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DEVELOPMENT OF BAUXITE & ALUMINA RESOURCES IN THE KINGDOM OF SAUDI ARABIA

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Abstract

Driven by desire to diversify its economy in an oil rich country and by the need to create jobs for the increasing number of Saudi youth, the Kingdom of Saudi Arabia established the Saudi Arabian Mining Company (Ma'aden) to develop its mineral resources. Local bauxite will be developed into an integrated mine-to-metal aluminum industry. Numerous challenges have to be overcome. Major Infrastructure has to be built; construction and operating costs have to be contained to ensure the economic viability of the project. The lack of expertise in the kingdom to run such an operation created the need to involve an international joint venture partner. The human development is no less challenging and early plans have to be in place to recruit and train a large number of Saudis to be the core of the operating organization.

Introduction

Saudi Arabia well known for its large reserves of oil and gas contains also appreciable mineral deposits such as gold, cupper, phosphate, bauxite and others. The potential remains high as the amount of exploration for minerals done so far is limited. Most of this potential is identified to be in the Arabian Shield, the geological formation on the west of the country along the Red Sea extending inland to Najd and Qassim areas. In spite of extensive surveys conducted in Saudi Arabia in recent years, the amount of investment in exploration is very modest compared to other countries. Saudi Arabia is blessed with large reserves of phosphate, bauxite, magnesite, gold, iron, copper, and other minerals that are yet to be developed and exploited. It suffices to say that the total fund spent on exploration in the Arabian Shield in the last 30 years is less than what is spent in the Canadian Shield annually. Yet, all indications attest to the diversity of the mineral resources in the Kingdom and the tremendous potential for finding new resources through additional exploration.

Since the discovery of oil in the late thirties and especially after the oil crisis of the seventies and the increase in oil prices, the country has enjoyed large revenues that translated in the leaps of development of both infrastructure and industry. This revenue remains however subject to fluctuating oil prices and it has seen the worst downturn cycles in the mid eighties and at the turn of the century. From the enactment of the national Five Year Development Plans in 1970, diversification of Saudi economy has remained one of the top strategic objectives of the Kingdom. Great achievement has been made in the petrochemical sector generating over $20 billion revenue in 2003 and in 2007 non-oil manufacturing contributed 10% to the GDP.

Following the successful story of developing the petrochemical industry led by Sabic, the government established in 1997, the Saudi Arabian Mining Company (Ma'aden) to lead a similar development of the country's mineral resources. The development of the two large phosphate and bauxite deposits discovered and utilizing the country's abundant energy resources and the developed infrastructure will generate good non-oil revenues putting Ma'aden right after Sabic in terms of revenue generation as soon as the two projects start full production.

The demographic changes in the kingdom are alarming. According to the Demographic Survey of 2007, the total population of the kingdom is about 24 millions including over 5 millions resident expats. With over 50% of the population under the age of 25 and a yearly growth in population over 3%, generation of new jobs becomes a high priority and warnings of social havoc due to rising unemployment rates are increasing. Mining industry- primary and secondary -offers two features that make it attractive in this regard.

Firstly, this industry will contribute greatly to a balanced regional development planning—another national strategic objective—as a result of investing in remote areas where the resources are located. This will slow down and possibly reverse the migration from such areas to the already congested big cities thus helping to relax the strains, shortages, and socio-economic risks associated with such migrations.

Secondly, the industry's potential for job creation is large as the mining industry is much more labor-intensive than oil, gas and petrochemical industries. As thousands of young Saudis entering the job market each year, this industry will have the capacity to absorb a large number of job aspirants through direct and indirect hire.

Location and Geology

The bauxite deposit is located in a remote desert area of northern Saudi Arabia, predominantly in the province of Ha'il. Elevations range from 535 to 600 meters above mean sea level. Ma'aden's exploration license is 192 kilometers long by 35 kilometers wide, approximately centered on the town of Az Zabirah (northwest of Riyadh). Ma'aden's proposed mine targets the South Zone of the deposit and Ma'aden's mine processing facilities will be located approximately 43 kilometers northwest of the town of Qibah. The town of Az Zabirah is a similar distance to the northwest of the proposed mine processing facilities. The mine is called after a small settlement between Qibah and Az Zabirah called Al Ba'itha.

