CESA
CEMENT ENGINEERING SA

AROUND THE WORLD

CEMENT ENGINEERING (CESA) S.A.

Consulting Engineers

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NOCIBE - BENIN

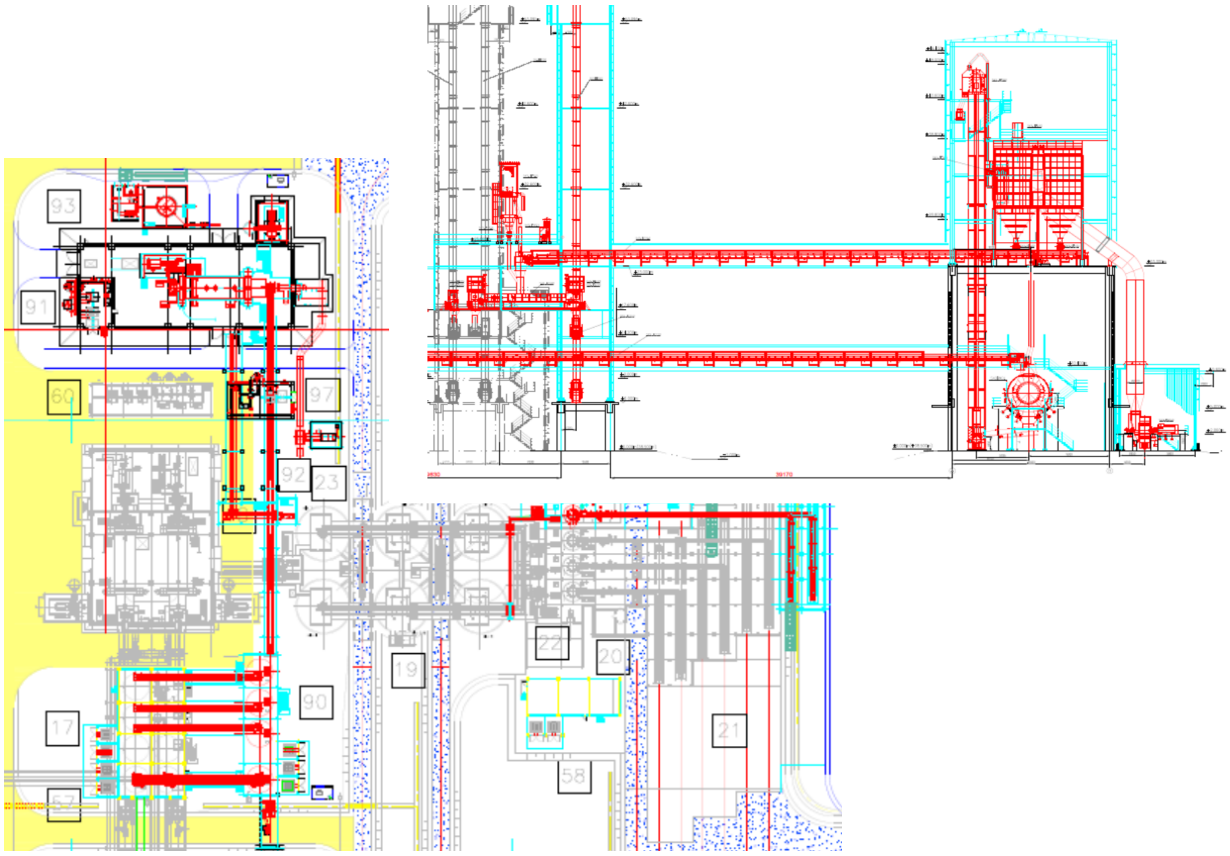
Sheet no 217

Client: **Nouvelle Cimenterie du Bénin, *Benin.***

Project: Third cement grinding line with a capacity of 130 t/h, multiple packages.

Date: 2025 -

Project description : NOCIBE has decided to undertake the construction of a third cement grinding line for the existing plant in Massé. The capacity is of 110 t/h, CEM I at 3600 Blaine or 130 t/h, CEM IIB at 4500 Blaine. The work encompasses feed hoppers, cement grinding with a closed-circuit ball mill with separator, and cement transport to the existing silos.



Services provided by CESA:

- Technical feasibility study and budget estimation.
- Basic engineering.
- Tendering and evaluation of offers.
- Assistance to NOCIBE during technical-commercial negotiations.
- Drafting of the contract.
- Approval of the detailed engineering.
- Scheduling, management and coordination of construction site.
- Leading of the plenary meetings..
- Monitoring of the performance guaranties and equipment extended warranties.
- Validation of the provisional and final acceptances.

For more information, please contact:
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Sheet no 215

CAHYA MATA CEMENT
NEW CLINKER LINE - MALAISIA

Client: **Cahya Mata Cement Sdn. Bhd, Sarawak, *Malaisia.***

Project: Construction of a new complete clinker line with 6'000 t/d capacity, from raw material crushing to clinker storage. The project includes also a WHR system and a solar power station.

Date: 2025 -

Project description : Cahya Mata Cement operates an integrated cement plant, in Mambong, Sarawak State, approximately 20 km south from Kuching. The plant comprises already a clinker production line with a capacity of 2,800 tons per day and a cement grinding plant with a capacity of 3,600 tons per day, equivalent to 1.0 million tons per annum (MTPA).

Additionally, the Client operates two other cement grinding plants located in Pending and Bintulu, with grinding capacities of 1.0 MTPA and 0.75 MTPA, respectively.

Services provided by CESA:

- Critical evaluation and enhancement of the Employer's requirement documents.
- Basic engineering.
- Evaluation of the Supplier's documents.
- Approval of the detailed engineering.

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NOCIBE - BENIN

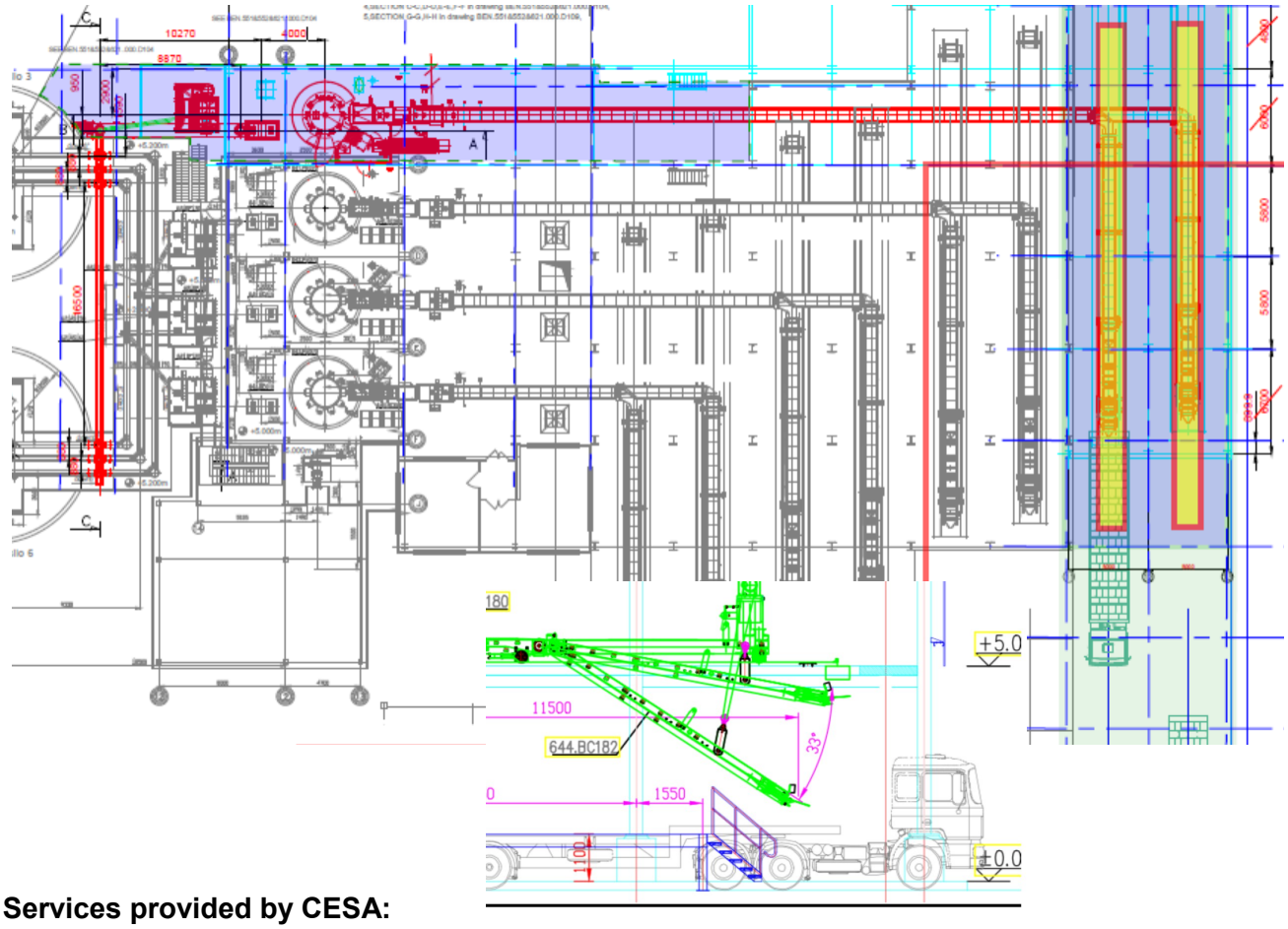
Sheet no 213

Client: **Nouvelle Cimenterie du Bénin, *Benin.***

Project: Construction of a new packing plant.

Date: 2025 -

Project description : NOCIBE has decided to undertake the construction of a fourth packing line with 3'000 bags/h capacity.



Services provided by CESA:

- Technical feasibility study and budget estimation.
- Basic engineering.
- Multi-package tendering and evaluation of offers.
- Assistance to NOCIBE during technical-commercial negotiations.
- Drafting of the contract.
- Approval of the detailed engineering.
- Scheduling, management and coordination of construction site.
- Leading of the plenary meetings.
- Following of the respect of the guaranties and warranties of the Supplier.
- Validation of the provisional and final acceptances.

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CIMENT DE MAURITANIE - MAURITANIE

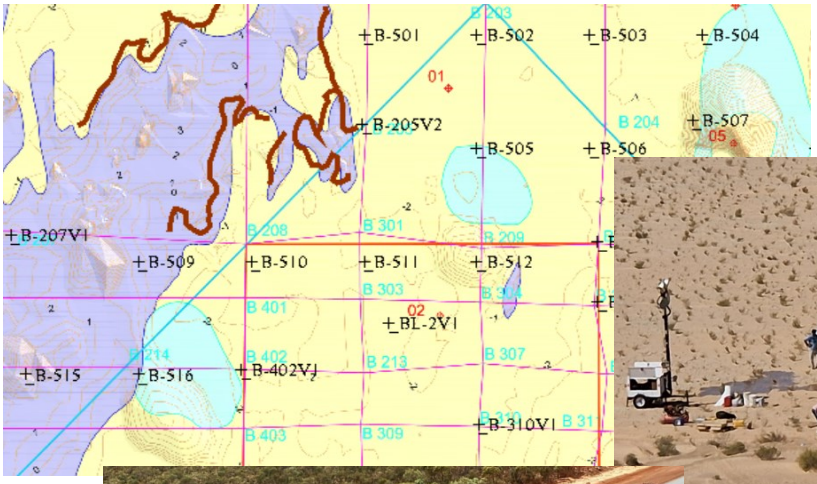
Sheet no 212

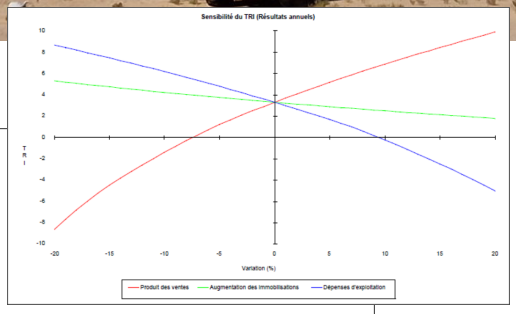
Client: **Ciments de Mauritanie S.A. (CMSA), Nouadhibou, *Mauritanie.***

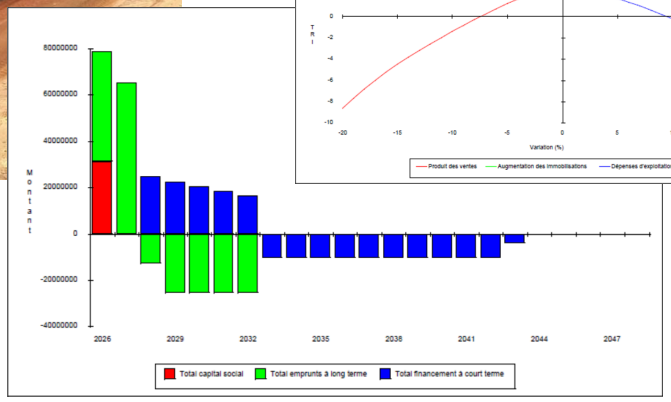
Project: Feasibility study for the construction of a clinker line of 3200 t/y capacity to feed the grinding stations around Nouakchott.

Date: 2024 -

Project description : Mauritania currently imports all of its clinker. CMSA intends to remedy this situation and has been studying the possibility of building a clinker plant for several years. Road trains will transport the clinker to the port of Nouadhibou, where it will be loaded onto barges bound for Nouakchott.







Services provided by CESA:

- Critical study of the feasibility study done by a third party.
- Realisation of a new bankable feasibility study encompassing:
  - Basic engineering including the selection of a plant site.
  - Market study.
  - Financial evaluation (COMFAR evaluation).
  - Extension of the raw material exploration campaign, including field mapping, geological modelling, quality evaluation, raw mix proposition, and resource evaluation.
  - Review of the preliminary Environmental and Social Impact.

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COGECA - SENEGAL

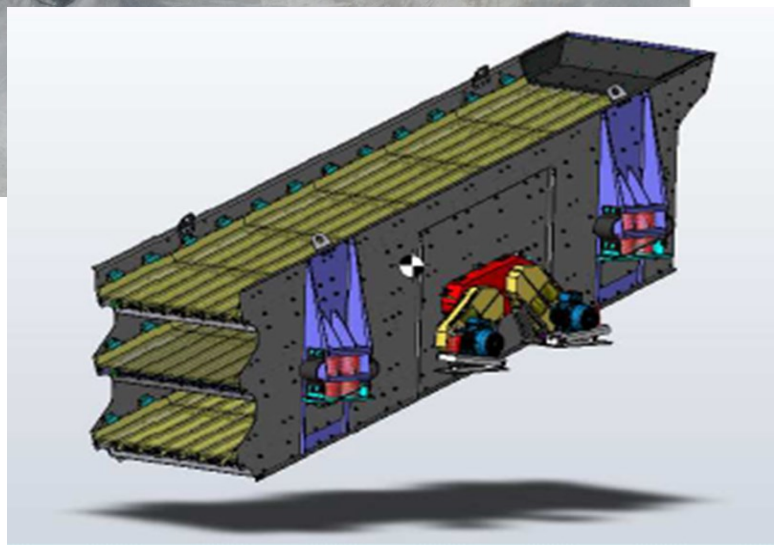
Sheet no 210

Client: **COGECA, Diack, *Senegal.***

Project: Aggregate plant extension and modernization.

Date: 2024 - 2025

Project description : COGECA plans to develop its quarry activities at the Diack site by increasing the production of 0/16 aggregates by optimizing the 8/16 fraction and reducing the 0/3 fraction as much as possible, with the possibility of producing standardized granular classes of 0/4, 4/6, 6/10, 10/14 and 14/20 for road aggregates, as well as 25/50 for ballast and well-graded granular material 0/31.5.



Services provided by CESA:

- Pre-project studies.
- Tendering and evaluation of offers.
- Project management and supervision of equipment erection.
- Training of personnel.
- Provisional and final acceptance.

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NOCIBE - BENIN

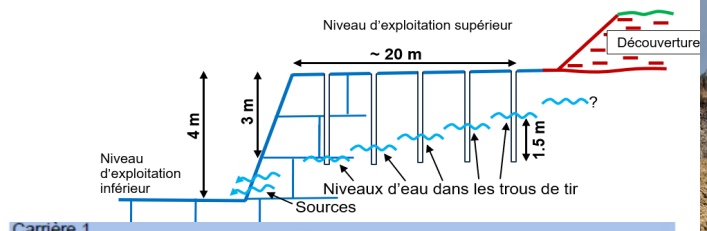
Sheet no 207

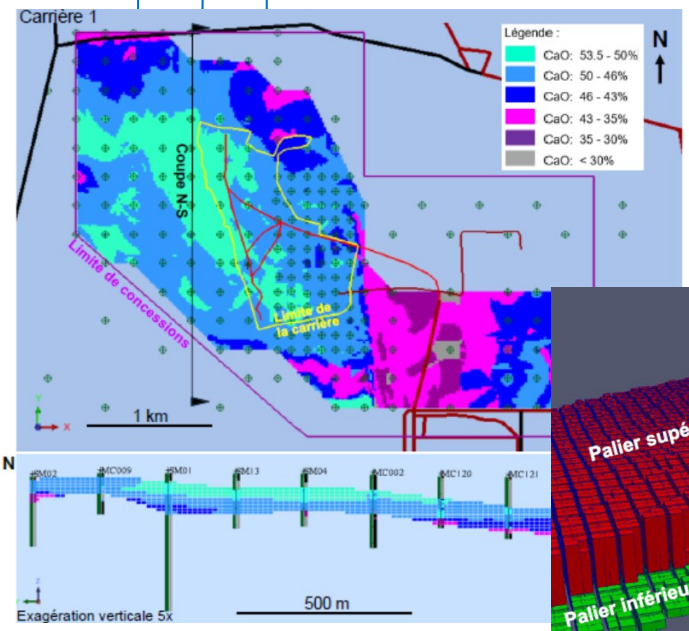
Client: **Nouvelle Cimenterie du Bénin, *Benin.***

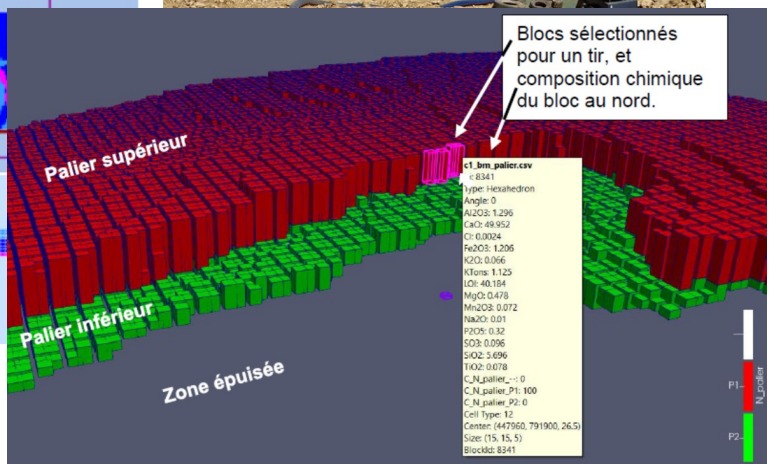
Project: Construction of a solar power plant with a capacity of 20 MW, with the possibility of an extension to 40 MW.

