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BACKGROUND PAPER

ON THE

VOLTA ALUMINIUM COMPANY (VALCO) 1/

by

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The Volta Aluminium Company (Valco) reduction plant at Tema, Ghana, is the largest on the African continent. Construction of the plant began in May, 1964, with the first ingot poured in November, 1966.

Official plant start-up was in the spring of 1967.

Owned by Kaiser Aluminum & Chemical Corporation (90 percent) and Reynolds Metals (10 percent), and managed by Kaiser Aluminum, Valco today has a rated annual capacity of 204,000 metric tons of aluminum - an 85 percent increase over its initial 110,000-metric-ton-a-year capacity. Originally operating with three potlines, the plant has been expanded twice in its 10 years: in June of 1972, with the addition of a fourth potline, which increased its capacity to 154,000 metric tons a year; and in March of this year, with the addition of a fifth potline, which increased capacity to its present 200,000-metric-ton-a-year level.

There are three primary reasons for the establishment of the Valco plant in Ghana, for its success, and for the confidence of its owners which justified subsequent expansions. First, the availability for a long period of low-cost electricity from Ghana's Akosombo hydroelectric dam on the Volta River. Second, the availability of favorable long-term financing. And, lastly and most importantly, the mutual trust and cooperation between Valco's owners and the government of

Ghana which has continued since the project's conception.

Tied to these factors was a recognition by Kaiser Aluminum and Reynolds Metals at the time the commitment to build was made that although world demand for aluminum was then on a cyclical downturn, it would soon return to its historical eight percent annual growth level and new greensite capacity would be required.

At the time of its construction, the Valco plant represented the latest design and technology in the aluminum industry. It remains today one of the world's more sophisticated reduction plants, and has for several years produced some of the industry's "purest" metal.

During construction (which took seven years, two months when the three phases are totaled), the number of Ghanaians employed ranged from a high of 5,200 on phase one, to 1,500 on phase two, and 2,300 on phase three. Ghanaians worked an estimated 164,200 man-months during construction, and, for the period, a total of U.S. $27.3 million was injected into the local economy.

A unique engineering requirement during construction was for extensive off-site, pre-arrival planning and pinpoint scheduling of ships carrying tools, materials, equipment, and other supplies needed in the work. This importation was made necessary by the fact the vast majority of the equipment, supplies, and materials needed in construction were not available on the local market, and that often up to six months was required from identification of a need to delivery of the item or items needed.

Although there was an abundance of available labor in Ghana at the time of Valco's construction, it was anticipated this would not always be the case. Valco, therefore, was not designed to be labor intensive, a decision which also insured a higher degree of uniformity in production, better operating results, and higher purity. Attaining the maximum level of efficiency and productivity was seen by both the government and Valco's owners as highly desirable. This high technology and sophistication extended to environmental control facilities as well. While environmental control standards in Ghana were and remain less stringent than in the United States, air control equipment capable of meeting guidelines existing in the United States at the time of Valco's construction was installed. This equipment was comparable to that in operation at Kaiser Aluminum's Ravenswood, West Virginia, reduction plant in the United States -- the corporation's best technology at that time.

Prior to Valco's construction, a great deal of thought was given as to what type of plant to build. The conservative viewpoint was to duplicate existing reduction cells in use for many years at Kaiser Aluminum plants in the United States, thereby minimizing the risk of operating problems.

The forward-looking view, however, was much more in keeping with Kaiser Aluminum's tradition. That view was to reach out and construct a plant with larger and more efficient cells than existed at any plant in the Kaiser Aluminum system

at that time, and to equip that plant with the most advanced ancillary equipment that could be designed to optimize automation and working conditions.

The forward-looking approach was selected, and a new 150,000 ampere prebaked anode cell was designed for installation at Valco. The decision has proven to be a sound one, and the cell, which was prototyped at the Ravenswood reduction plant in order to confirm the many engineering decisions that had been made, has to date been duplicated in design at six different locations representing almost one million tons of new capacity.