The coordinates for the approximate center of the mine processing facilities are:

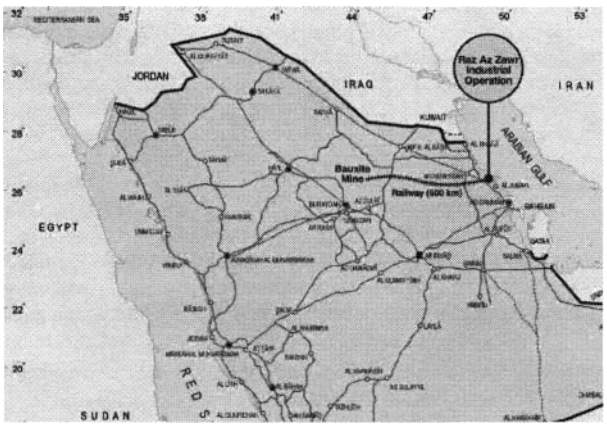
- WGS84 latitude / longitude 27°39'52.8"N/ 44°0'38.5"E
- UTM Zone 38 3 060 750N / 404 600E

The alumina refinery will be located on a virgin peninsula on the Arabian Gulf called Ras Az Zawr about 80 KM north of the major industrial city of Al Jubail.

The coordinates of the approximate center of the processing plants (Refinery, Smelter and Rolling Mill) are:

- WGS84 latitude / longitude 27°30'52.4"N/ 49°10'38.5"E.
- UTM Zone 39 3 044 753N / 319 980E

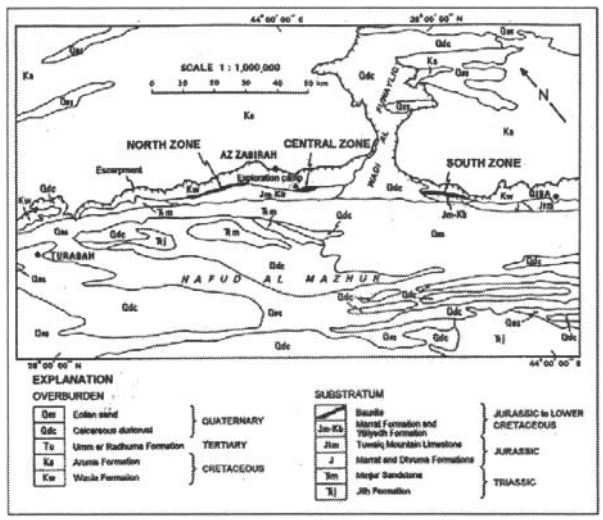
The location map below shows the location of both facilities and the railway link in between.



Geologic evaluation of the deposit was initiated by Riofinex through drilling exploration programs performed from 1979 through 1984. The Riofinex Report identified three distinct zones (the North Zone, Central Zone and South Zone), spaced approximately 30 kilometers apart along the strike, which exhibited economic potential. Additional exploration was performed by the French BRGM from 1987 through 1993. Ma'aden's also conducted exploration drilling at the deposit in 2002 through 2003. The deposit is located discontinuously along a strike length of approximately 105 kilometers and with a width identified by drilling of at least 5 kilometers. In the Riofinex report, Riofinex interpreted that the deposit's bauxite was formed during the Early Cretaceous as a weathering profile on Late Triassic to Early Jurassic terrigenous sediments deposited in marine or littoral environments. Riofinex tentatively assigned these sediments to the Minjur Formation (North Zone), the Marrat Formation (Central Zone), and the Dhruma Formation (South Zone). Both Riofinex and BRGM referred to these collectively in their respective reports as the "Parent Rock Sequence".

The deposit's bauxite profile is several meters thick and is unconformably overlain by Late Cretaceous fluviatile and lagoonal sediments. Riofinex and BRGM refer to these sediments as the "overburden sequence (OVB)," and the Riofinex Report characterizes the sediments as part of the Wasia Formation.

The bauxite outcrops in limited places on the western edge of the deposit and uniformly dips at approximately 0.5 degree to the northeast. At the eastern edge of the deposit, the BRGM Report estimated that the overburden sequence is approximately 50 meters thick.