Date: 2024 -

Project description : After 10 years of operation, the NOCIBE wished to conduct a complete audit of its quarries, update the exploration data, the geological modeling and block model. On this basis, it was decided to densify the exploration drilling and then model the quarry extraction planning in order to optimize the use of raw materials.







Services provided by CESA:

- Audit of the quarries.
- Update of the geological modelling.
- Planification and management of the drilling campaign.
- Building of the exploration data database.
- Estimation of the bloc model.
- Modelling of the of both quarries in phases up to 5 years.
- Training of the quarry manager to the exploitation planning software (AthosGEO).
- Writing of exploration reports describing the work done.
- Following and recommendation.

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Opportunity Study O.I.P - MEXICO

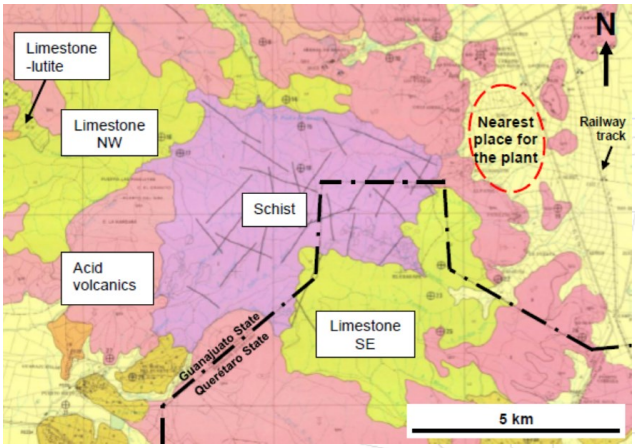
Sheet no 206

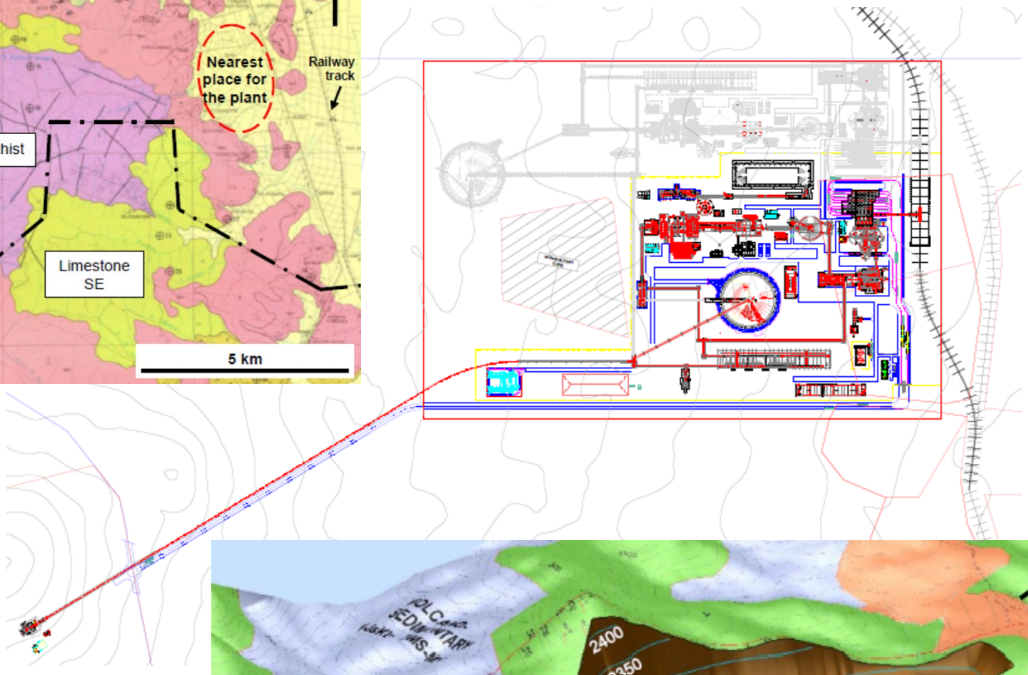
Client: **O.I.P., *Mexico.***

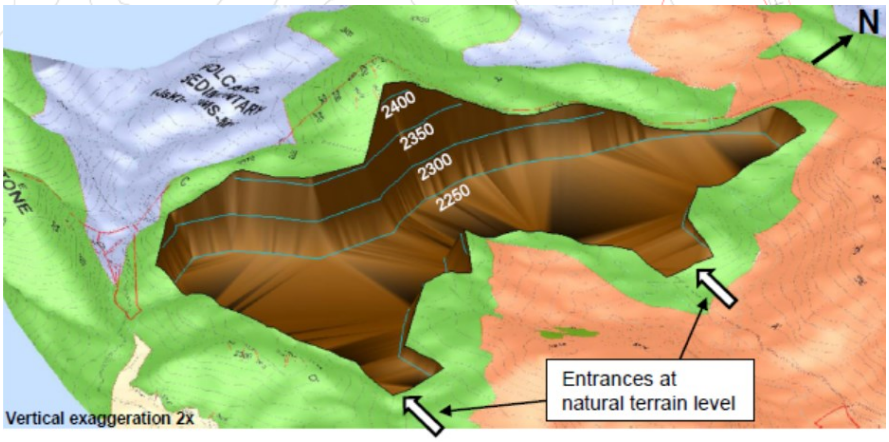
Project: Joint-venture for the construction of a new 2 Mt integrated cement plant in the Bajio region of norther Mexico.

Date: 2023 - 2024

Project description : Joint-venture project between O.I.P and a local partner for the construction of a new cement plant in the Bajio area, considered the region with the most developing potential in Mexico.







Services provided by CESA:

- Preliminary market study proposing the Bajio region for implantation of the 2 Mt integrated cement plant.
- Exploration work in the Bajio region to select suitable raw material locations.
- Complete field work and drilling campaign on two sites.
- Geological modelling of the most promising site.
- Raw mix determination and resource estimation.
- Drafting of several plant layout on the selected site.
- Writing of exploration report.

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SOLAR POWER PLANT - CDS SENEGAL

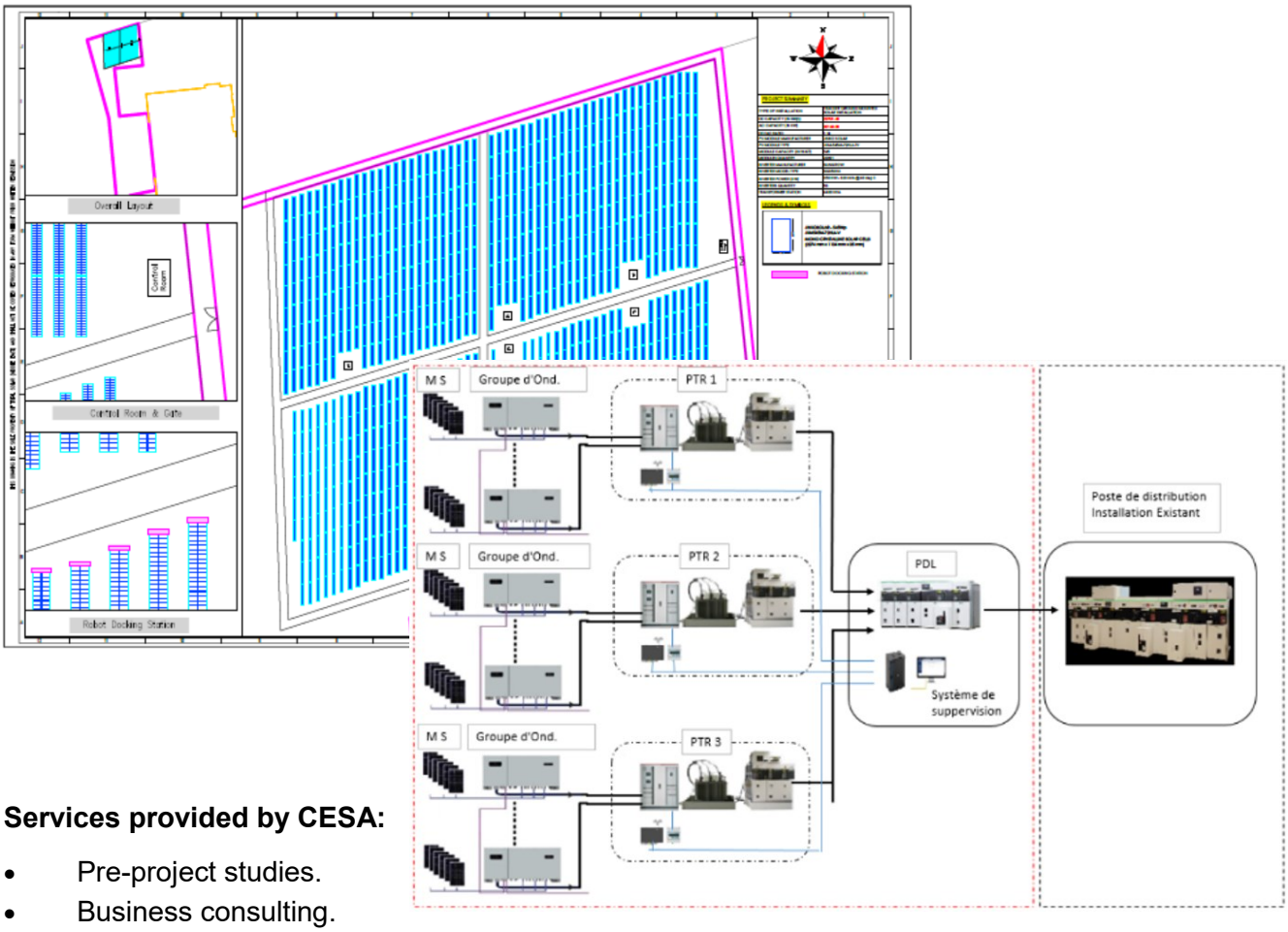
Sheet no 205

Client: **Les Ciments du Sahel, *Senegal.***

Project: Construction of a solar power plant with a capacity of 20 MW, with the possibility of an extension to 40 MW.

Date: 2023 -

Project description : Ciments du Sahel SA is fully in line with the cement industry's objective of reducing greenhouse gas emissions which contribute to global warming. The solar power station considered for the project is a photovoltaic plant with a field of photovoltaic panels as an energy source which will be coupled to existing and future HFO/gas thermal power plants (90 MW).



Services provided by CESA:

- Pre-project studies.
- Business consulting.
- Evaluation of offers.
- Assistance to CDS during technical-commercial negotiations.
- Drafting of the contract.
- Directorate for the execution of works contracts.
- Scheduling, management and coordination of construction sites.
- Assistance to CDS for acceptance of works Validation of final acceptance.
- Assistance to the customer for the resolution of the punch list and satisfaction of the guarantees.
- Validation of final acceptance.

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NEW GRINDING LINE - SCB BENIN

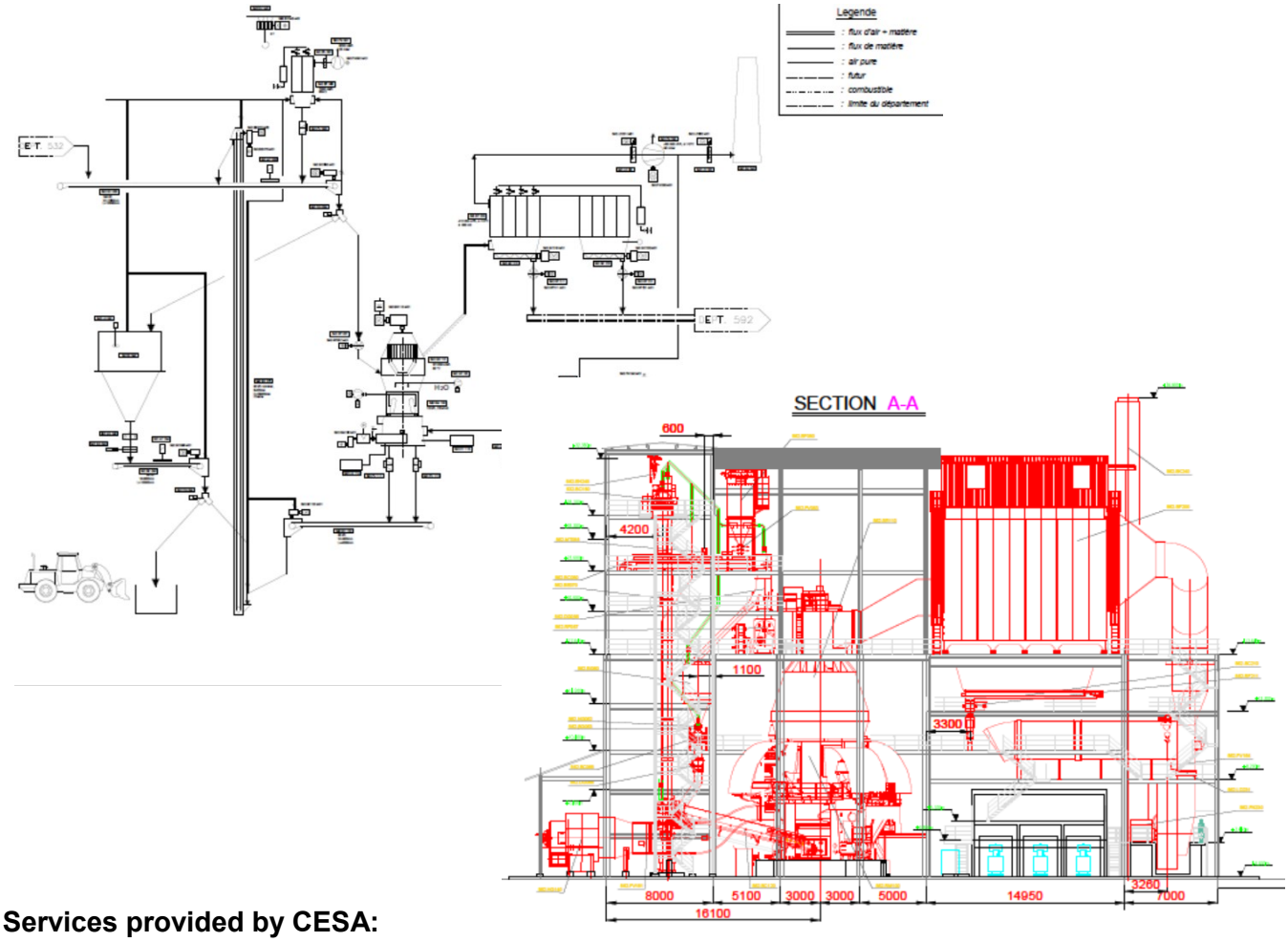
Sheet no 203

Client: **SCB - Lafarge, Benin.**

Project: Basic engineering and establishment of call for tender for a new cement grinding line.

Date: 2021 - 2024

Project description : Installation of a new grinding line on the site of the Onigbolo cement plant, 740,000 t/year.



Services provided by CESA:

Responsibility as consulting engineer:

- Plant audit.
- The technical feasibility study and the budget estimate of the optimal scenarios: evaluation of several options.
- Establishment of the planning until the signature of the contract.
- A basic engineering study of the solution selected at the end of the feasibility study.
- Drafting of the tender documents, launch of the consultation to the suppliers and evaluation of the offers, both technically and commercially.

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GRINDING AND PACKING PLANTS SENEGAL

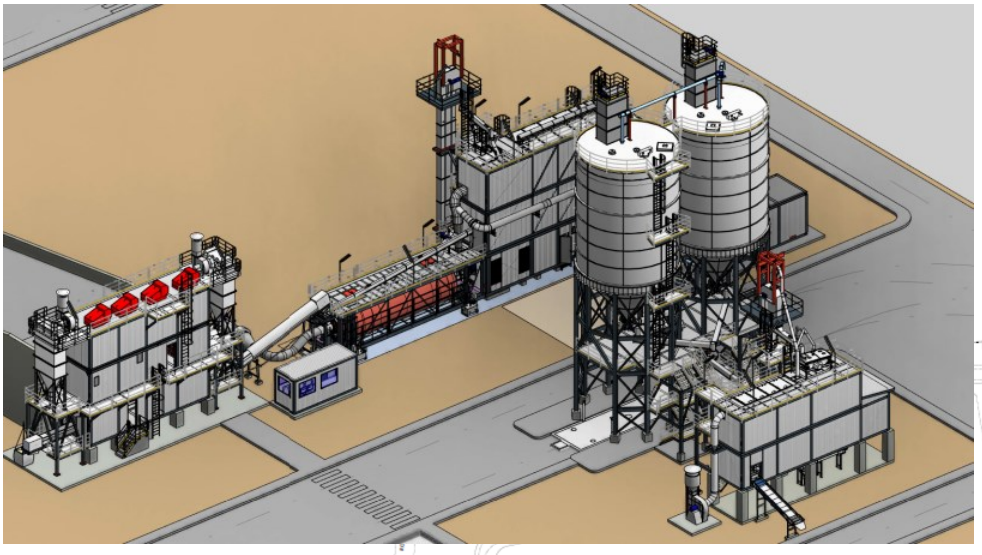
Sheet no 201

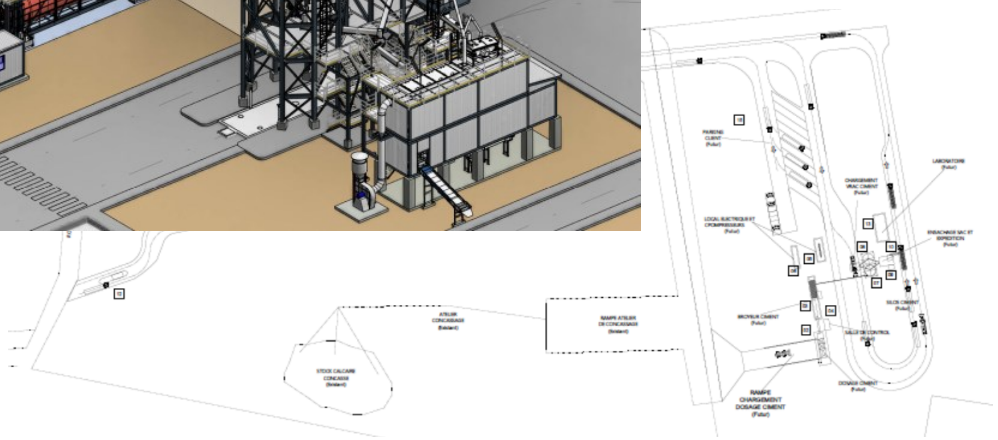
Client: **Xewell Cimenterie, *Senegal.***

Project: Technical and financial feasibility study for a new cement grinding line and concrete plant.