Valco's potroom environmental control system begins with hooded cells which evacuate particulate matter and gases at a rate of 4,000 cubic feet a minute. These emissions are passed through multiclone dust collectors and then dispersed through a 500-foot-tall stack. Twenty-four environmental control sampling points have been set up around the plant to monitor the system and assure its efficiency. The environmental control system on the plant's carbon baking ovens also disperses through high stacks.

Valco today serves markets in Europe, Japan, and the United States with rolling ingot, billet, 566-kilogram sows, and 23-kilogram ingot. These products are formed using traditional casting techniques, with production percentages established by market demand.

Valco's production capacity was determined using a

number of criteria, not the least of which were the limits of available financing, the amount of power required to provide a firm base load and sufficient revenue for successful operation of the Akosombo dam, and amortization of the heavy investment involved in constructing the plant. The site at T[illegible] was selected because of its excellent harbor, the already-planned concept of an industrial park in that city, proximity to Akosombo, and the geographical characteristics of the land.

The story of Valco in Ghana is one of success for both Ghana and Valco's owners.

The plant provides the country with secure employment for an average 2,400 men and women; it generates a considerable amount of foreign exchange for Ghana; it contributes to the nation's economic, social, medical, and cultural progress through its Valco Fund; it represents a source of tax revenue for the government; and it acts as an impetus for local business to provide goods and services needed in support of its operations. In addition, the plant has contributed to an increased standard of living in the country; provided an attraction for new industry; served to diversify the nation's economy; and, most significantly, made construction and operation of Akosombo dam possible.

Perhaps the most immediate benefit to Ghana of Valco's presence and its participation in the Akosombo project is that power from the dam has to an important degree shielded Ghana from increasing world oil prices. Without this shield, without the

dam and its abundant power, the country's foreign exchange position would undoubtedly have suffered. In 1959, prior to Akosombo's construction, total power demand in Ghana was estimated at less than 66 megawatts. In 1975, Akosombo was more than able to meet a demand which had grown to 523 megawatts.

The decision to build Valco in Ghana posed a requirement for a complex infrastructure to meet the needs of the plant and its people.

In preparation for industrial development in the Accra-Tema area of Ghana, the government of Ghana had financed and built a new harbor at Tema. In addition, it had participated in the construction of roadways, housing, schools, and sewage and water facilities. Tema itself, now Ghana's second most populous city, was planned and built from the ground up solely as an industrial community, while the government at the local level and in Accra, the nation's capital and largest city, learned to adapt and respond in the many new and demanding ways required to facilitate the planning, construction, and operation of various industrial plants, and the location and housing of thousands of people.

The success of the operation for Ghana and Valco is directly reflected in statistics compiled since Valco began production in 1966. As an example, from 1967 through 1976, the Valco plant contributed U.S. $138 million to the Ghanaian economy in the form of payments for power, goods and services bought on the local market, through loan repayments, construction expendi-

tures, and salary payments to Ghana, and contributions through the Valco Fund, a concept developed by Valco to allow all Ghanaians to share in the plant's success.

Valco's history is, of course, inextricably tied to that of the Akosombo dam and the Volta River Authority, the latter established by the government of Ghana to organize and administer the hydroelectric complex and the transmission of its power. In the initial negotiations it was agreed that the dam would be financed by the governments of the United States and the United Kingdom, the World Bank, and the government of Ghana, and operated exclusively by the government of Ghana. Financing, ownership, and operation of the smelter, it was decided, would be the sole responsibility of its owners.

Formal signing of the 30-year Master Agreement making the project a reality took place in Accra January 22, 1962. This was followed by a similar ceremony February 8, 1962, in Washington, D.C. Construction work at Akosombo, which had actually begun in late 1961, was formally launched January 23, 1962, with the first power on a commercial basis available in September, 1965. Construction on the reduction plant at Tema began in May, 1964, with the first, symbolic, ingot poured 30 months later.

Initial cost of the Valco project was U.S. $120 million. Subsequent expansion of the plant in 1972 represented an additional expenditure of U.S. $22 million, and in 1977 of U.S. $63 million. Cost of the Akosombo dam and powerhouse, the transmission network, and support facilities has been estimated at U.S. $175 million.