(Source: DGMR Technical Report BRGM-TR-13-3 Part 1)

Since 2001 Ma'aden has continued drilling in the south and central zone to improve resource and reserve estimates. The resource in the south zone of the deposit is currently estimated at about 300Mt and the reserve is estimated at about 200 Mt at 40% TAA cutoff which represent the basis of current phase of the project. The resource in the central zone is estimated by Hatch (2004) at 135 Mt with slightly higher silica and lower iron content. Ma'aden continues through yearly drilling programs to increase resource estimate and obtain better understanding of the bauxite ore in the central zone of the deposit.

The Project

The Ma'aden Integrated Aluminum project, jointly developed by Ma'aden and Alcoa, includes currently the following scope:

- 4.25 Mtpa bauxite mine in Al Ba'itha
- 1.8 Mtpa alumina Refinery in Ras Az Zawr
- 750 Ktpa Aluminum Smelter in Ras Az Zawr
- 460 Ktpa Rolling Mill
- Common Facilities and Infrastructure

The Smelter and Rolling Mill are ahead on planned completion schedule whereas Mine and Refinery are lagging with about one year behind. The first metal from smelter is scheduled for early 2012. The Smelter will start with imported alumina until Refinery is able to supply the required alumina.

On the same site and within the Ras Az Zawr Mineral Industrial City (RAZMIC), Ma'aden is developing also a large phosphate complex that produce DAP fertilizer utilizing ore from the large phosphate deposit in Al Jalamid. The phosphate complex shares with the Aluminum Project basic infrastructure such as roads, housing and port.

Large Infrastructure- The first challenge

Considering the remoteness of mine sites and lack of water resources in these locations, processing plants have to be located hundreds of kilometers away. Therefore, providing a means of

transportation of the ore to potential processing locations is of utmost importance. Including development of such large infrastructure in a mining project will be fatal to its viability.

Early studies of the feasibility of the Az Zabirah bauxite deposit highlighted transportation of bauxite to location of process facility as the major obstacle to develop the deposit. Saudi Arabian Sabic concluded in a study conducted in 1985 that processing of Az Zabirah bauxite is not feasible due to lack of water at the mine site and the lack of means of transport. Since inception of Ma'aden in 1997, it highlighted this problem to government agencies and requested allocation of funds to building the railway to support the feasibility of the bauxite and the phosphate projects.

Another major infrastructure required for the process facilities on the Gulf is a deep water port that allow import of raw materials (caustic, liquid pitch, calcined coke ect) and export of products (aluminum metal, alumina, DAP, etc) from and to the world markets.

Recognizing the value of these mining projects to the development of the country, the government undertook these two major infrastructure projects to build the North South Railway (NSR) which is by itself a major railway project with a track length of over 1800 Km extending from the Al Jalamid phosphate deposit near the Jordanian borders down to Az Zabiarah bauxite deposit and finally to the Ras Az Zawr mineral processing facility on the Arabian Gulf.

Reliable and cost-effective electric power source is vital to the success of the project. The national grid is quite stretched and will not provide the reliability and the tariff that support the project. The electric power required for the Ras Az Zawr Aluminum Complex including the three operations (Refinery, Smelter and Rolling Mill) and infrastructure, is in excess of 1300 MW. Ma'aden completed many studies for the feasibility of a power plant to support the industry but this encountered many challenges:

- Ma'aden would be the first private industry to build a major power generation plant at this scale
- The power industry regulatory framework is at infancy stage and there are no clear regulations on issues such as power generation licensing, fuel pricing, power tariffs, power wheeling, reliability of supply etc
- Connection to the national grid is a must not only to provide backup power but to allow sales of excess power needed by the national grid.
- The size of investment in a large power plant became huge especially with high sulfur heavy crude oil proposed.
- The issues above required a large level of coordination among many government organizations where decision making is very slow.

After much iteration, and a few years of studies, consultations and interaction with government agencies, it was decided to combine Ma'aden power requirement with water needs of the country and under special arrangement Saline Water Conversion Corporation (SWCC), a government agency, will build a combined water and electricity generation facility in Ras Az Zawr with a capacity of 2400 MW of electrical power and just over 1 million cubic meter per day of potable water. Most of the power generated (1350 MW) will be used by the aluminum complex through a high reliability grid connection. The power and desalination plant will also provide the required water for domestic, process and cooling duties.