Date: 2022 - 2024

Project description : The company Xewell Climenteries intends to build a cement grinding line with a capacity of 50 t/h in Thies, Senegal.





Services provided by CESA:

Responsibility as consulting engineer:

- CESA acts as the project engineer who ensures the coordination of all the services, manufacturing, and works necessary for the completion of the project, from the feasibility study to final acceptance.
- CESA will ensure the proper application of the environmental rules in force, in particular with regard to air, water, noise, soil, and social measures.
- CESA will apply the rules in force specified by the lenders.
- The methods and factors for investment costs reduction will be applied:
  - Optimization of the number of machines.
  - Integrated solution including civil, process, and electrical and automation.
  - Optimal use of local fabrications.
  - On-site manufacturing of bulky items.
  - Choice of the most efficient companies (price, quality, deadlines).

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OPPORTUNITY STUDY, APAXCO MEXICO

Sheet no 198

Client: **Holcim Apasco, Apaxco plant, *Mexico.***

Project: Opportunity Study for the capacity increase of line n°1 of the Apaxco Cement Plant.

Date: 2022

Project description: The Apaxco plant counts with two 4 stage preheater kilns, n°1 with a capacity 1'200 tons per day and n° 2 with a capacity of 2'800 tons per day. Kiln n°1 has the potential to be upgraded by a modification to 3'000 tons per day.

Services provided by CESA:

Evaluation of two options:

- Option A consists in modifying kiln n°1 by:
  - Replacing the clinker cooler and corresponding dedusting.
  - Replacing the 4-stage preheater by a 5-stage preheater and calciner.
  - Adding a new vertical raw mill or roller press to complement the raw grinding capacity.
  - Replace or modify the existing gas treatment of the kiln.
  - Allowing 35 % of alternative fuels in the whole calcining section.
  - Reduction of the thermal consumption from 4'000 MJ/to to 3'000.
  - Addition of a new vertical cement mill.
  - Usage of slag to reduce CO2 emissions.
- Option B consists in replacing kiln n°1 by a new kiln line of 3'000 tons per day clinker line.

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60 MW POWER PLANT - CDS SENEGAL

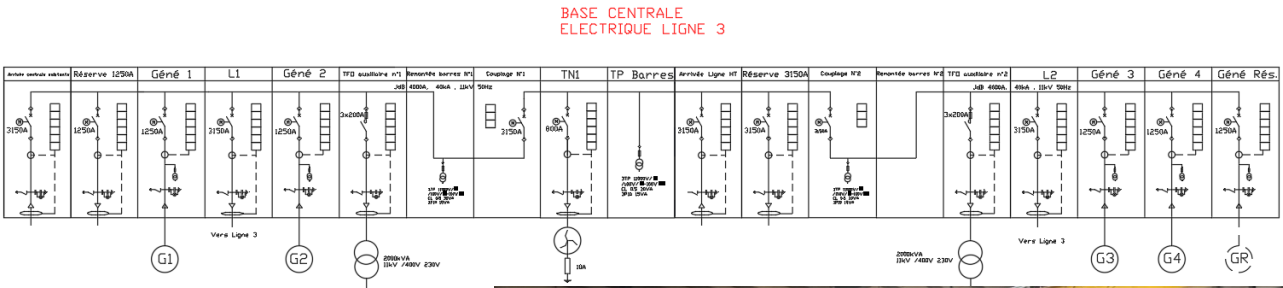
Sheet no 166– 3

Client: **Les Ciments du Sahel, *Senegal.***

Project: Construction of a 60 MW power plant to supply the third clinker production line of 6,000 t / d of clinker and 3 mio. tons of cement per year.

Date: 2020 - 2024

Project description : Les Ciments du Sahel is a well established cement producer in Senegal and the region. In order to increase its market share CDS decided investing in a third line allowing doubling its production capacity to 6 mio t/y cement.



Turnkey Supplier: CCGC

Services provided by CESA:

Responsibility as general contractor:

- Management of technical coordination meetings with the Employer, suppliers and contractors.
- Review and validation of all engineering drawings.
- Workshop inspection before dispatch of the main equipment by CESA supervisors.
- Monitoring of the assembly of transformers, the installation of cables and MV equipment.
- Management of plenary meetings to monitor the progress of the work.
- Assistance to the start-up of equipment.
- Supervision of performance tests and validation of certificates.
- Assistance to the customer for the resolution of the punch list and satisfaction of the guarantees.
- Validation of final acceptance.

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NEW 6000 TPD CLINKER - CDS SENEGAL

Client: **Les Ciments du Sahel, *Senegal.***

Project: Construction of the third clinker production line with 6,000 t/d of clinker and 3 mio. tons of cement per year.

Date: 2020 - 2023

Project description : Les Ciments du Sahel is a well established cement producer in Senegal and the region. In order to increase its market share CDS decided investing in a third line allowing doubling its production capacity to 6 mio t/y cement.

Turnkey Supplier: CBMI

Services provided by CESA:

Responsibility as general contractor:

- Management of the geotechnical study and injections to stabilize the subsoil.
- Review and validation of all engineering drawings, in particular the optimization of material connections between the old and the new lines in order to ensure great flexibility and complementarity of all production lines.
- Management of technical coordination meetings with the client, suppliers and contractors.
- Supervision of the manufacture of the plate works in workshops in China by CESA supervisors.
- Monitoring of civil engineering works, erection of metal structures and equipment.
- Assistance with the start-up of equipment.
- Supervision of performance tests and validation of certificates.
- Assistance to the customer for the resolution of the punch list and satisfaction of the guarantees.
- Validation of final acceptance.

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GREENFIELD CEMENT PLANT - MOROCCO

Sheet no 189

Client: **Tekcim, *Morocco.***

Project: Greenfield cement plant with 3'600 tpd clinker capacity and 1.4 mio. tpy cement production.

Date: 2019 - 2024

Project description: The Société Générale du Maroc (SGTM), the largest construction company in Morocco decided to build and operate a modern cement plant on the site of Ouled Ghanem benefiting of the latest technological developments.

EPC contractor: SGTM and FLSmidth (Danemark) S.A.S.

Services provided by CESA:

- Collaboration in the writing of the EPC contract documents and their annexes in particular the technical aspects of the mechanical and electrical equipment as well as for the civil works.
- Project management assistance and support to the client on all aspects of the works.
- Supervision of the fulfilment of the execution contract, in particular the approval of all the documents and plans required to carry out the project.
- Supervision of the respect of the project schedule and billing procedure.
- Supervision and control of the work. To this end, CESA provides an on-site expert.
- Critical analysis of the practical methods and procedures for conducting the testing of the facility prior to commissioning of the equipment. CESA experts assist and supervise the Supplier throughout this critical phase.

CESA is responsible for drawing the attention of the client to anything that may compromise the smooth running of the project, to advise on the measures to be taken and to check their good execution.

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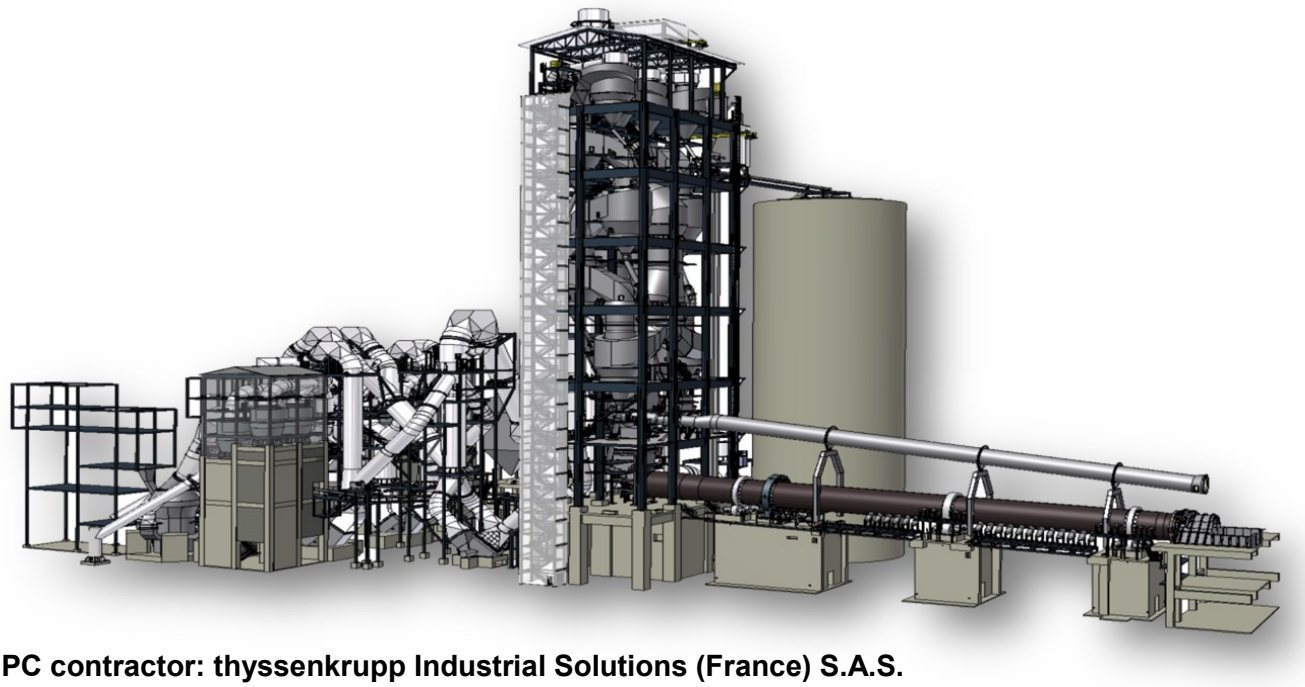
GREENFIELD CEMENT PLANT - ALGERIA

Client: **Société des Ciments de Sigus, Groupe GICA, *Algeria.***

Project: Greenfield cement plant with 6'000 tpd clinker capacity and 2.5 mio. tpy cement production.

Date: 2016 - 2020

Project description: As a national cement supplier and in view of economic development around the metropolis of Constantine, the GICA (Groupe Industriel des Ciments d'Algérie) decided to build and operate a modern cement plant on the site of Sigus benefiting of the latest technological developments.



EPC contractor: thyssenkrupp Industrial Solutions (France) S.A.S.

Services provided by CESA:

- Critical study of the specifications and its annexes, including geology and geotechnics.
- Critical study of the EPC contract of realization, in particular the technical aspects, the conditions of price, of payments, of deliveries, of assembly, of insurance and commissioning.
- Supervision of the fulfilment of the execution contract, in particular the approval of all the documents and plans required to carry out the project.
- Supervision and control of the work. To this end, CESA provides an on-site team of engineers specialized in all areas of the project: mechanical, process, electrical, control-command and civil engineering.
- Critical analysis of the practical methods and procedures for conducting the testing of the facility prior to commissioning of the equipment. CESA experts assist and supervise the Supplier throughout this critical phase.

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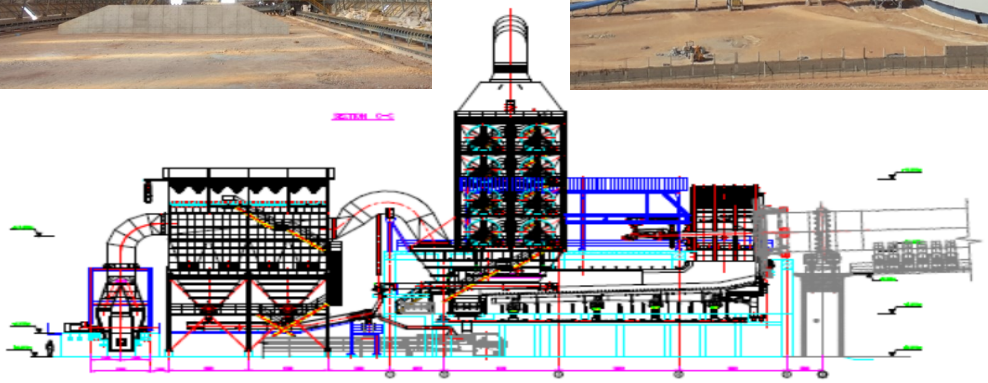
GREENFIELD CEMENT PLANT - ALGERIA

Client: **Société Saoura Ciment - Béchar, Groupe GICA, *Algeria.***

Project: Greenfield cement plant with 3'200 tpd clinker capacity and 1.3 mio. tpy cement production.

Date: 2016 - 2021

Project description: As a national cement supplier and in view of the isolated situation of the booming region of Béchar, the GICA (Groupe Industriel des Ciments d'Algérie) decided to build and operate a modern cement plant on the Saoura site, project that will also become a pole of development and job creation.



EPC contractor: CBMI.

Services provided by CESA:

- Supervision of the fulfilment of the execution contract, in particular the approval of all the documents and plans required to carry out the project.
- Supervision and control of the work. To this end, CESA provides an on-site team of engineers specialized in all areas of the project: mechanical, process, electrical, control-command and civil engineering.
- Assistance to the client in setting up a project implementation team.
- Critical analysis of the practical methods and procedures for conducting the testing of the facility prior to commissioning of the equipment. CESA experts assist and supervise the Supplier throughout this critical phase.
- Critical analysis of the general organization of the operation, the procedure for the selection of the operating and maintenance staff and the program of their training by the Supplier.

For more information, please contact:
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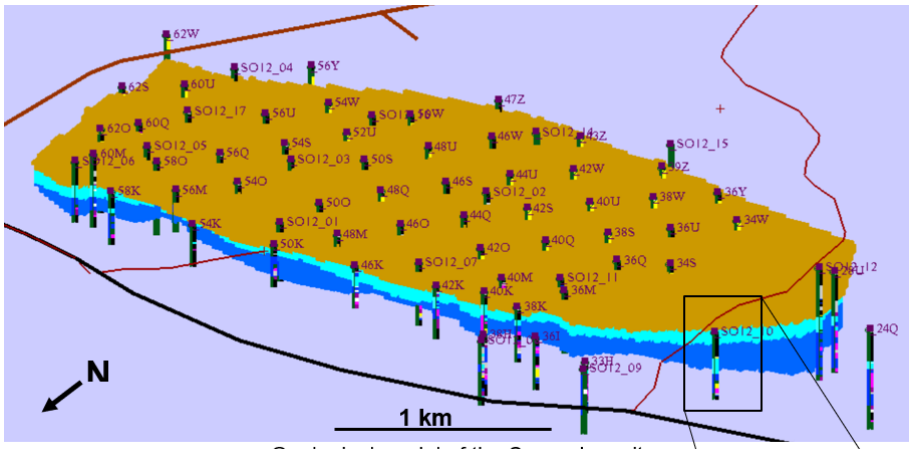
GREENFIELD CEMENT PLANT - NIGERIA

Client: **INTERNATIONAL CEMENT COMPANY LTD, *Nigeria.***

Project: Feasability study for a Greenfield plant with 3'600 tpd clinker capacity and 1.5 mio. tpy cement production.

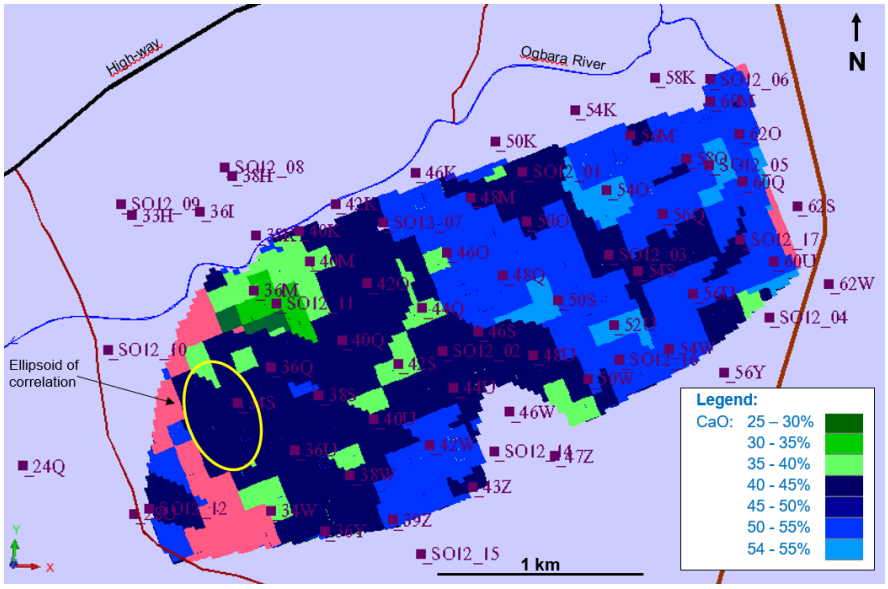
Date: 2021

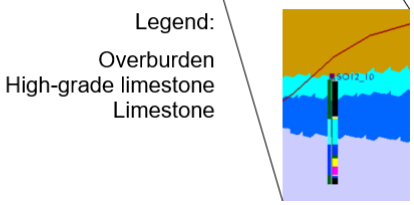
Project description : Chicason Group is willing building a new cement plant north of Lagos, in Ogun state. CESA was mandated to elaborate and conduct a raw material exploration program and to construct the 3D geological model and bloc model estimation.



Geological model of the Somo deposit

3D view of the block model for the Limestone





Service provided by CESA:

- Review of all the drill hole data, geological desctiption and chemical analyses of the cores.
- Statistical and geostatistical analyses of the chemical data and of the variograms.
- Estimation of the bloc model by kriging.
- Resource evaluation in terms of quantity and quality. Calculation of the raw mix design.
- Full reporting and documentation.

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TECHNICAL AUDIT - PANAMA

Sheet no 196-1

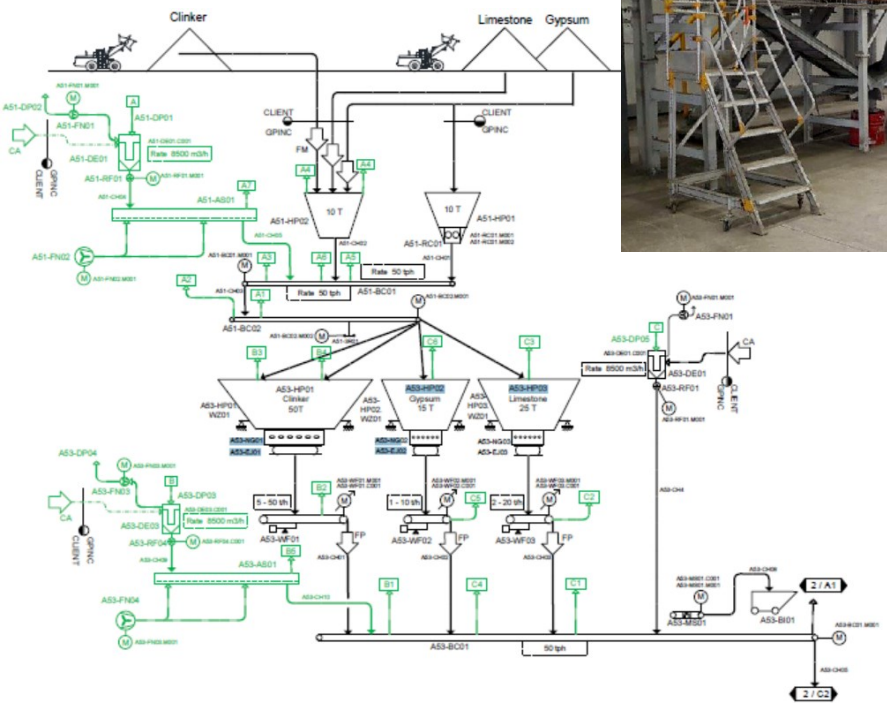
Client: **Cemento Chagres, *Panama.***

Project: Critical study of the design, engineering and construction of the entire grinding station built in 2018 by a company from Forida, USA.