The Power Contract formed the basis of the Master Agreement. In it, capacity was dedicated to Valco, rates were set, and operating guidelines were spelled out through 1997. Since its signing, the power contract has been renegotiated, and the rate to Valco increased, three times.

Among the many unique aspects of the Valco project, Kaiser Aluminum believes the most important and challenging was the selection and training of the Ghanaians who would be operating the facility (both supervisory and hourly employees), and the selection, orientation, and acclimatization of the plant's expatriate staff.

To the first half of this challenge, an extremely important and helpful factor was the fact English was spoken broadly throughout Ghana and that fluency in the language could, therefore, be practically and fairly made a basic condition for employment. In addition, there were and are a number of colleges in the country turning out the professionals needed to staff supervisory positions at the plant.

While these were definite pluses, however, they were countered to a degree by the fact Ghana did not have any industry similar to an aluminum reduction operation (heavy industry, with high technology and shift work), which would have given the Ghanaians exposure to the type of day-to-day demands that would be placed on them in operating the Valco plant.

An important initial decision made with the commitment to build Valco was that Ghanaians would be trained and developed to assume supervisory control of the plant as soon as possible. Valco's owners remain committed to this goal. In line with this policy, Ghanaian professionals were recruited for a number of key management functions to work with the expatriates brought in to coordinate the plant start-up and personally train their replacements. This personal training concept has, we believe, proven quite successful. It has brought a number of carefully selected Ghanaians very rapidly into the higher levels of plant management and into the mainstream of the plant decision-making process.

For employees below this level -- first-line Ghanaian supervisors, and hourly maintenance and operations personnel -- an in-house training plan and schedule was developed by Kaiser Aluminum in 1964. The maintenance function was given first priority in recruitment and training because of the necessity for having a maintenance force in place and operating as equipment was commissioned. Beginning work in this area, a survey was made by Valco management of Ghanaian industry and educational institutuions, and of the Valco plant and Akosombo dam construction crews to determine what maintenance and other skills were available in the country.

A key in the maintenance training program was retention by Kaiser Aluminum of an international industrial training consultant. This firm was contracted to recruit and train electrical and mechanical maintenance training supervisors; to

indoctrinate these supervisors to their method of instruction; to help the supervisors develop training programs to use in their classrooms; and to assist them in their subsequent recruiting and orientation programs. In addition, Kaiser Aluminum developed in-house tests to establish the level of capabilities of the Ghanaians applying for employment. The bulk of this testing, which was supplemented by tests developed by the consultant, was done in 1966-67. As it developed, there were some 20 to 25 candidates for each available maintenance position. The testing itself required a full day (one-half written and one-half practical), and was followed by a personal interview.

Once a man was selected for the maintenance program, he underwent a physical examination, additional testing, full-day classroom and practical training, and periodic refresher courses. All of this training was designed and implemented by Kaiser Aluminum and Valco training specialists. Throughout the training aspects, a ratio of approximately one instructor to 20 Ghanaians was maintained. On the job, the ratio was approximately one supervisor to 10 or 15 Ghanaians.

The recruitment and training of operators and first line supervisors coincided with the phasing in of the expatriate staff as construction proceeded. Each expatriate superintendent had a specific training plan for his department, and a person responsible for implementing it.

Operator training was undertaken for employees in each area: in materials handling, the carbon plant, power distribution and casting operations, and in the potrooms. Training in these areas was

preplanned to follow the natural start-up sequence of the plant. Operators were recruited and trained on a schedule similar to that established for employees in the maintenance section.

Training for the first line supervisors was also formalized, with candidates given a specially adapted version of the American Management Association's (AMA) course on "Basic Principles of Supervisory Management." This was followed by a second AMA series on "Developing Supervisory Leadership." Men were selected for this course of instruction on the basis of their previous work experience and educational background.