The mineral railway and the deepwater port are in the final construction stages and will be operational early in 2011 to support the phosphate plant which is being commissioned. The power plant was awarded for execution and is expected to be operational late 2012 in time to support the startup of the aluminum smelter.

The Integration Challenge

The bauxite and alumina is part of a larger development for a mine-to-metal integrated project. As outlined above the level of interfaces to develop the required government-sponsored infrastructure is by itself a challenge. It required working through different governmental and semi-governmental organizations to move things and make decisions. Coupled with that is a high level of interface management required internally to get the different elements of the project aligned. These elements (Mine, Refinery, Smelter, Rolling Mill and Integrated Infrastructure) are being designed and executed by different EPCM consultants in three continents and engineering design is spread over many countries. Yet all these elements have to coordinate activities and manage interfaces related to site, systems and procedures, corporate policies, design standards and at all execution and operation readiness levels. This presents a challenge unprecedented at this scale in the aluminum industry.

Bauxite characterization and Technology Selection

Extensive sampling and assaying programs were conducted for the bauxite starting with Riofenix program. Ma'aden during a prefeasibility study in 2001-2003 carried a data acquisition and assaying program. Ma'aden undertook an intensive close-spaced drilling program in a region of the South Zone forming the initial ten-year mine plan. A number of samples from that area were then composited in a devised plan to arrive at a bulk representative sample, indicative of the first ten years mining. The drill-hole samples were assayed at the Al Amri laboratory in Saudi Arabia, and the samples were further analyzed with extensive testing by Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO) Minerals laboratories in Australia. These composites were characterized in terms of chemical elemental composition, quantitative mineralogy, particle size distribution, and available alumina and reactive silica under expected refinery digestion conditions (digestion temperature and liquor caustic concentration). The predesilication behavior of the composite bauxites was investigated, particularly the extent of reactive silica to desilication product (DSP) transformation under nominated conditions, and the minimum time to achieve optimum transformation.

Also On behalf Ma'aden, in 2004 Hatch engaged JKTech to determine a number of comminution parameters for Az Zabirah bauxite samples, including 'average grade – AGB', 'high grade – HGB' and 'low grade – LGB'. Parameters such as the ore behavior in SAG/AG mill, the primary crushing power draw, the rod milling power draw, the ball milling power draw, the abrasion of

mill lining, the strength of the ore sample when subjected to compressive forces without lateral constraints, were investigated. Later in 2005 and 2006 additional infill drilling was carried out in the South zone and a new composite sample representing the 30 years ROM was prepared. Further chemical and physical testing programs were undertaken between 2007 and 2010 including digestion and extraction tests, bauxite rheology tests and impurity analysis (especially of iron, fluoride, chloride and calcium). The results of all these tests confirmed findings of the earlier campaigns and were incorporated in the flow sheet design. The series of tests confirmed the following basic characteristics:

- The alumina is highly boehmitic (monohydrate)
- High alumina and silica content (average 56 %, and 9% respectively)
- Bauxite will require a high digestion temperature (260-280C)
- Due to high silica and high DSP, the circuit will therefore have a high capacity to incorporate impurities
- Low iron content
- Low organic matter

Table 1 below shows the composition of Az Zabirah bauxite

Table 1. Az Zabirah Bauxite (Average Values)

Components (wt%)	High grade	Representative	Low grade
Al2O3	56.2	55.56	54.14
Fe2O3	12.59	11.17	10.99
SiO2	5.48	7.71	9.29
CaO	1.24	1.14	1.16
TiO2	3.48	3.45	3.35
P2O5	0.16	0.15	0.15
MgO	0.09	0.09	0.09
SO3	0.65	0.65	0.68
V2O5	0.1	0.09	0.09
Cl	0.03	0.03	0.03
F	0.08	0.08	0.08
LOI	19.77	19.64	19.4
TOC	~0.2	~0.2	~0.2