Date: 2020

Project description: Cemento Chagres is a 300,000 tonnes per year clinker crushing and cement distribution station built on the west coast of Panama in 2018.

This installation shows many imperfections and Cemento Chagres manded CESA Cement Engineering to resolve certain faults to allow the production to resume.



Services provided by CESA:

- Critical study of the documents (Due diligence).
- Site visit, visual inspections and collection of missing documents.
- Detailed report on the condition of the equipment with comments and recommendations for repair with regards on the site and weather conditions.
- Engineering study of the internal equipment of the crusher (shielding, intermediate and exit partitions, length of chambers 1 and 2, and grinding charges) compatible with the fixed factors (installed power, rotation speed and ventilation).

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INSTALLATION OF EQUIPMENT- PANAMA

Sheet no 196-2

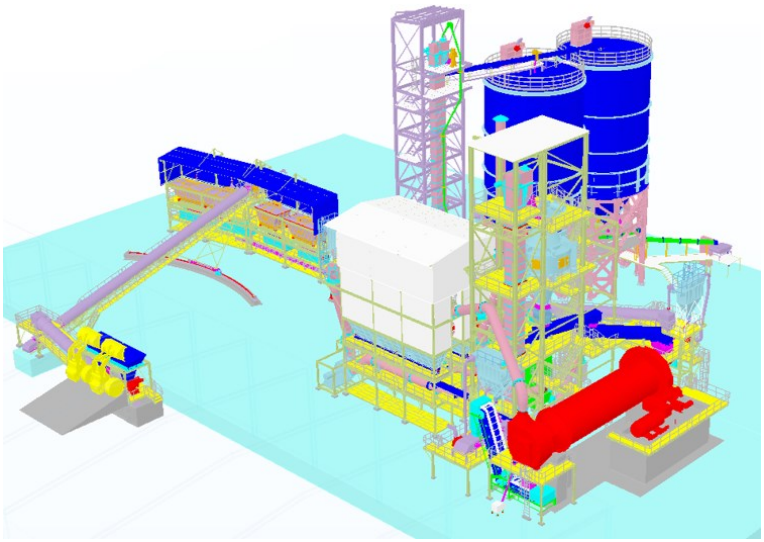
Client: **Cemento Chagres, *Panama.***

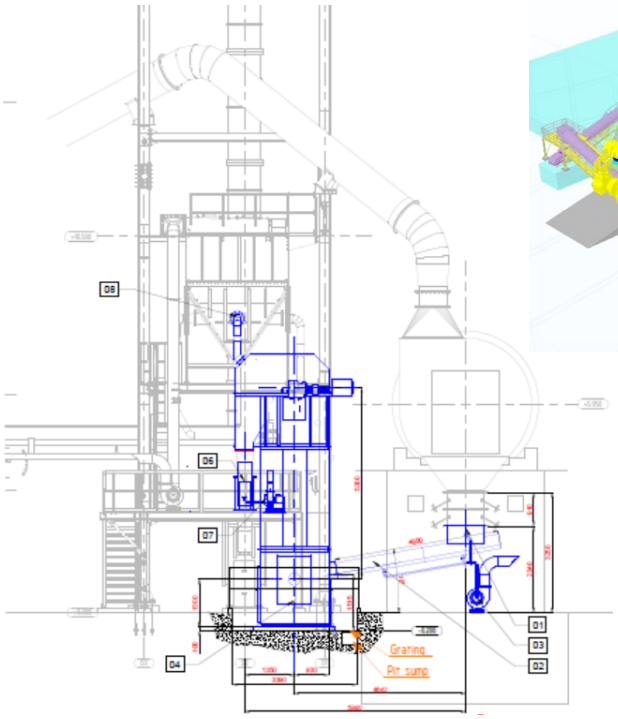
Project: Study and implementation of a 250 t/h dust-free transport between the outlet of the crusher and the feed to the classifier.

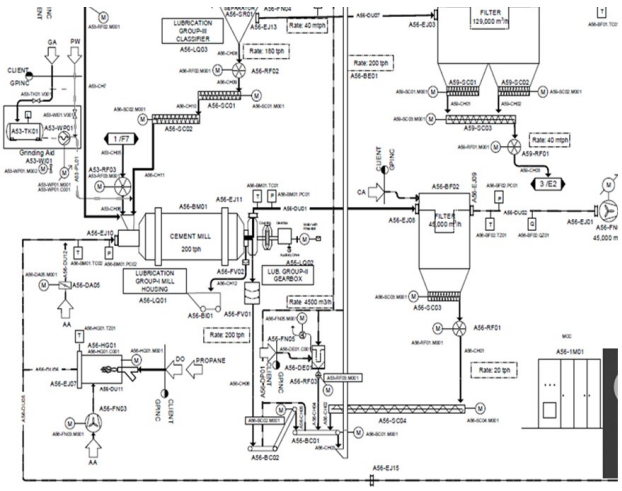
Date: 2020

Project description: Cemento Chagres is a 300,000 tonnes per year clinker crushing and cement distribution station built on the west coast of Panama in 2018.

This installation shows many imperfections and Cemento Chagres manded CESA Cement Engineering to resolve certain faults to allow the production to resume.







Services provided by CESA:

- Examination of the faulty original system.
- Design of a perfectly dust-free system.
- Definitions and specifications of the selected equipment.
- Installation engineering in the space available and considering local conditions (soil and climate).
- Site visit and inspection after completion of the work.

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AUDIT OF A GRINDING STATION MOROCCO

Sheet no 195

Client: **Al Hoceina, *Morocco.***

Project: Technical audit of the grinding plant of Dakhla Amenagement SA in Dkhla with a capacity of 100,000 t / a of CPJ 45 quality cement according to the Moroccan standard.

Date: 2020

Project description: West Capital Partners advises an industrial group on the acquisition of a clinker grinding and cement bagging station located in southern Morocco. To this end, WCP has mandated CESA as an independent technical advisor to inspect and technically evaluate this station.

Services provided by CESA:

CESA carried out a complete technical audit, in particular on the following points:

- Site visit and inspection
- Analysis of the technical aspects listed below:
  - Installation design.
  - Design of main equipment.
  - Laboratory and quality control.
  - Compliance with the Moroccan standard of the cement produced.
  - Operation.
  - Environmental protection.
- Proposal of optimization measures and quantification of the cost of investments.

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BROWN FIELD CLINKER LINE - LIBYA

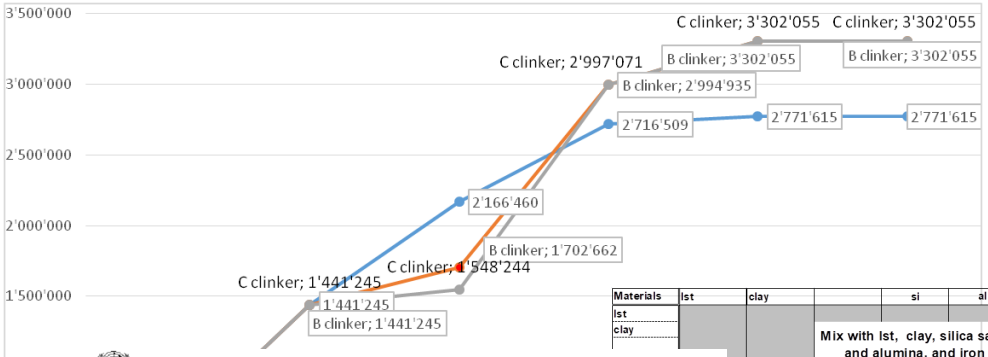
Sheet no 185

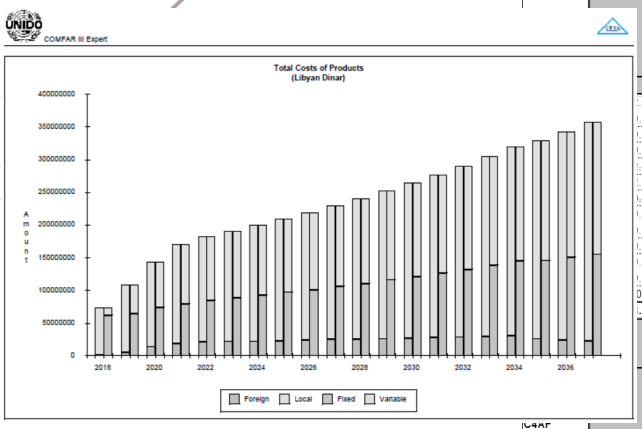
Client: **Libyan Cement Company, *Libya.***

Project: New clinker production line of 3'600 tpd in order doubling the cement production to 3 mio. tpy.

Date: 2018 - 2020

Project description : The owners of the Libyan Cement Company decided to, in addition to the revamping of some of the old lines of the Benghazi and Hawari plants, to build a new clinker production line.





Materials	Ist	clay		si	al	fe	petcoke ash	Mix	Clinker
Ist								72.92	72.92
clay								18.00	18.00
			Mix with Ist, clay, silica sand and alumina, and iron corrective from Wadi Shati					0.00	0.00
								6.04	6.04
								1.49	1.49
								0.80	0.80
								0.75	0.75
								100.00	100.00
.80	19.97			5.22	20.07	2.00	0.00	35.43	
.49	42.73			83.59	9.69	9.00	40.61	13.62	21.09
.40	10.49			1.80	42.23	8.00	25.12	3.17	4.91
.28	3.78			0.88	20.32	75.00	9.13	1.91	2.96
.12	18.62			6.31	1.05	4.00	4.20	41.82	64.77
.16	1.62			0.46	0.24	3.00	1.23	1.93	2.99
.26	0.12			0.21	0.08	0.20	18.00	0.36	0.56
.16	1.90			0.69	0.1	0.10	0.17	0.50	0.78
.12	0.47			0.35	0.05	0.10	0.13	0.20	0.30
.02	0.65			0.15	2.3			0.17	0.27
.00	0.08			0.02	0.67			0.03	0.04
.05	0.09			0.02	2.67			0.09	0.14
052	0.036			0.010	0.003			0.05	0.07
.91	100.56			99.71	99.47	101.40	98.59	99.28	98.89
								97.00	97.00
								2.68	2.68
								1.66	1.66
									66.13
									10.63
									8.00
									9.01
Liquid phase									25.07
Alk/SO3									1.74
Na2O eq									0.82

Service provided by CESA:

- Feasibility study and evaluation of several rehabilitation scenarios:
  - Only revamping of the existing lines.
  - Building of an entire new production line.
  - Revamping of the less damaged existing lines an construction of one new line.

  This last solution was chosen by the client and CESA put in charge of this project.
- Writing of the tender documents for an EPC contract.
- Clarification meetings with the suppliers and contractors.
- Evaluation of the technical solutions proposed and of the commercial offers.
- Contract negotiations and writing of the contractual documents.

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RAW MATERIAL EXPLORATION AND EXTRACTION SCHEDULING - INDIA

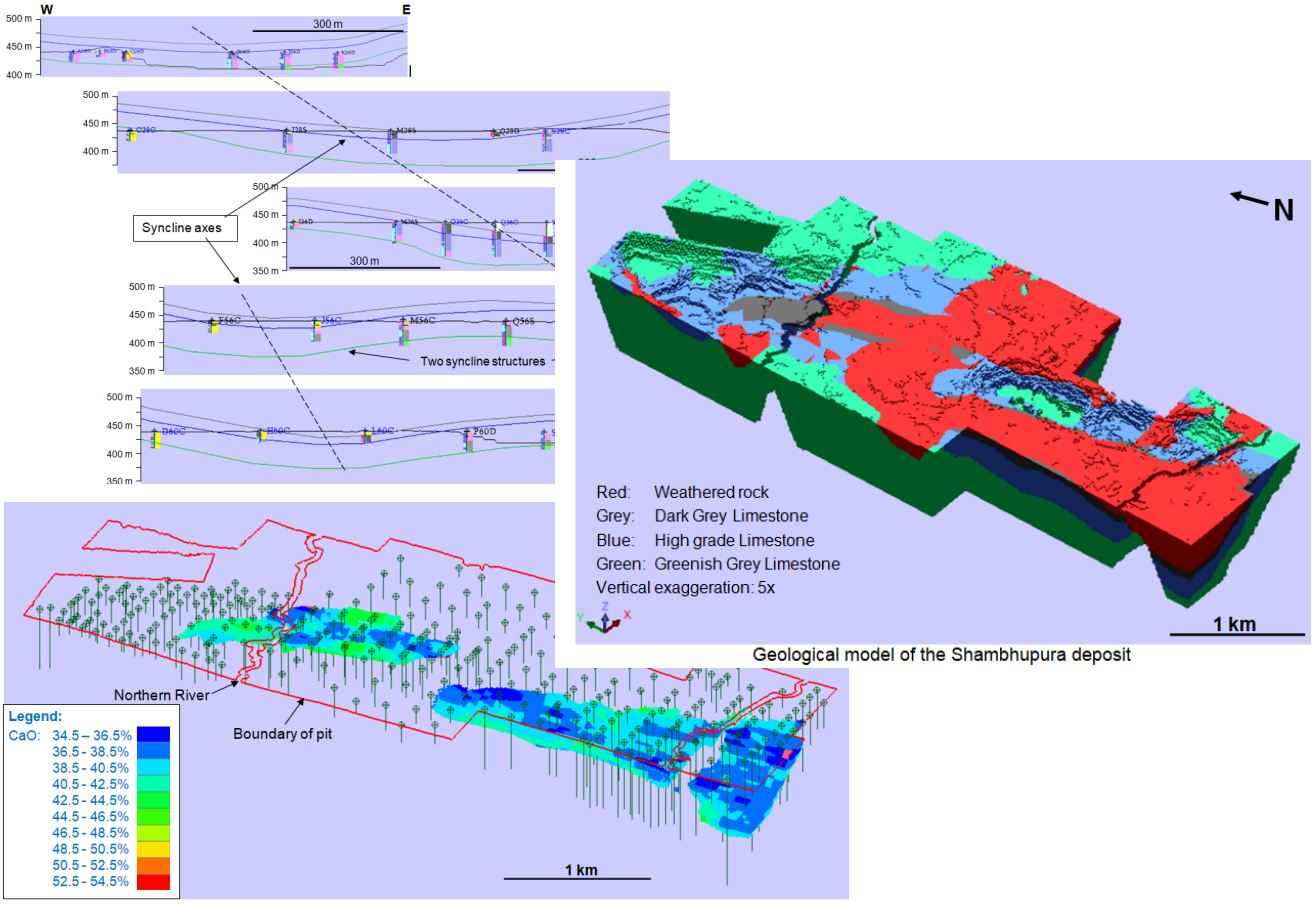
Sheet no 186

Client: **ULTRATECH, *India.***

Project: Update of the geological model of the Sambhupura deposit, block modeling and scheduling of the extraction.

Date: 2017 - 2018

Project description : Ultratech is the largest cement company in India. The requirement to better understand its cement raw material led them to contact CESA for its geological and mining modeling expertise.



Geological model of the Shambhupura deposit

Service provided by CESA:

- Field visit to verify the accuracy of the geological map and model, the good core recovery of the new core holes and the procedure of sampling and chemical analyses. In particular verification of the compatibility of the various data set resulting from different drilling techniques.
- Update of the geological model with the data of the new drill holes. Improvement of the geological model of the remainder of the deposit.
- Geostatistics and estimation of a new bloc model over the entire deposit.
- Calculation of the optimal raw mix.
- Volume calculation and estimation of the resource per pit.
- Detailed reporting.

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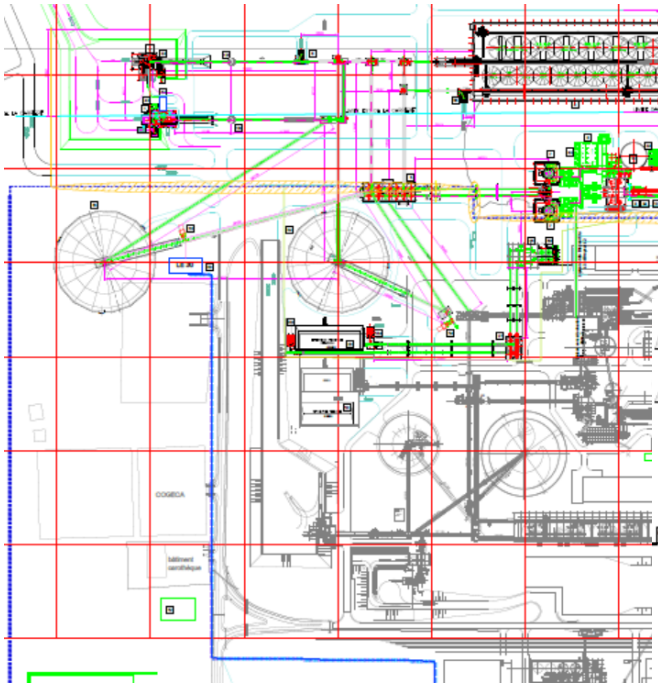
NEW 6000 TPD CLINKER - CDS SENEGAL

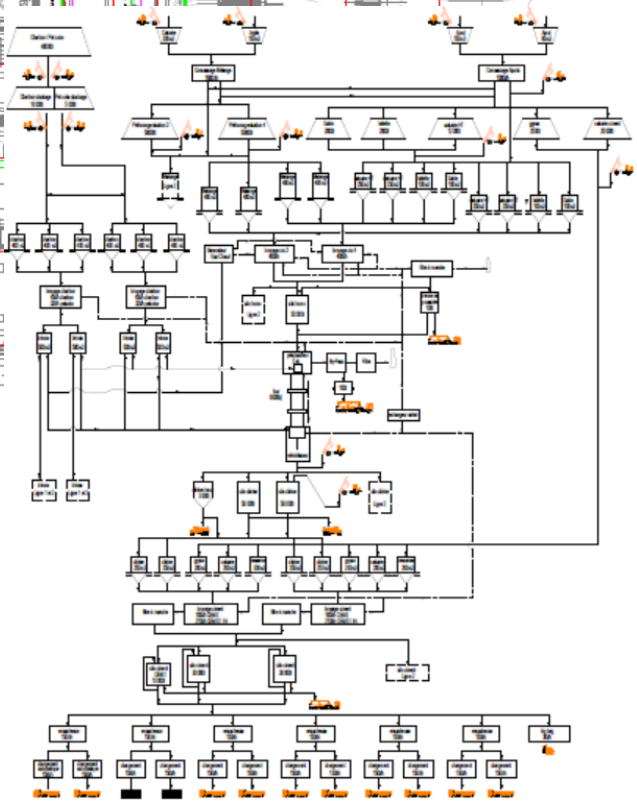
Client: **Les Ciments du Sahel, *Senegal.***

Project: Feasibility study for a third clinker production line of 6,000 t / d of clinker and 3 million tons of cement per year.