A number of lessons were learned in this process, among them:

* The development of tests to determine "skill" levels in a different culture can be very difficult, and test results should be viewed judiciously;

* Potential supervisors can perhaps be best identified by actual on-the-job performance, as opposed to testing, background, and educational analyses;

* Emphasis in training should include close attention to developing troubleshooting skills;

* Guidelines should be developed and made known to each employee outlining specific job requirements and qualifications required for advancement; and,

* Training should be an uninterrupted, continuous function with the highest management emphasis.

The selection, orientation, and acclimatization of the plant's expatriate staff also posed a number of unique challenges. Work in this area began in mid- to late 1964 with selection of a plant manager and his formation of a management team from Kaiser Aluminum's world headquarters in Oakland, California, and from the company's four reduction plants in the United States.

Some of the more important early decisions made in this area were that the company would build and operate its own Valco hospital, school, commissary, and recreation facility. Another important commitment was the signing of an agreement with the Tema Development Corporation (TDC), a government agency responsible for constructing housing and building and maintaining residential sewage, lighting, and water service. All living quarters for expatriates in Ghana today are owned by the TDC and paid for through a leasing arrangement.

With these decisions made, an Oakland-based Valco recruiting team visited each Kaiser Aluminum reduction plant with a slide show and description of the new project and support facilities. The team established a Valco coordinator at each location, distributed Valco policy manuals, and began their interviewing and selection process. This process included administration of a "family questionnaire" for potential employees and their spouses designed in-house by an industrial psychologist to identify potential problem or stress situations before they developed. At the same time, in order not to "strip"

the domestic plants, recruitment was being coordinated outside the company in the U. S. and through a personnel firm in London, England.

Prior to moving to Ghana, each expatriate family was counseled and oriented as to what to expect socially and environmentally in the country. This was supplemented by yet another orientation program in Ghana.

The Valco hospital and school are good examples of the support facilities built and staffed by Valco for its employees.

Valco hospital serves all expatriates and their families, all Ghanaian supervisors and their families, and all hourly employees. The hospital staff totals about 50 people. It includes one expatriate resident medical director, who is a surgeon, one Ghanaian doctor, 15 registered nurses, and some 30 licensed practical nurses. It includes a fully equipped operating theater and clinical lab, an X-ray facility, and has its own ambulance. Families of hourly employees not served at the Valco hospital (because of its small size) are given free service contracted for by Valco at a clinic in Tema.

The Valco school was organized with the assistance of a U. S. international educational service organization. This firm develops and recruits teachers for overseas service and aided Valco in designing a curriculum equivalent to U. S.

public school standards. The Valco school was initially designed to take students from kindergarten through the eighth grade. It was subsequently expanded to go through the ninth grade. Today, children from both expatriate and Ghanaian supervisors' families attend the school. Children of expatriate families above grade nine have the option of remaining in the U. S., of going to a secondary school in Accra, or of attending school in Europe through a company-financed tuition reimbursement plan.

A number of lessons were learned in this process also. Among them:

* In selecting expatriate staff members, as much attention should be given to the family as to the individual;

* An "enclave" approach to expatriate housing, schooling, recreation, etc., should be avoided, with host-country supervisors and their families given every opportunity to participate in these areas; and,

* Relocation of a top executive in a "resident manager's" position in the host country and with specific responsibility for government and community relations is highly recommended.

A great deal more could be said about Valco. Obviously more lessons have been learned than could be mentioned here. Obviously there was much more to the negotiations, planning, construction, financing, and training

than could be discussed here. And, certainly, there are aspects of the project not discussed here which could have been.

This should not obscure the basic thread running through the Valco story, however: the fact Valco has been successful for both its owners and Ghana, and that a major factor in this success has been the mutual trust and cooperation shown by the owners and the government of Ghana.

Kaiser Aluminum believes that opportunities for the development of aluminum smelters remain throughout the world today, both in developing and developed countries, and that these have the full potential to achieve the same degree of success the Valco project has. We anticipate that world demand for aluminum will continue to increase at its historic rate in coming years; and that new capacity will be built to meet this demand. The criteria for construction of this new capacity remain what they always have been in whatever location: favorable financing, an adequate power supply at a reasonable cost, a good port, a sufficient labor pool, and trust and cooperation between the parties involved.