The Az Zabiarh bauxite underwent extensive bench scale testing by reputable research laboratories and results were reviewed by many experts from different leading operating companies. Following 2009 Alcoa JV partnership the process design was reviewed by Alcoa process consultants. The consistency in the results of these tests and reviews gave high confidence in the selected refinery flow sheet design. Based on the bauxite chemical and physical characterization, the selection of process technology was done. The choice of technology was governed by the following underlying principles:

- Design has to use public-domain technology as much as possible
- Design has to reflect the most advance developments in Bayer process, especially in environmental, health and safety.
- The bauxite is new and has not been processed before.
- The refinery will have a new operation team and design must be robust and forgiving
- The design has to allow for local harsh ambient conditions

The above considerations and the bauxite characteristics formed the basis of the process design. Although conventional Bayer circuit was selected for most areas, digestion design was given special consideration. Ma'aden operation experts along with external consultants carried out a qualitative comparative risk evaluation of digestion design options that include single stream full jacketed pipe heating, hybrid indirect and direct heater design and dual stream utilizing conventional shell and tube heaters. This evaluation was undertaken as possible means to mitigate the risk of unacceptably high scaling rates in high temperature indirect slurry heaters to determine which should be taken forward into process and engineering design. Evaluation criteria included process risks, capital and operating costs, and operability and maintainability considerations. Based on the evaluation criteria, the hybrid option was recommended for heater design in digestion. This option benefits from the jacketed pipe heating design in terms of energy efficiency and ease of cleaning. However, by shifting to the direct heating beyond 200C, the design minimizes the risk of potential scaling in the tube.

The Ma'aden alumina refinery consists of a two-unit greenfield plant operating the Bayer process and using public domain technology to produce 1.8Mtpa of smelter grade alumina. Approximately 1.4Mtpa of the refinery product is expected to be consumed by the nearby Ma'aden aluminum smelter. The remainder will be exported. The Refinery will nominally comprise:

- Three grinding mills, at 100% digester unit capacity each
- Two digester units
- Two precipitator trains
- Two fluid-bed calciners, at 75% total plant capacity each
- Two evaporation trains.

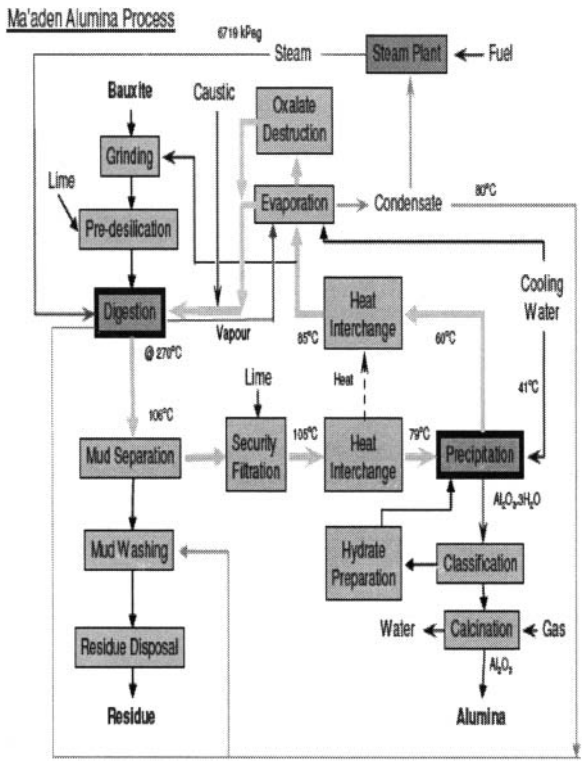
The Figure below shows a schematic of the Ma'aden Refinery flow sheet and the basic design conditions.

The Maaden Bayer circuit is unique in some aspects due to the bauxite chemistry and the country ambient conditions:

1. The flow sheet does not return any supernatent liquor from the residue area due to high evaporation rates

2. The Bauxite has high reactive silica and therefore high incorporation capacity of impurity in the DSP.
3. The casticity of the liquor is relatively high (about 0.94)

All of the above predicts a fairly clean liquor circuit.