Date: 2016 - 2019

Project description : Les Ciments du Sahel is a well established cement producer in Senegal and the region. In order to increase its market share CDS decided investing in a third line allowing doubling its production capacity to 6 mio t/y cement.





Service provided by CESA:

- Conception of several technical solutions including connections to the actual lines in order to assure flexibility and complementarity between the two existing and the third new line.
- Feasibility study (raw materials availability study, market study, technical study, financial study).
- Elaboration of the tender documents for an EPC contract and for a multi-package solution.
- Clarification meetings with the suppliers and contractors.
- Evaluation of the technical solutions proposed and of the commercial offers.
- Contract negotiations and writing of the contractual documents.

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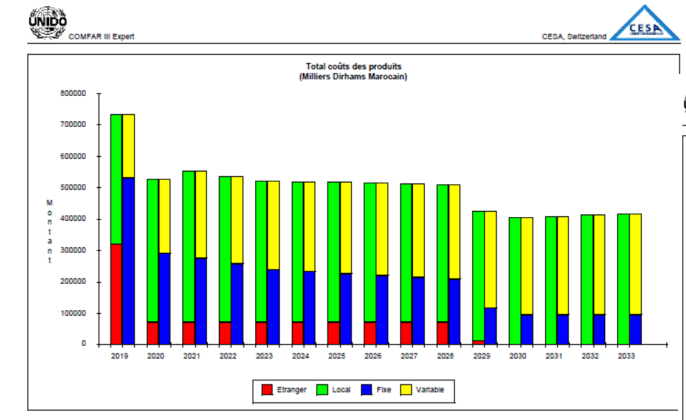
GREENFIELD CEMENT PLANT - MOROCCO

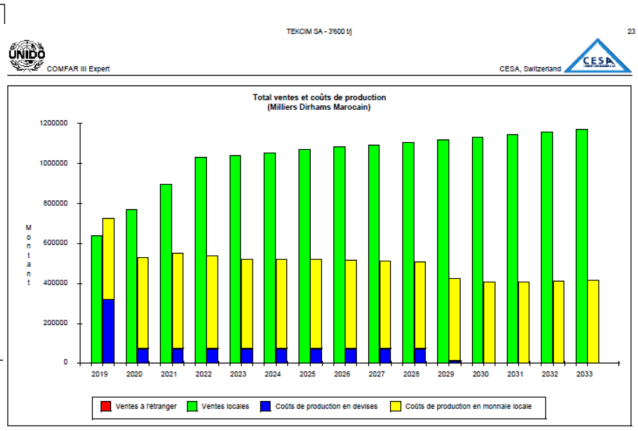
Client: **Tekcim, *Morocco.***

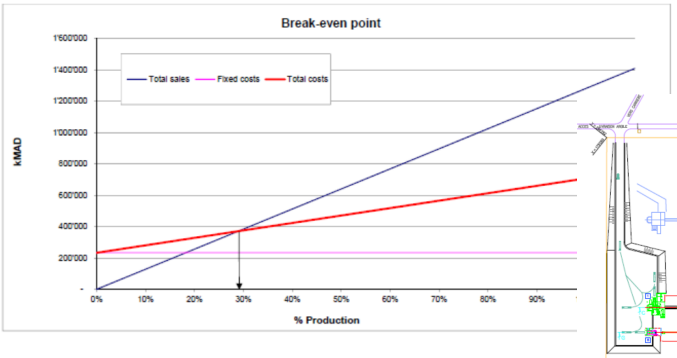
Project: Greenfield cement plant with 3'600 tpd clinker capacity and 1.4 mio tpy cement production.

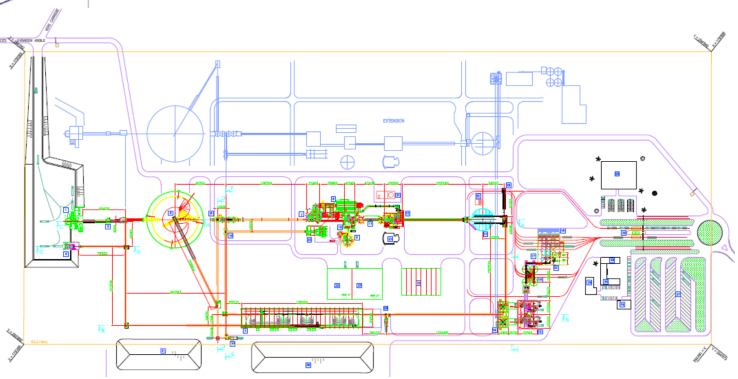
Date: 2010 - 2019

Project description: The Société Générale du Maroc (SGTM), the largest construction company in Morocco, decided to build and operate a modern cement plant on the site of Ouled Ghanem, benefiting of the latest technological developments.









Services provided by CESA:

- Comparative feasibility study for a 5'000t/d and a 3'600t/d production. This comparative study is based on economic, technical, operational reliability, cost and production planning considerations.
- Writing of the complete technical description of the integrated cement plant to be build as basis for an international call of tender.
- Redaction of a special electrical tender documents to address independent electrical suppliers established in Morocco.
- Evaluation of the offers, organisation of clarification meeting and technical negotiations.
- Collaboration in the writing of the EPC contract documents and their annexes, in particular the technical aspects of the mechanical and electrical equipment, as well as for the civil works.

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NEW GRINDING PLANT - ULAAN BAATOR

Client: **Moncement Building Materials LLC (MBM) , *Mongolia.***

Project: New grinding unit of 120 tph in the Songino-Khairklian District.

Date: 2016 - 2018

Project description : Moncement builds close to Ulaan Baator, the capital of Mongolia, the largest cement grinding unit of the country in the Songino-Khairklian District. The plant has a cement capacity of 120 tph. Clinker and gypsum arrive by train from the new Urgun Soum plant where the grinding capacity is of only 60 tph.

The project includes the utilisation of fly ash of the coal power plants located close by.

EPC contractor:

JDEE (Jidong Equipment & Engineering Co., Ltd).

Service provided by CESA as the Project Management Consultant:

- Control and review of the design and engineering.
- Site organisation and management, including HSE.
- Monitoring of the equipment fabrication and deliveries to the site.
- Compliance with local (Mongolian) standard and regulations (in cooperation with MCC).
- Regular meetings with the EPC Contractor and monthly reporting regarding design and construction works progress, time schedule, cast, operating performance and risk management against the EPC contract deliverables.
- Recommendations with qualifications to MBM on progress payments.
- Inspection of all the work on site and reception of the constructions.
- Monitoring and participation in the testing commissioning face.

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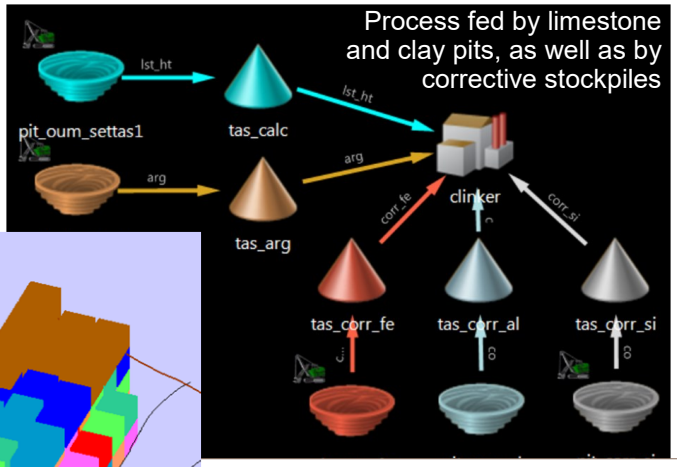
LARGEST ALGERIAN CEMENT PLANT

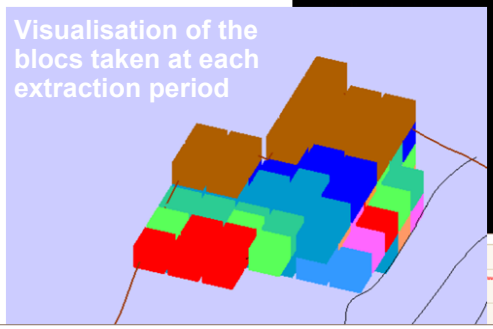
Client: **CEVITAL Minerals, *Algeria.***

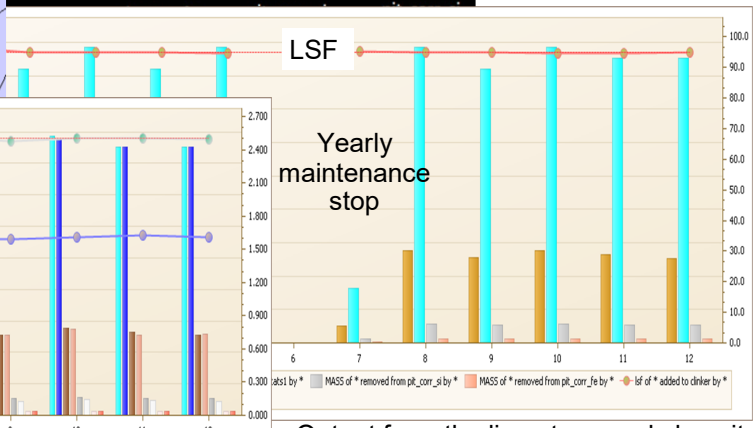
Project: Greenfield cement plant with 12'000 tpd clinker capacity and 5 mio tpy cement production.

Date: 2015 - 2016

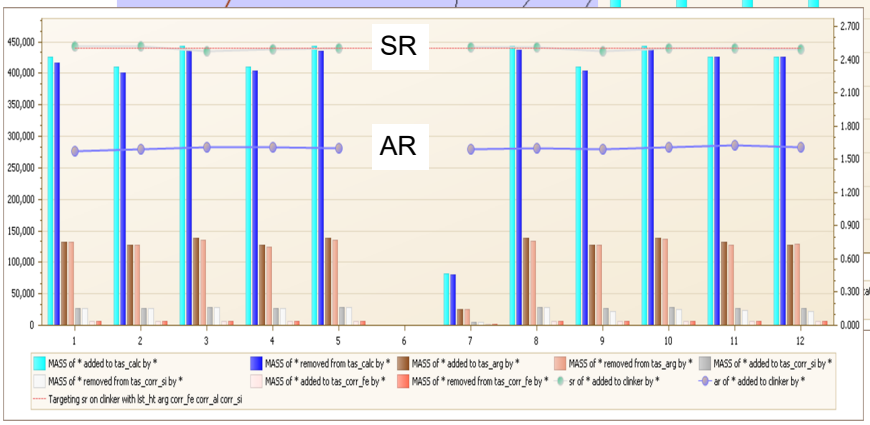
Project description: The ultimate goal of raw material exploration is to plan the extraction of raw materials so that the raw mix is as close as possible to the desired composition and has a minimum of fluctuation over time.







Output from the limestone and clay pits



Management of the stockpiles

Services provided by CESA:

The modeling of the extraction of the raw materials makes it possible to confirm an adequate mixture for each prehomogenization pile. The planning optimizes extraction by:

- Stabilizing the production of raw materials in terms of quality while ensuring the required production.
- Reducing the need for correctives and anticipating their consumption in the future.
- Increasing the life time of the deposits by efficiently mixing the materials.
- Simplifying extraction through improved quarry development.

The production of a constant raw mix makes it possible to optimize the production of clinker, allowing saving energy and producing a clinker of constant quality.

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LARGEST ALGERIAN CEMENT PLANT

Sheet no 171 - 2

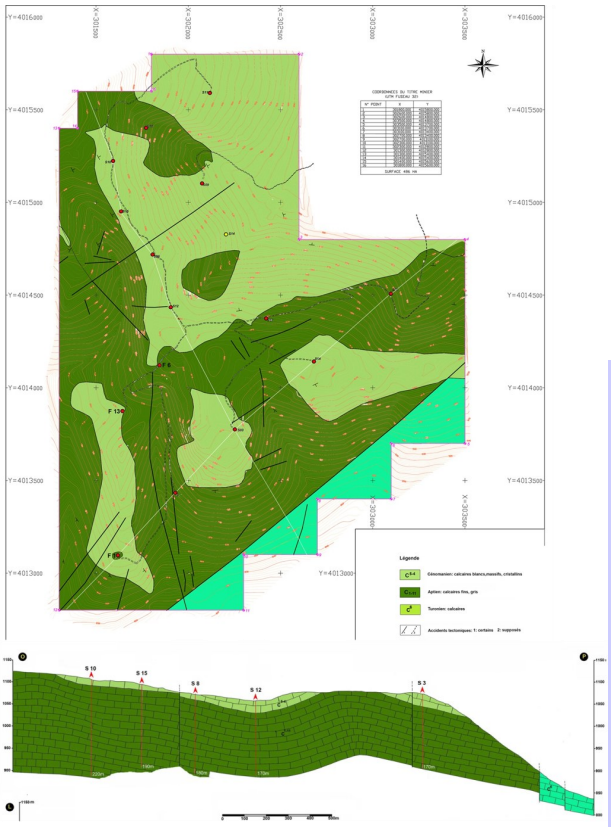
Client: **CEVITAL Minerals, *Algeria.***

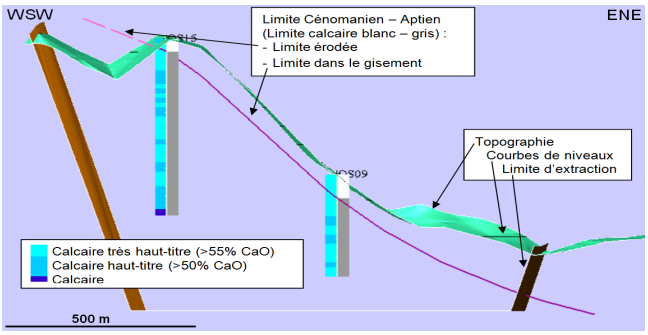
Project: Greenfield cement plant with 12'000 tpd clinker capacity and 5 mio tpy cement production.

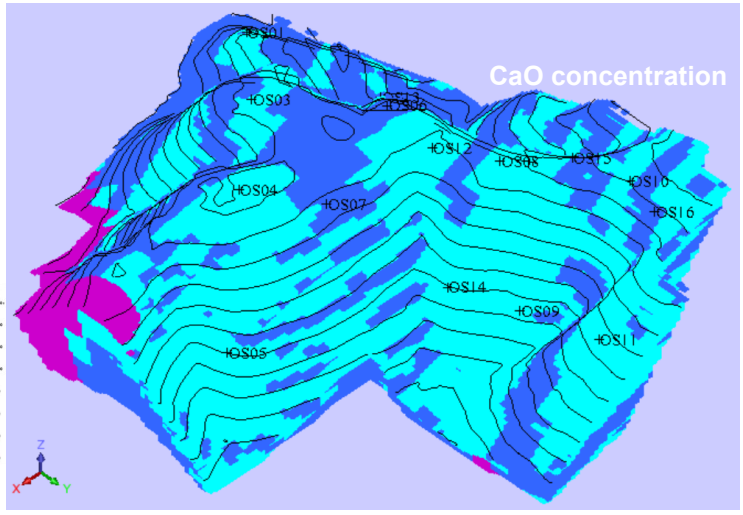
Date: 2015 - 2016

Project description: CEVITAL Minerals already operates several quarries of various raw materials. The company therefore has the resources to carry out an exploration campaign, but nevertheless wished to hire the services of an expert office to supervise the exploration work in order to ensure that the requirements specific to cement are respected.

Geological mapping resulting in 3D-modeling and bloc modelling







Services provided by CESA:

- Writing of specifications for the execution of the drilling campaigns and chemical and environmental analyzes of the cores. Planning for the extension of the drilling campaign in the limestone and clay deposits.
- Field visits to validate the geological mapping and the proper execution of specifications to ensure that exploration results are representative of the deposits.
- 3D geological modelling and statistical and geostatistical analysis of the data. Then, estimation of the block models by ordinary kriging for the limestone and clay deposits with the Geovia Surpac program of Dassault Systèmes.

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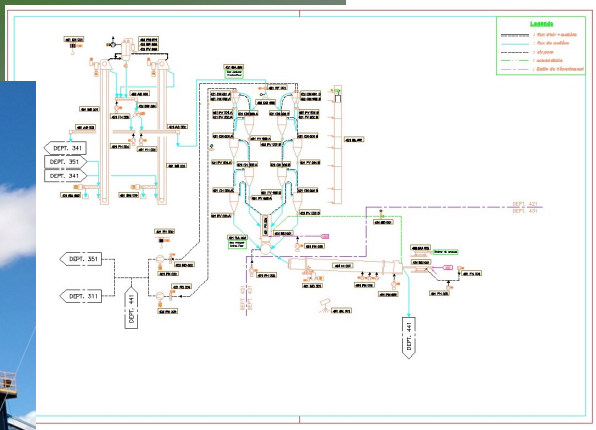
TURNKEY CEMENT PLANT - MONGOLIA

Client: **Monpolymet, Senj Sant cement factory, *Mongolia.***

Project: Greenfield cement plant with 1'750 tpd clinker capacity and 730'000 tpy cement production.

Date: 2014 - 2016

Project description: This project is the first integrated cement plant in Mongolia. The works consisted, in addition of the plant itself, of the construction of a 12 km access road, a rail connection to the Trans-Mongolia-Russia-China railway line and a base camp for the employees.



Turnkey Supplier (EPC): Huxin China.

Services provided by CESA:

CESA worked as an independent engineer for the EBRD, co-financing the project. CESA was put in charge of reviewing and validating by periodic visits on the site:

- Documentation of the project and its compliance with the technical, environmental and social impact requirements.
- The planning scheme to ensure its feasibility.
- The monthly progress of the works and the respect of the deadlines.
- Technical end-of-work reports and their conformity with the contract and the international standards.
- Respect for the social role linked to this project such as the construction of a village for 200 families, a system of heat recovery and production of hot water and consumable water for the village.