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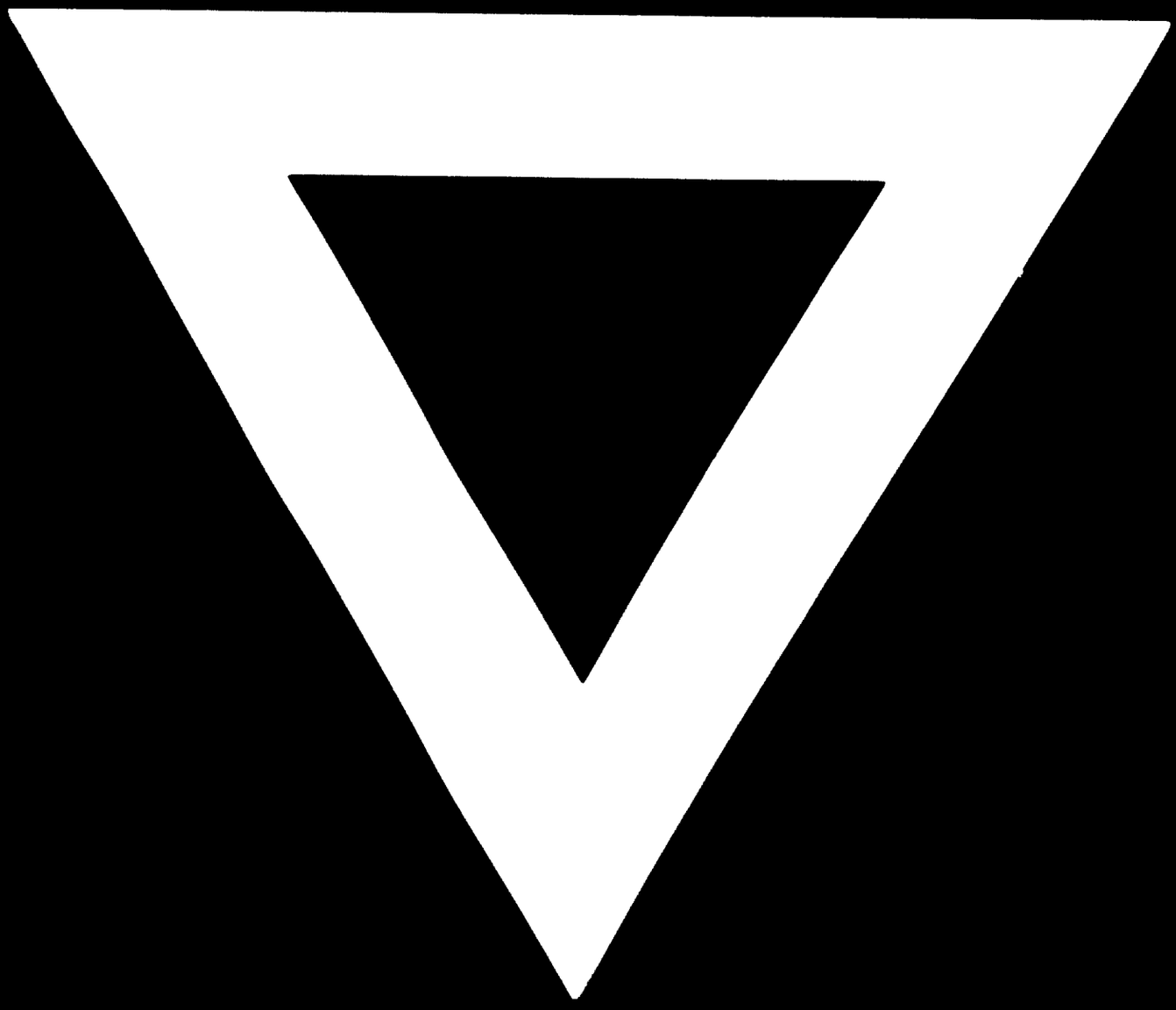

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