Joint Venture Partner

Since Ma'aden have no operating experience in the alumina and aluminum industry, the search for a joint venture partner was inevitable. Given the technical, political, and business challenges with establishing a vertically integrated aluminum industry and given the financial turmoil that hit the markets in the last few years, this search was long and demanding. It is true that Saudi Arabia is rich in energy and this constitutes a major driver for investment in the energy demanding aluminum industry. However from Ma'aden point of view, with a mandate to develop the local mineral resources, exploiting the local bauxite resources is equally important for the good reasons discussed above and as mandated by the country's strategic development plans. The following issues stood out in the process of search and selection of JV partner:

- The magnitude of investment in the infrastructure (at earlier stages of the JV surveillance many of the infrastructure elements that are now shouldered by government were part of the project).
- The legal framework of the kingdom is not advanced enough and that was perceived as a risk to external investors
- Technical risks associated with processing of the new Az Zabiarh bauxites
- The large size and complexity of the project and large equity funding (over $10 billion investment)

Joint venture partner discussions, negotiations, and due diligence were carried out with the major players in the industry. At last and In December 2009, a joint venture partnership was announced with Alcoa. This paved the way to progress the project into the next phase of execution and provided depth of resources in both execution and operation expertise.

Controlling Construction Costs and Operating Costs

The Saudi government extended its great support for the first major mineral development in the kingdom. The government, through Public Investment Fund (PIF) and the Saudi Arabian Railway (SAR) built a $4 billion railway link between the two deposits (Al Jalamid and Al Ba'itha) and the process facilities in Ras Az Zawr on the Gulf coast. The railway crossing the sand dunes of An Nufude Desert involved record breaking earthwork volumes in a difficult terrain. The government through the Saudi Port Authority (SEAPA) built a major deepwater port in Ras Az Zawr, a project close to $1 billion. The government of Saudi Arabia invested in a large combined water and power project in Ras Az Zawr to provide electricity to the Aluminum complex at attractive prices.

Yet, the amount of remaining infrastructure to support the project is sizable. The mine site facilities in Al Ba'itha are in remote area which lacks all infrastructures and the project has to include development of housing, water supply and access roads. The process facilities in Ras Az Zawr are proposed on a virgin peninsula on the Arabian Gulf north of the major industrial city of Jubail. Major housing, access roads, security fencing, seawater supply and return systems, and earth works have to be developed by the project. The integrated project sought possible synergies between the smelter, refinery and rolling mill to share these infrastructure facilities to reduce costs.

Value engineering studies were conducted at many stages of the project to challenge some of the equipment choice and or count to eliminate any excess capital. Best execution and delivery systems had to undergo several reviews by international and reputable consultants as well as Alcoa internal peer reviews. Alcoa experience in delivering such large and complex project was brought to table. Given the dispersed execution centers, the cost of execution including owner and EPCM consultants costs have to be contained. In some of the hot market environment that passed in 2007 and 2008 when construction costs sky rocketed, this threatened the feasibility of the project.

Controlling the operating costs of each ton of bauxite, alumina and aluminum is critical to the success of the project. Efforts were made to optimize the mining plan of waste and bauxite. Considering the quality of bauxite in Al Ba'itha, the different grade control parameters, and the variability in the ore body, the mine plan went through several optimization and reviews to reduce the per ton cost. The options of contracting all or parts of the mine operation were carefully examined. Energy costs for the production of Alumina were compared against other similar operating refineries. Despite the high temperature digestion conditions (273 C), opportunities to reduce steam consumption were exploited using experience from other Alcoa energy - efficient operations. Working closely with government agencies to

gain their support in building the Ras Az Zawr power plant is part of the effort Ma'aden management took to control energy costs essential to competitive operation.

The consumption of caustic for processing the Az Zabirah bauxite is very high averaging 200 KG/ ton of alumina due to the high reactive silica content. This puts the yearly demand of caustic for this refinery at more than 350 Ktpa on dry basis. Considering the volatile and unpredictable caustic prices, the risk of escalating operating costs due to caustic is very serious. Ma'aden explored options available including teaming up with local investors to build a caustic production facility in Ras A Zawr. Discussions and negotiations were held with the local caustic producer, Sabic. These efforts succeeded in establishing a joint venture partnership with Sahara, a local petrochemical company, to construct a facility that will provide the bulk of caustic requirements (Plant was sized to produce 250 Ktpa of membrane grade caustic and 300 Ktpa of EDC, and planned for startup one year earlier than Refinery). The remaining quantity will be sourced from Sabic or through global procurement network of the JV partner. In parallel, efforts to reduce caustic consumption in the process continued looking at options such as lime addition, improving wash efficiency and others.