For more information, please contact:
Cement Engineering (CESA) S.A.
Consulting Engineers, Rue Alexandre-Gavard 16, 1227 Geneva, Switzerland
www.cesaeng.com Tél: +41 (0) 22 304 14 50 Fax: +41 (0)22 304 14 51 E-Mail: info@cesaeng.com

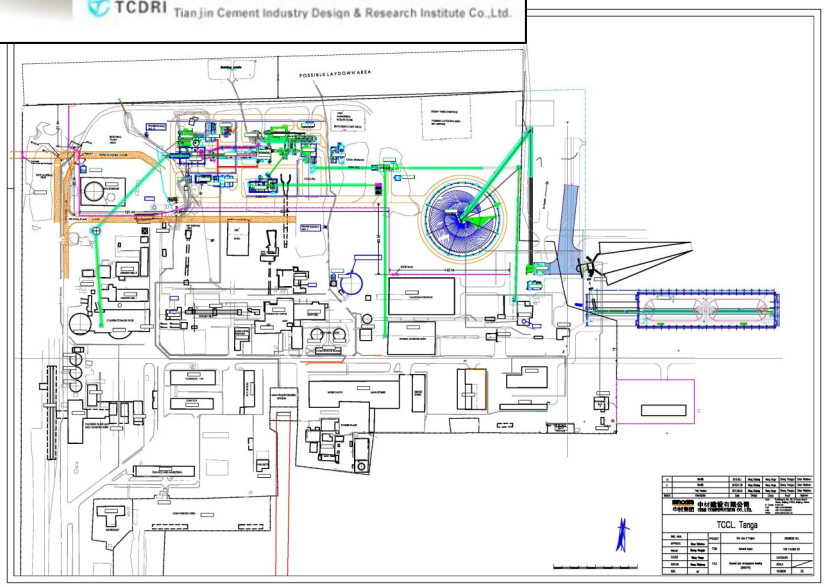
CEMENT PLANT EXPANSION - TANZANIA

Client: **TANGA CEMENT, *Tanzania***

Project: New production line of 2500 tpd of clinker capacity and 1 mio. tpy cement production.

Date: 2010 - 2016

Project description : In view of the favorable market conditions, Tanga Cement wishes to increase its production capacity by installing a second line.



Service provided by CESA:

The Project Works comprise the complete design, supply and setting to work of a new clinker production line at Tanga, comprising the following departments:

- Raw Material and raw meal preparation.
- Clinker Production.
- Correctives and additives preparation and handling
- Traditional and alternative fuels preparation and handling.
- Coal grinding plant.

CESA first carried out the due diligence report for the lenders and then followed and validated the construction progress and reported accordingly. CESA acted as the Lenders Technical Advisor as independent Engineer for the Public Investment Corporation mandated to arrange the financial loan facilities.

For more information, please contact:
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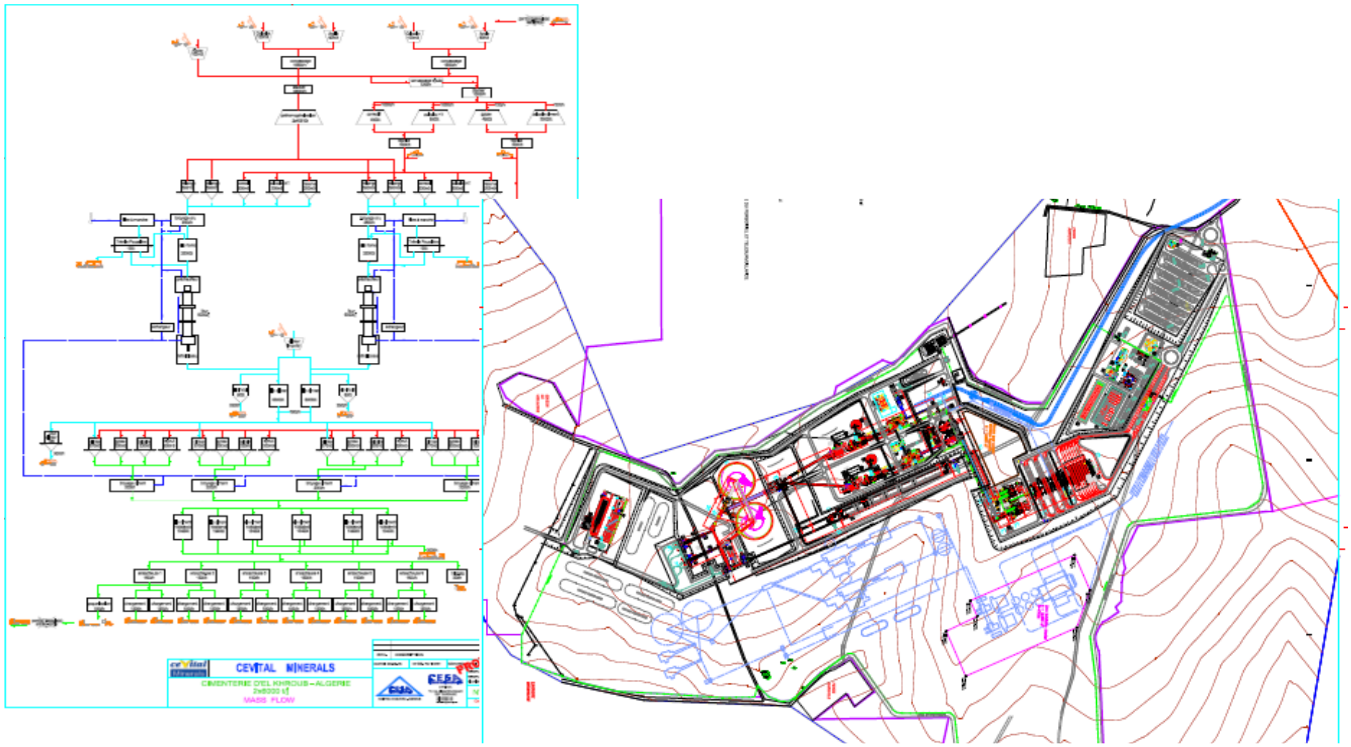
LARGEST ALGERIAN CEMENT PLANT

Client: **CEVITAL Minerals, *Algeria.***

Project: Greenfield cement plant with 12'000 tpd clinker capacity and 5 mio tpy cement production.

Date: 2015

Project description: CEVITAL Minerals successfully participated in the selection process defined by the Algerian government and obtained the concession of El Khoub, located south of Constantine, for the construction and operation of a cement plant benefiting of the most recent technologies.



Services provided by CESA:

- Comparative study of pyrolines lines of 2 x 6'000 t/d against 1x10'000 t/d or 1 x 12,000 t/d. This comparative study is based on economic, technical, operational reliability, cost and production planning considerations.
- Based on the customer's choice of the various options specified above, definition of the basic engineering of the project from quarrying to dispatch including maintenance workshops and administrative premises, laboratories and other utilities.
- On the basis of a multi-package project (ten packages), preparation of tender documents for each package. Analysis of the offers and establishment of technical, process and financial comparative tables.
- Negotiations with suppliers. Control and/or writing of the technical and commercial contract documents. Setting of the budget and final planning according to negotiated contracts.
- General direction of project execution: General coordination of supplier's studies, approval of execution engineering, organization and coordination of assembly work, checking and approval of invoices, meetings and monthly progress and progress reports.

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GREENFIELD CEMENT PLANT - NIGERIA

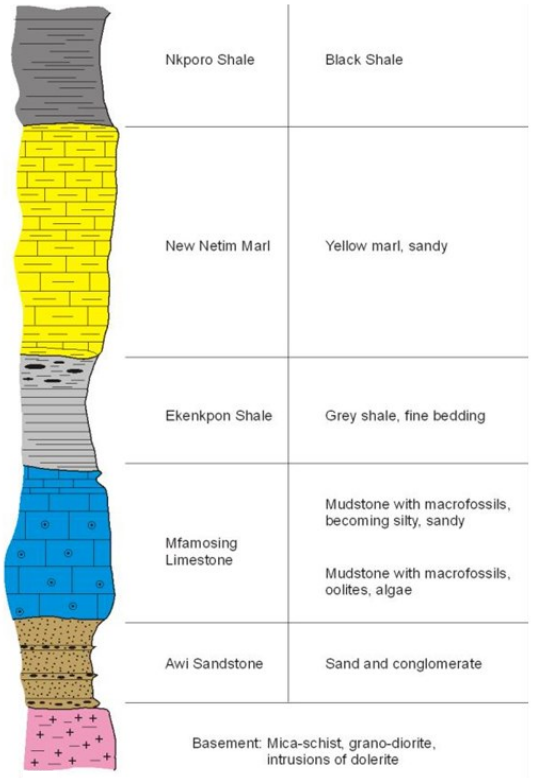
Sheet no 165 - 1

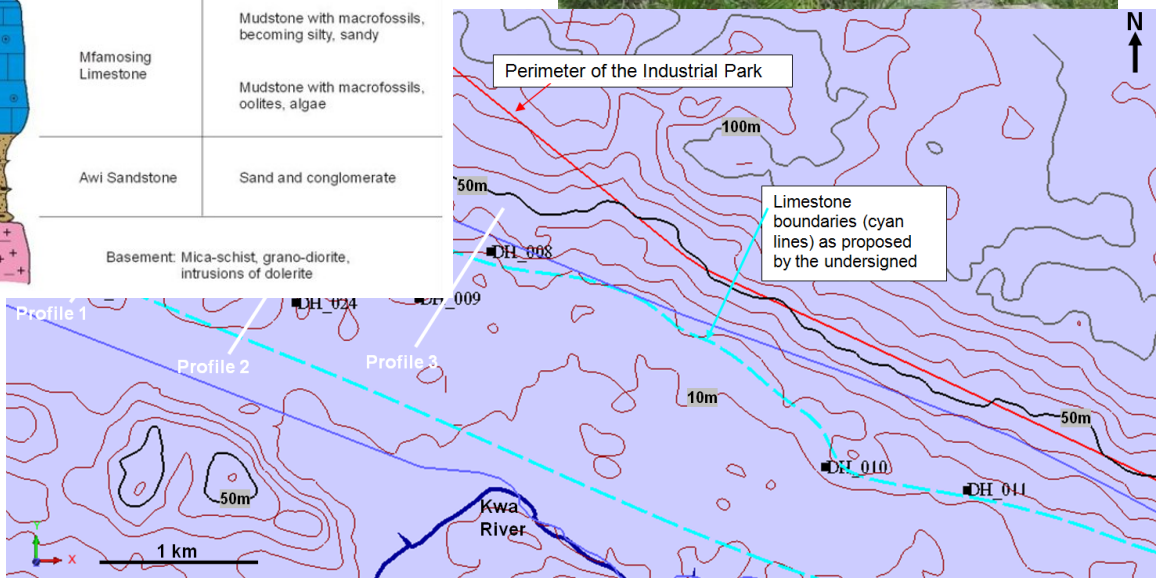
Client: **GIANT CEMENT WORKS LTD, Calabar, *Nigeria.***

Project: Feasibility study for a Greenfield plant between 3'000 and 6'000 tpd capacity and 1.3 to 2.6 mio. tpy cement production.

Date: 2014 - 2015

Project description: Planning and management of the raw material exploration of the limestone and clay deposit.





Services provided by CESA:

- Definition of the works to be done, planning and management of the exploration campaign.
- Writing specifications for the topographic and geological mapping, as well as for 138 drill holes and chemical and environmental analysis of 1308 samples.
- Multiple site visits to inspect the progress of the works and accuracy of the data collection.
- 3D geological modeling of the limestone and clay formations in the concession using Geovia Surpac software of Dassault Systèmes.

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GREENFIELD CEMENT PLANT - NIGERIA

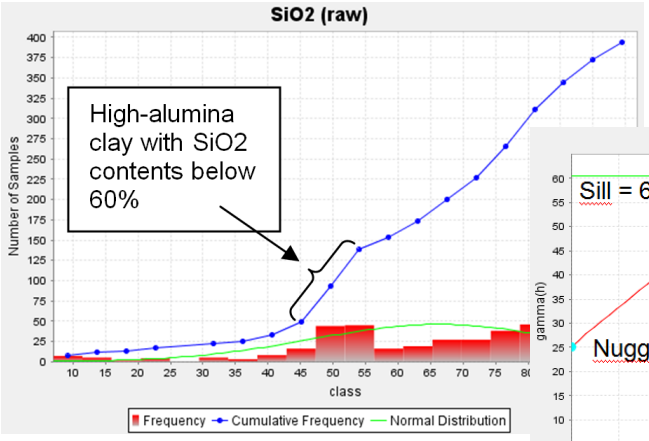
Client: **GIANT CEMENT WORKS LTD, Calabar, *Nigeria.***

Project: Feasibility study for a new Greenfield cement plant with a clinker capacity between 3'000 and 6'000 tpd and of 1.3 to 2.6 mio. tpa of cement.

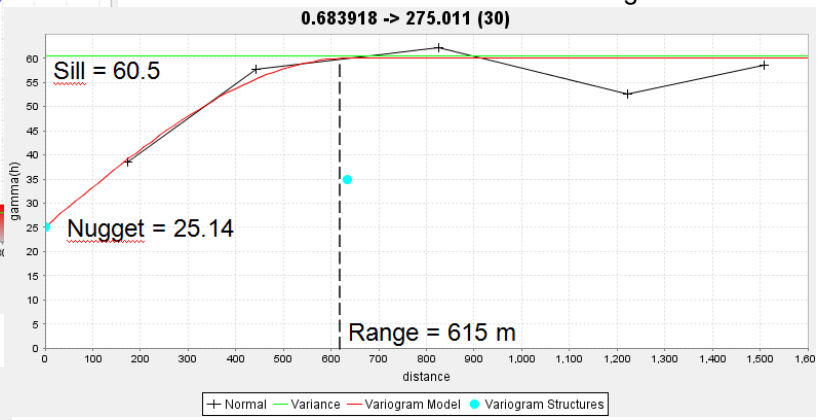
Date: 2014 - 2015

Project description: Estimation of limestone and clay resources.

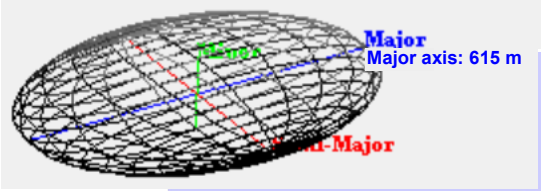
Statistical analyses

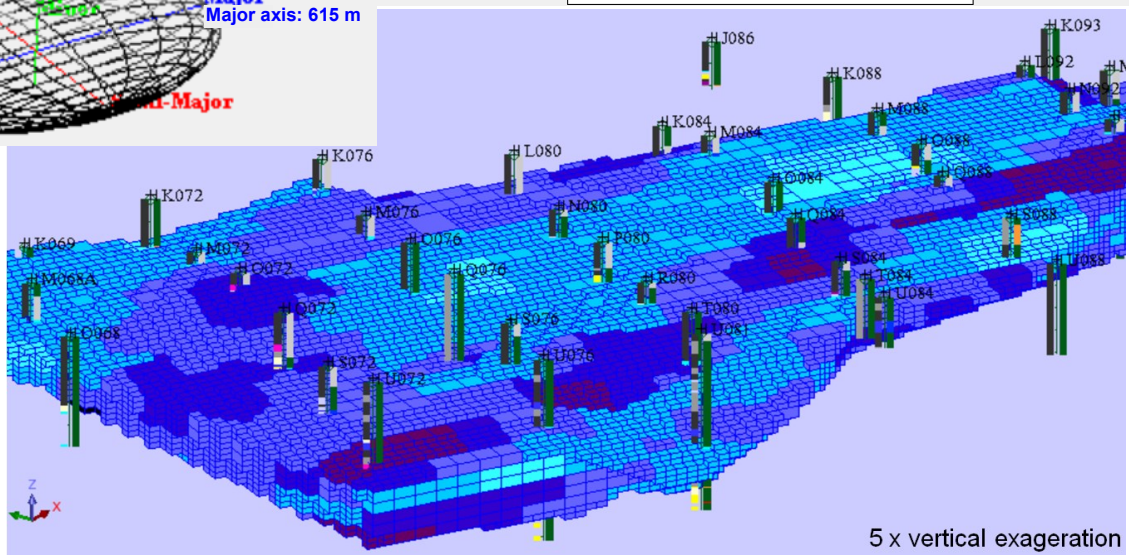


Geostatistics: variogramme of CaO



Correlation ellispoïd





Services provided by CESA:

- Statistical and geostatistical analyses are conducted in order to verify that the chemical samples were assigned to the correct domains (basically to the correct geological formations).
- Then, variography is conducted is order to delineate the intrinsic anisotropy of the deposits and to define the correlation ellipsoid.
- Finally the chemical composition of each bloc is estimated by ordinary kriging.

At this stage, a detailed description of the deposit is available that can be considered as an inventory of the available qualities. This work is the base for performing an extraction scheduling.

