. Frank Davis of Kaiser Aluminum

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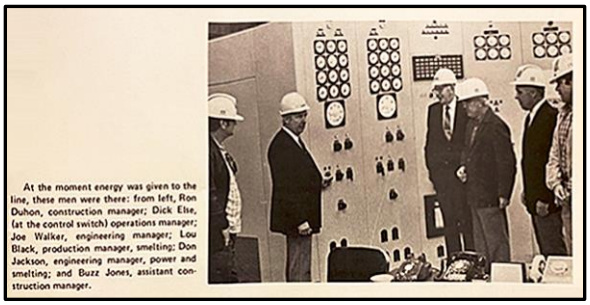
50th Anniversary of the P-225 Potline

On Monday September 22, 1975, at 9:01 a.m., Alcoa Massena's P-225 potline began operating.

Operations Manager Dick Else had the honor of throwing the switch to energize the new line. Standing by were members of the electrical department ready to step in if needed. But that proved to be unnecessary.



At the moment energy was given to the line, these men were there: from left, Ron Duhon, construction manager; Dick Else, (at the control switch) operations manager; Joe Walker, engineering manager; Lou Black, production manager, smelting; Don Jackson, engineering manager, power and smelting; and Buzz Jones, assistant construction manager.

Massena ALCOAN, November 1975 issue

At the time, Massena's P-225 potline with 198 cells was the longest and most advanced in the world. It was the first reduction pot technology to go above 200 kiloamperes of electric current.

The two potroom buildings were over 2,050 feet in length. A walk around the potline , under roof, was eight tenths of a mile!

P-225 Potline 6 was once the longest in the world

This potline used Alcoa's latest technology, with the ability to adjust anode positions in pairs.

An earlier version of the P-225s had been installed on two, shorter potlines, each with 182 reduction cells, at Tennessee Operations between late-1968 and 1972. These were permanently shut in the aftermath of the global economic crisis, in 2009, after an average of 39 years of operation.

Potline 6, is actually the 22nd potline of Alcoa that was built in Massena. The first sixteen were located on the original site, near the powerhouse of the Massena Power Canal on the Grasse River.

Six additional potlines were then built in what was referred to as the St. Lawrence plant. Potline 6 started 72 years after Massena's first potline. The rated amperage capacity for the pots had increased from 10 to 225 kiloamperes.

Potline 6 now exceeds 240 kiloamperes and consumes the equivalent of more than 20% of the Moses-Saunders hydroelectric facility on the St. Lawrence Seaway.

In all, Massena Operations has been producing aluminum metal since August 1903, longer than any other site in the world. The site is now in its 123rd year of operation.

by Kevin Kitzman & Stephen J. Lindsay

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