To control labor costs, the mix of labor for the mine and refinery organization has to be optimized. In Saudi industry, human resources are categorized into three types: Saudi Nationals, Western Expatriates, and Eastern Expatriates. Major industries in kingdom have achieved over the years a large percentage of Saudization approaching 90%. The target set by management for Ma'aden aluminum project is 50% as minimum. Considering the level of expertise potentially available in each labor category at startup, each role was studied carefully to ensure the mix of labor supports the intent to control labor costs but does not compromise safety or quality.

These efforts to contain operating costs and measures taken will result in a very competitive operation. Cash operating costs in the first quartile or lower second quartile are forecasted for the refinery and smelter operation in Ras Az Zawr.

Developing the people and the skills- Planning for operational readiness

The challenge of building the Operation Organization including people, business systems and manufacturing systems is not less than the challenge of building the physical assets.

Saudi Arabia has well developed industries in oil, gas, and petrochemicals. The surrounding region is home for Saudi Aramco and Sabic, world leaders in oil& gas and petrochemical respectively. Over decades of their presence, they trained and employed large number of skilled Saudi workforce. They established English as the industry language and created a strong base of industry knowledge and support services. However, all of the skilled manpower is tied to these industries and a new industry such as Ma'aden has to work on training and developing its manpower resources. Building on the strong industrial base available, Ma'aden took manpower development as a very high priority.

Plans for recruitment of young Saudi students were developed. Following the design of the operating organization, the skills of each of these targeted positions were identified. A recruitment plan was developed to ensure selecting the best students from surrounding areas of the mine and refinery facilities to support the local communities and to establish for higher retention. Students will be recruited in different intakes depending on their role and to ensure they join in time to attend on-job training before the startup of the facility. Ma'aden Human Resources and Operational Readiness personnel approached technical colleges in the area and discussed curriculum and timetables. Because this is a new industry in the region, a level of customization of college training curriculum has to be done. Ma'aden and its joint venture partners facilitated a cooperation program with overseas technical colleges with experience in training industry professionals, to ensure training program outputs respond to the specific needs of the industry.

Selected roles in the mine and refinery operating organization were targeted for overseas training in an operating bauxite mines or alumina refineries. These are mainly in lead and supervisory positions. Saudis nominated for these roles will be experienced engineers, and operation/maintenance staff from existing operation who lack the specific industry experience. They are intended to be the core of the operation organization. They will be seconded to overseas operation for varying periods to give them the required exposure before commissioning the operation of mine and refinery. The plan requires them to finish in time to return to country to participate in developing operation, maintenance and training materials, coaching of the new college students and later participate in the pre-commissioning and commissioning activities. Management recognizes that staffing as early as planned is costly, however the payback in terms of readiness for operation cannot be under estimated.

Deliverables required from vendors to support training were highlighted and given high priority in the procurement process. The delivery of these was timed to support the overall training plan to ensure training material is available earlier not later. Training of locals was included in all contracts signed for technology, engineering and project management.

Thinking of long term retention of developed skills – a challenge ahead.

Ras Az Zawr is a relatively remote location. It is planned to house employees on single status in company provided campus on site. Families have to stay in the nearby Jubail. The majority of our staff will be married Saudis according to the cultural norms. They will have to drive about 80 Km to come to work and back at the end of the work day.

The operation and maintenance of alumina refinery include labor intensive tasks not typical in the surrounding hydrocarbon production and processing facilities such as descaling of piping and equipment, continuous isolation of sections of the plant for caustic washing, etc. These physically demanding tasks coupled with harsh ambient conditions make the refinery operation a difficult environment.

These features of the site and the operation will make retention of the developed skill a challenge ahead. Plans that address human resources aspects, safety and health aspects and community relations aspects will be prepared to make Ras Az Zawr an attractive place to work and maximize talent retention.