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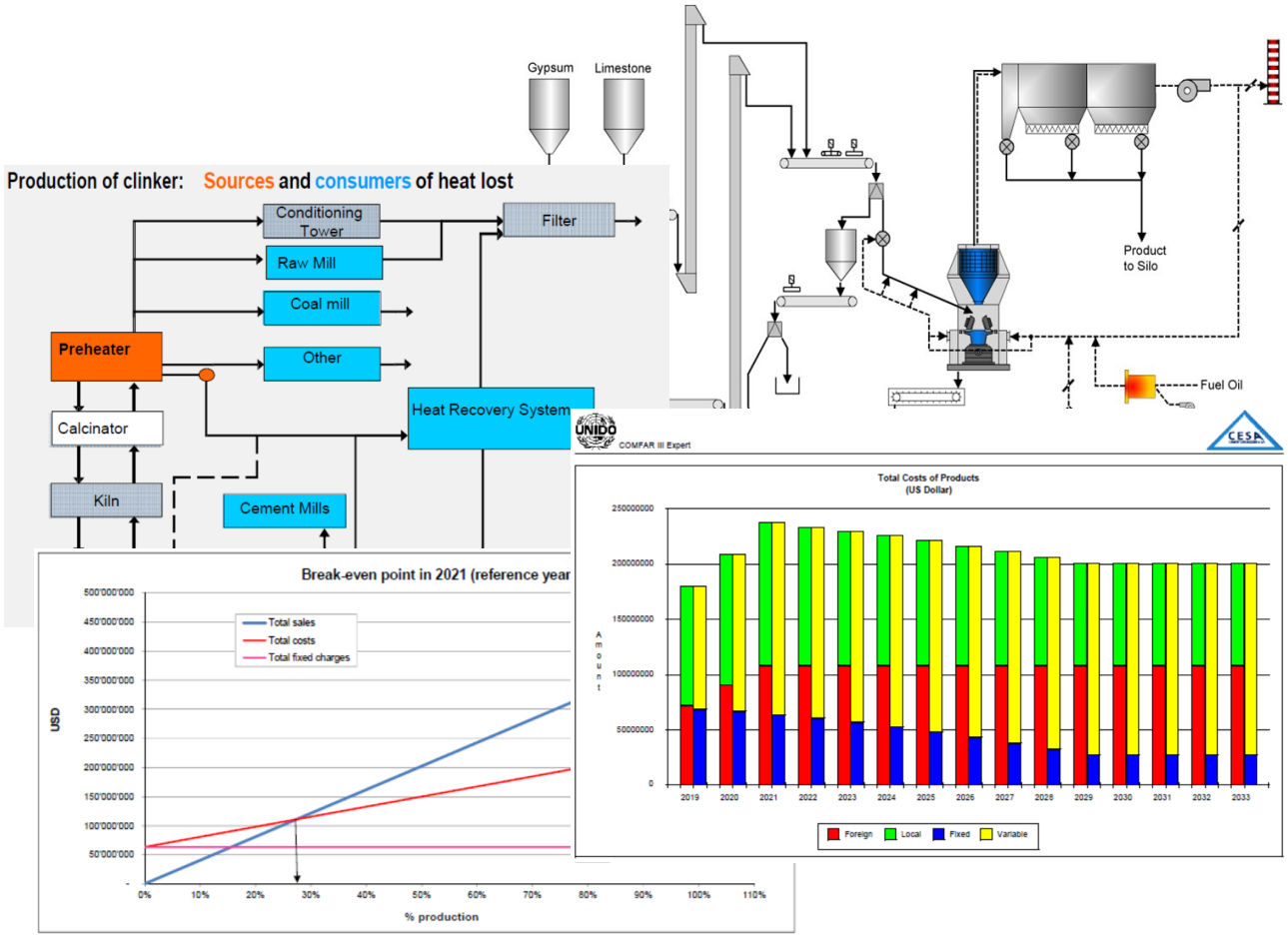
GREENFIELD CEMENT PLANT - NIGERIA

Client: **GIANT CEMENT WORKS LTD, Calabar, *Nigeria.***

Project: Feasibility study for a Greenfield plant between 3'000 and 6'000 tpd capacity and 1.3 to 2.6 mio. tpy cement production.

Date: 2014 - 2015

Project description: Honeywell Group of Nigeria wishes to install a new cement plant in Cross River State under the name Giant Cement Works Ltd. Honeywell is a private group active in the fields of energy, infrastructure, real estate, food and services.



Services provided by CESA:

Honeywell, having realized the interest of employing an internationally renowned consultant in an area where they are not yet active, mandated CESA for a feasibility study enabling its accreditation by financial institutes.

Feasibility study:

- Technical study allowing the determination of the plant capacity and the technical concepts.
- Market situation and its probable future development in order to a propose a realistic financing and estimate the return on investment.

The CESA experts also assisted Honeywell in all sorts of subjects annex to the project, such as the relocation of a new highway planned by the local authorities.

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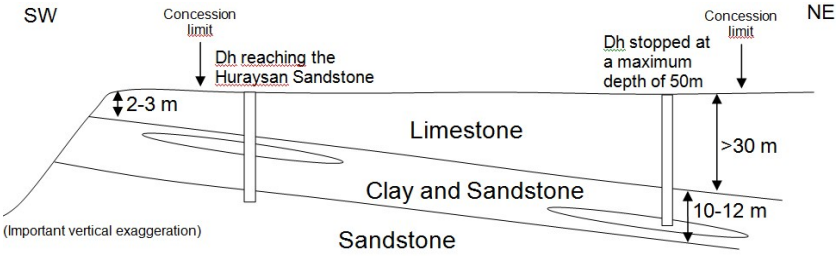
GREENFIELD CEMENT PLANT - KSA

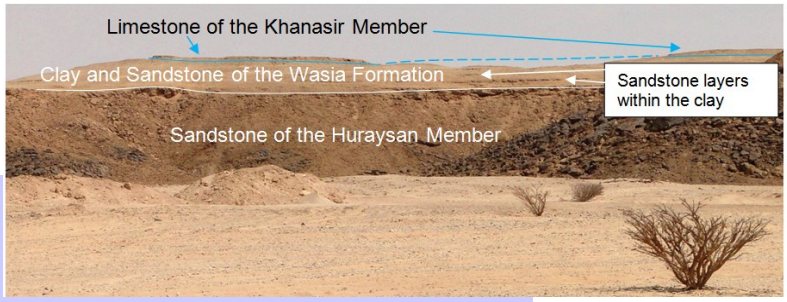
Client: **Yamama Cement Company, *Kingdom of Saudi Arabia.***

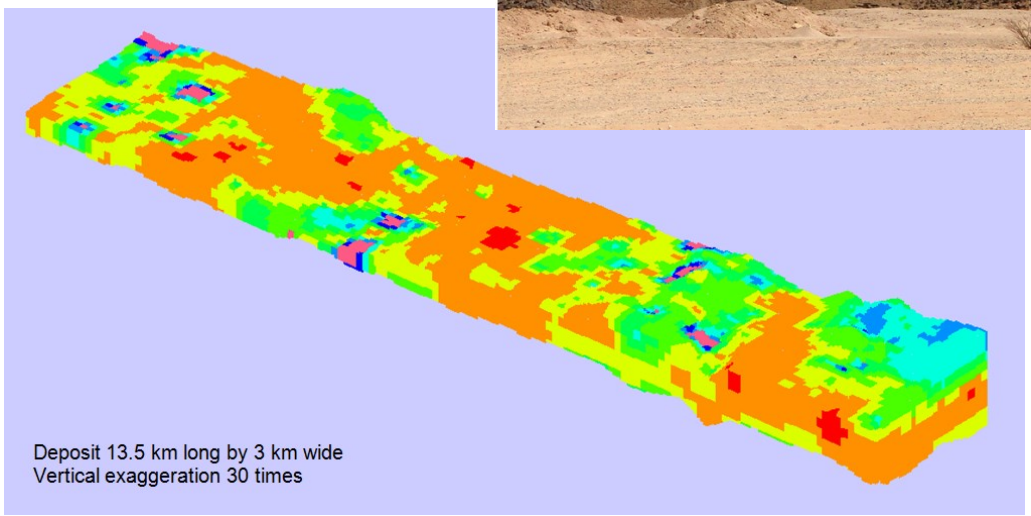
Project: Greenfield cement factory close to Riyad with 30'000 tpd clinker capacity and 12.7 mio. tpy cement production.

Date: 2013 - 2014

Project description : Yamama Cement Company is actually located in the outskirt of Riyadh. The company will move its activities in a new location, some 80km east of Riyadh and will source its raw material from a new quarry close to the new plant.







Services provided by CESA:

- Planning and manage the exploration campaign, in particular the drilling of the 285 bore holes.
- Writing of the drilling and chemical and environmental analyses specifications.
- Several on site visit to check work progress and accuracy of the data collection.
- Cross-check analyses to verify the quality of the 3913 chemical analyses done by the plant's laboratory.
- Establishment of the exploration database et building of the 3D geological model.
- Statistical and geostatistical analyses of the data order to verify the correct definition of domains.
- Estimation of the resource of each formation by block model.

For more information, please contact:
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MARBLE EXPLORATION - UGANDA

Client: **Kiboko Cement Industries Ltd.**

Project: Geological mapping and preliminary drilling north of Moroto, Uganda.

Date: 2013 - 2014

Project description : Kiboko Cement Industries had launched a project to build up a small cement plant 30 km north of Moroto, Karamoja region, for the local needs in order to avoid the expensive imports of cement.

Project Scheduling Part 1:	April 2013	May 2013	June 2013	July 2013	August 2013	Sept. 2013
Visit of the geologist of CESA						
Field visit and surface sample collection						
Sample dispatch and analyses						
First geological report						
Part 2:						
Definition of exploration campaign						
Drilling campaign						
Sample preparation, dispatch, and analyses						
Final reporting						

Hole	From	To	Thick.	Lithology
KB001	0	5	5	Siliceous rock
KB001	5	11.4	6.4	Marble
KB001	11.4	14	2.6	Dolomite and silic. rk
KB001	14	24.7	10.7	Marble
KB001	24.7	39	14.3	Dolomite
17.1 m of usable material with acceptable waste/ore ratio				
Ratio waste to ore	1.44			
KB002	0	2.4	2.4	Dolomite
KB002	2.4	4.7	2.3	Marble
KB002	4.7	10.6	5.9	Dolomite
KB002	10.6	18.2	7.6	Marble
KB002	18.2	24	5.8	Dolomite
9.9 m of usable material with acceptable waste/ore ratio				
Ratio waste to ore	1.84			

KB007	0	9.6	9.6	Dolomite
KB007	9.6	16.3	6.7	Siliceous rock
KB007	16.3	18.1	1.8	Marble
KB007	18.1	24	5.9	Dolomite
1.8 m of usable material with unacceptable waste/ore ratio				
Ratio waste to ore	10.06			
KB008	0	2.7	5	Siliceous rock
KB008	2.7	8.1	5	Dolomite
KB008	8.1	12.8	5	Siliceous rock
KB008	12.8	27	5	Dolomite

Service provided by CESA:

CESA proposed an exploration campaign to recognise the limestone / marble potential of the 42.8 km^2 exploration license. The services consisted in:

- Review the available data.
- Negotiation and selection of a local geologist and of the drilling contractor.
- Planning and management of the geological mapping and of the drilling campaign.
- Establishment of the geological database, of the 3D geological model and preliminary estimation of the raw material resources.
- Evaluation of raw mixes and requirements of correctives.
- Reporting and recommendations.

For more information, please contact:
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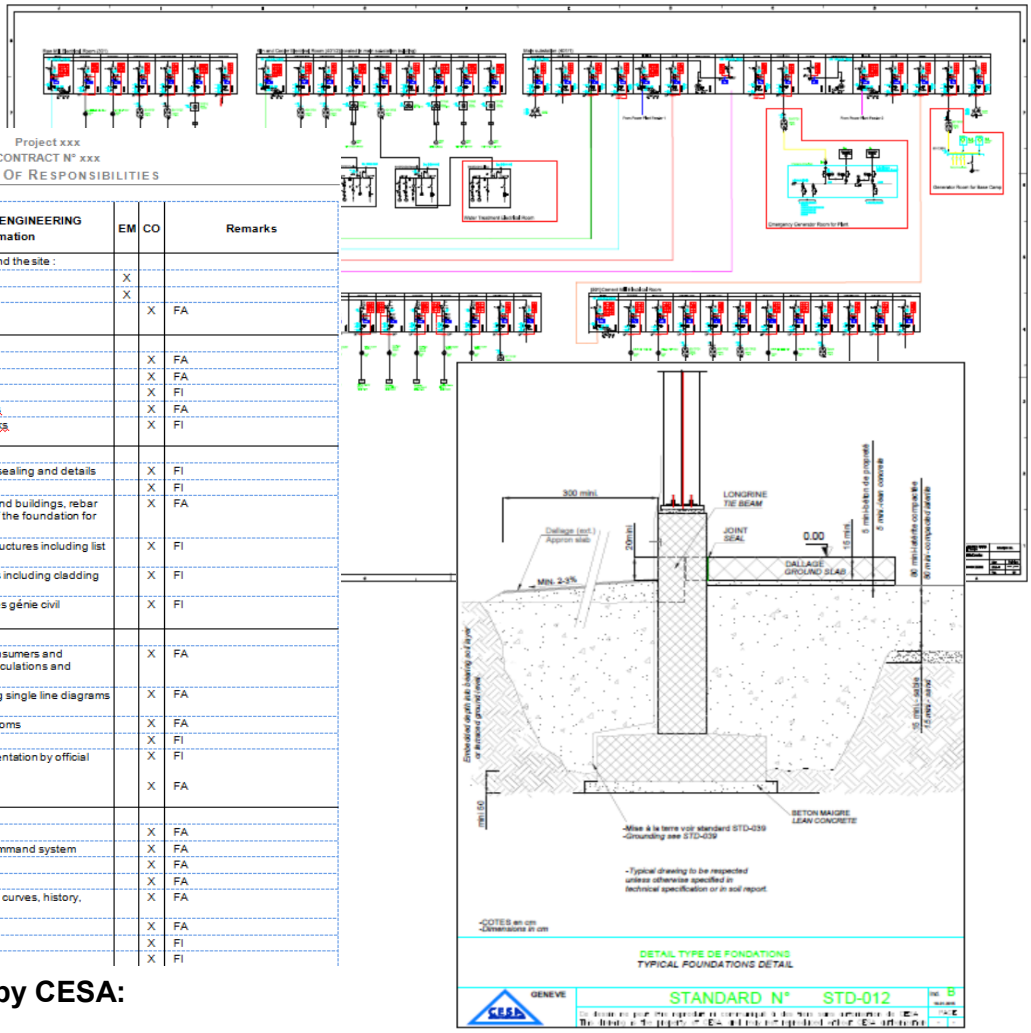
CALL FOR TENDER AND NEGOTIATION OF CONTRACTS - NIGERIA

Client: **INTERNATIONAL CEMENT COMPANY LTD (ICC), *Nigeria.***

Project: Greenfield plant with 3'600 tpd clinker capacity and 1.5 mio. tpy cement production.

Date: 2013 - 2014

Project description : Chicason Group and other local investors are willing building a new cement plant north of Lagos, in Ogun state, under the name of ICC. The project includes a cement plant, an electric power station, a base camp and the access road.



Project xxx
CONTRACT N° xxx
DIVISION OF RESPONSIBILITIES

A. BORDERLINES FOR DESIGN AND ENGINEERING Supply of basic project information	EM	CO	Remarks
A1. General information about the project and the site :			
a) Climatic conditions	X		
b) Topographic Survey of the site	X		
c) General plant layout		X	FA
A2. Mechanical studies			
a) Massflow diagram and Flowsheet		X	FA
b) General arrangement drawings		X	FA
c) Outline & Load drawings		X	FI
d) Execution drawings for plateworks		X	FA
e) Material and parts list for plateworks		X	FI
A3. Civil work studies			
a) GA drawings with loads including sealing and details		X	FI
b) Outline drawings		X	FI
c) Execution drawings for civil work and buildings, rebar and formwork including drawing of the foundation for finishing work, sanitary, roads, ...		X	FA
d) Construction drawings for steel structures including list of material and parts list		X	FI
e) Steel structure assembly drawings including cladding and roofing		X	FI
f) Bordereau quantitatif des ouvrages génie civil		X	FI
A4. Electrical studies			
a) General engineering including consumers and instruments list, equipment list, calculations and dimensioning		X	FA
b) Wiring diagrams MV / LV, including single line diagrams MV / LV		X	FA
c) Development plans of electrical rooms		X	FA
d) Wiring books and routes		X	FI
e) Registration and approval documentation by official bodies		X	FI
f) Spare parts list (first emergency)		X	FA
A5. Control-command studies			
a) General engineering		X	FA
b) General drawing of the control-command system		X	FA
c) Detailed instrumentation list		X	FA
d) Functional diagram		X	FA
e) Supervision software (with alarms, curves, history, reports, ...)		X	FA
f) Programming		X	FA
g) FID drawings		X	FI
h) Wiring books		X	FI

Service provided by CESA:

CESA drew up the complete tender documents, including the complete description of the equipment of the cement plant and the power plant, buildings, and all the necessary installations including the housing estate. The level of quality desired by the customer has been defined and the suppliers and subcontractors chosen accordingly.

CESA also conducted all the technical negotiations with the various suppliers and drafted all the contract documents. Finally, CESA assisted the client in the final commercial negotiation with the selected suppliers of the cement and the power plant, as well as with the financial institutes.

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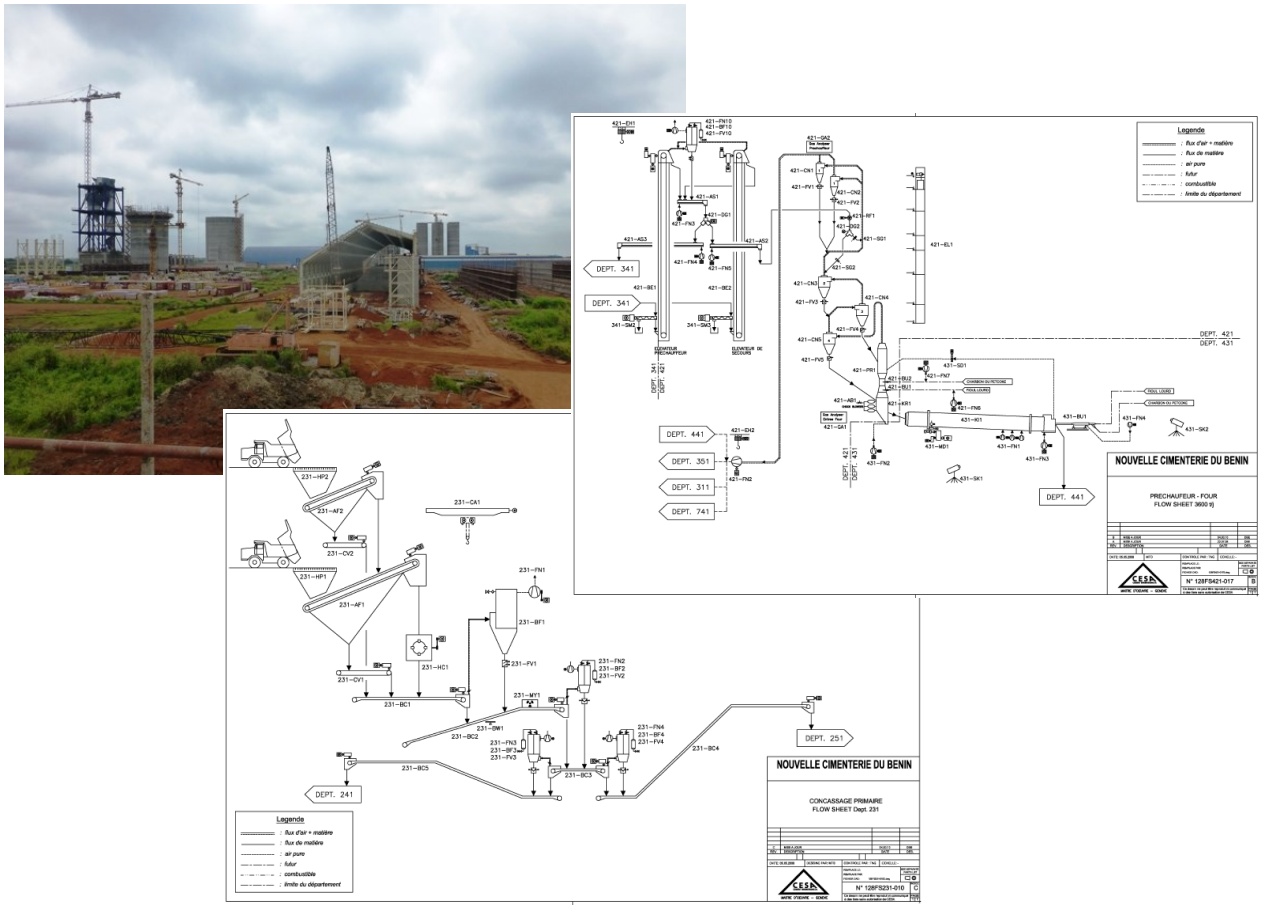
GREENFIELD CEMENT PLANT - BENIN

Client: **NOCIBE, *Benin.***

Project: Greenfield cement plant with 3'600 tpd clinker capacity and 1.5 mio tpy cement production.

Date: 2010 - 2014

Service provided: Benin has only one cement plant whicht does not satisfy the needs of the country. Taking advantage of its good relationship with the state of Benin, the Company of "Les Ciments du Sahel" has decided to build a new cement plant in the south of Benin. This project represents the largest private investment ever made in Benin.



Services provided by CESA:

CESA was the prime contractor and had about fifteen experts on site to ensure the quality of the work. The responsibilities of CESA were as follows:

- Definition and realization of geotechnical studies which have demonstrated the need to base the installation on more than a thousand foundation piles.
- Verification of execution plans and supervision of the execution of works in accordance with plans and deadlines.
- Monthly progress report of the work to the client and funders.
- Assistance with the start-up and training of plant personnel.

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CEMENT PLANTS AUDIT - ETHIOPIA

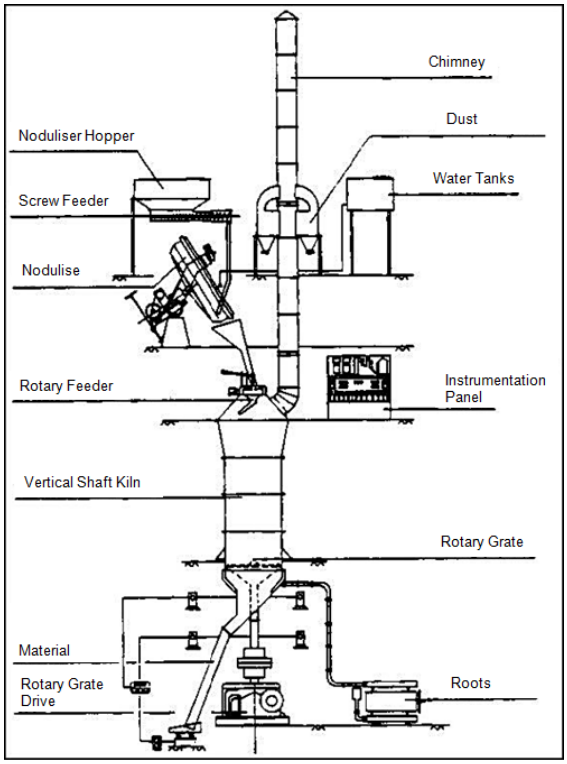
Sheet no 157-1

Client: **Pégase International S.A., *Switzerland.***

Project: Audit of two cement plants with vertical shaft kilns of a combined capacity of 1.1 mio. t/y in the vicinity of Addis Abeba in view of their purchase.

Date: 2013

Project description : Pégase International S.A. is a trading company having a cement import terminal in Djibouti. Most of the imported cement is transported to Ethiopia, in the booming economic region of Addis Ababa. Pégase is considering purchasing the existing plants to produce cement in the market area and thus saving significant transportation costs.



Services provided by CESA:

The objective of the audit is to assess the feasibility for the customer to purchase and upgrade these facilities. The study conducted by CESA considered:

- The layout and the mass flow diagrams of these factories, the particularity of which is that they are equipped with vertical shaft kilns.
- Actual production costs.
- The investments necessary to rehabilitate the furnaces and all the installations.
- Estimate the period of return on investment.
- The quality and availability of raw materials, correctives and additives.
- The logistics between the factories, the limestone being available only on one of the sites.

The CESA experts also conducted an in depth discussion with the client on the risks specific to this technology and the material and human means necessary for the success of such an undertaking.

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CEMENT GRINDING AND DISPATCH

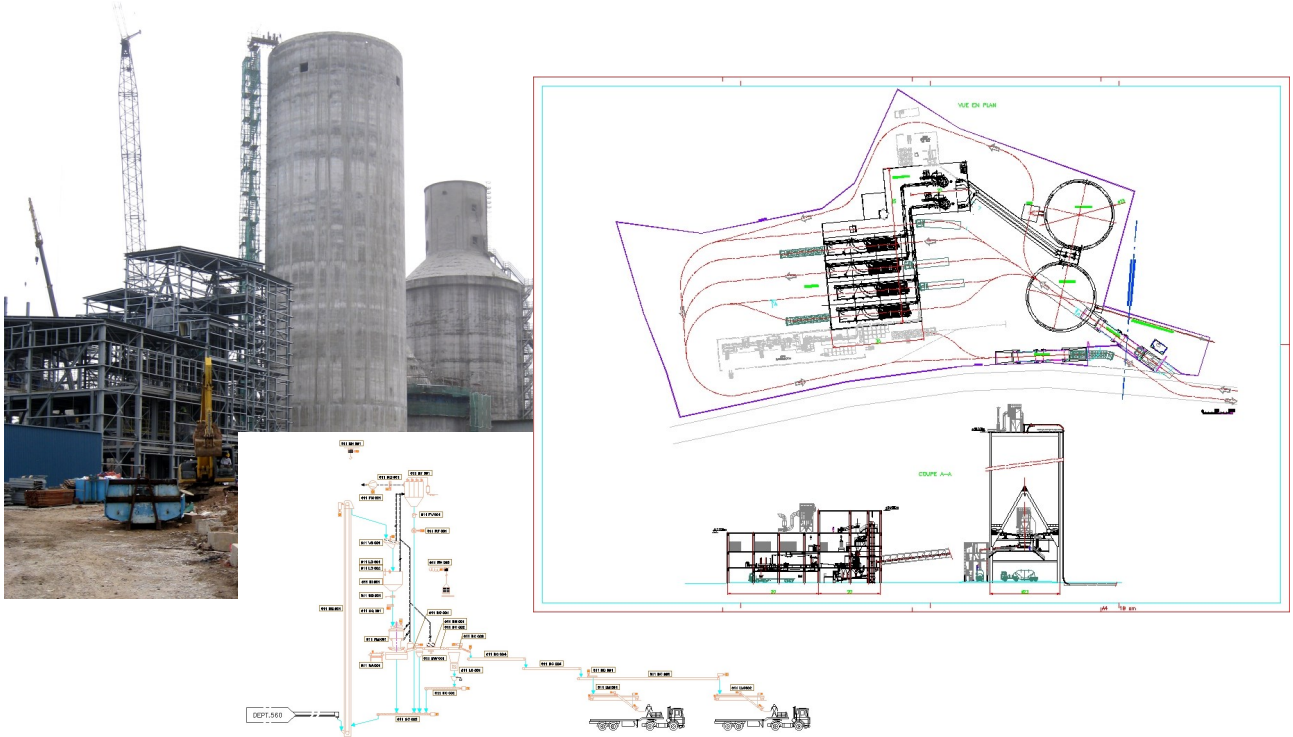
Client: **CMS for Mambong Sarawak, *Malaysia.***

Project: Cement mill 150 tph.
Cement dispatch 1 million tpy.

Date: 2013

Service provided: CESA has been awarded to:

- Basic engineering.
- Call for tender establishment.
- Tender evaluation.
- Negociation assistance.
- Management of project execution and site supervision in partnership with CME Philippines.



Equipment Supplier: CPB.

Project description :

Due to the demand of the market, CMS has decided to install a cement producing section in the existing clinker production line at Mambong, Sarawak.

The production rate is 1’000’000 tpy. The cement production section includes:

- Cement grinding plant.
- Cement storage silo.
- Cement packing plant and dispatch.

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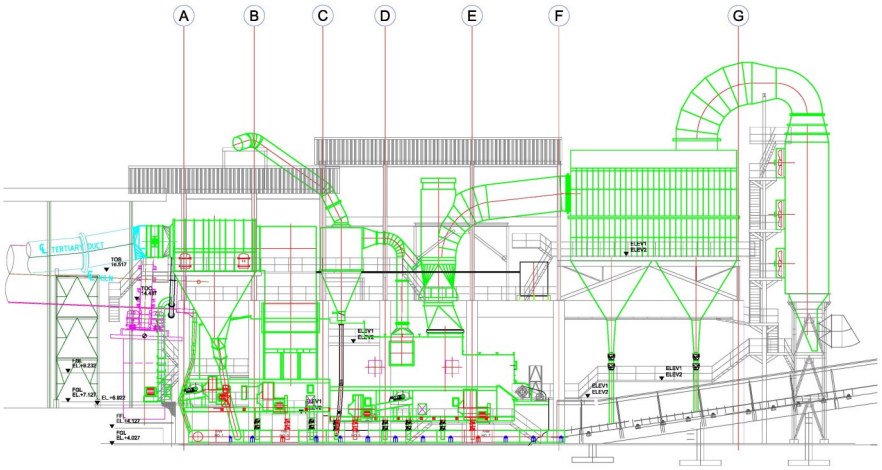
CLINKER COOLER UPGRADE PHILIPPINES

Client: **HOLCIM, La Union plant *Philippines.***

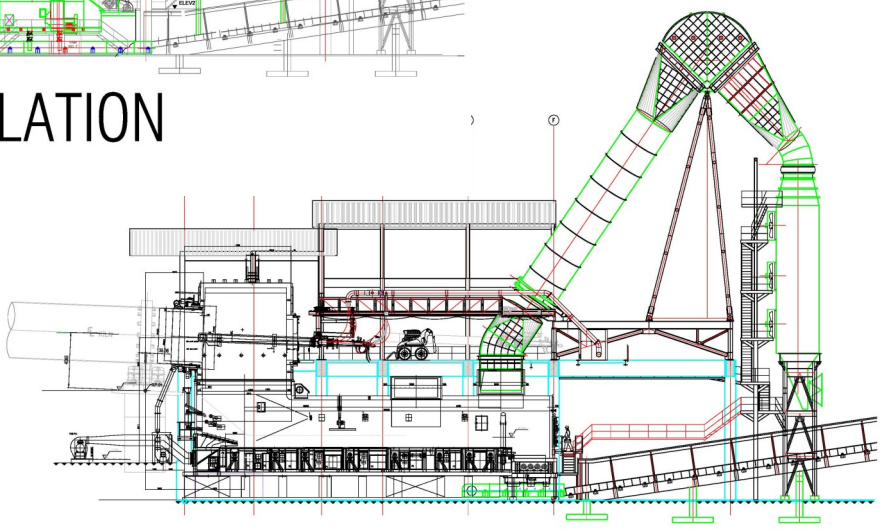
Project: Upgrading and replacement of Clinker Cooler of 2'800 tpd capacity.

Date: 2012 - 2013

Project description : Holcim Philippines mandated CME Inc for the replacement of the kiln shell and burner, clinker cooler as well as complementary equipment. CESA was put in charge by CME for the engineering tasks.



OLD INSTALLATION



NEW INSTALLATION

Service provided by CESA:

The experts of CESA were put in charge of:

- Review of general arrangement drawing.
- Establishment of the purchasing specifications for the expansion joints, screw conveyors components, rotary feeders components, fan, instrumentation and electric cables as per CME's data.
- Follow up of on the technical clarification of the imported components and their deliver.

For more information, please contact:
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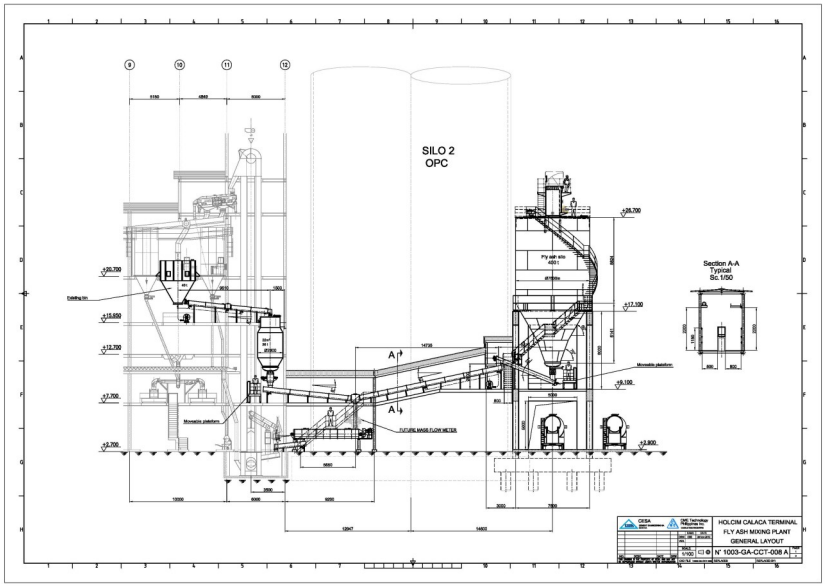
FLY ASH BLENDING - PHILIPPINES

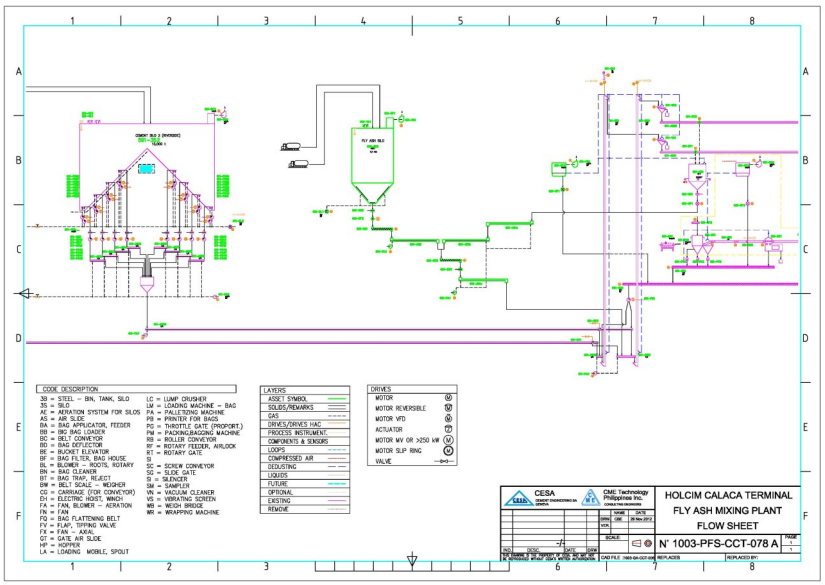
Client: **HOLCIM, Calaca plant, *Philippines.***

Project: Fly Ash Blending Addition to Existing Cement Terminal.

Date: 2012 - 2013

Project description : This cement / fly ash blending plant can reach up to 375'000 tpy blended fly ash cement. The blending operation shall be sufficient for one rotary packing machine. The new 500 m^3 metallic storage silo feeds a mixing screen through the intermediary of screw and airslides. The finished product is transported to the rotary packer.





Service provided by CESA:

The experts of CESA were put in charge of:

- Review of general arrangement drawing.
- Establishment of the purchasing specifications.
- Follow up of on the technical clarification of the imported components and their deliver.

For more information, please contact:
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Consulting Engineers, Rue Alexandre-Gavard 16, 1227 Geneva, Switzerland
www.cesaeng.com Tél: +41 (0) 22 304 14 50 Fax: +41 (0)22 304 14 51 E-Mail: info@cesaeng.com

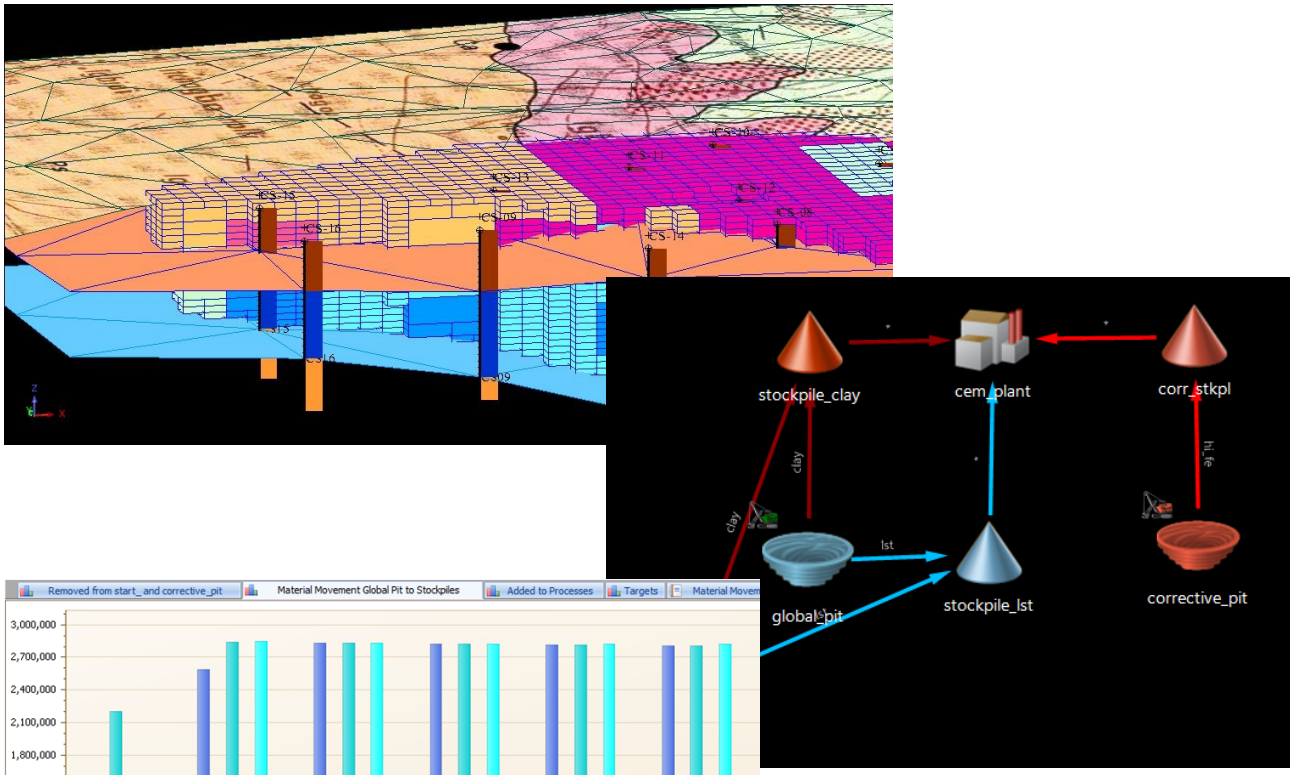
MODELING RAW MATERIAL OPERATION - BENIN

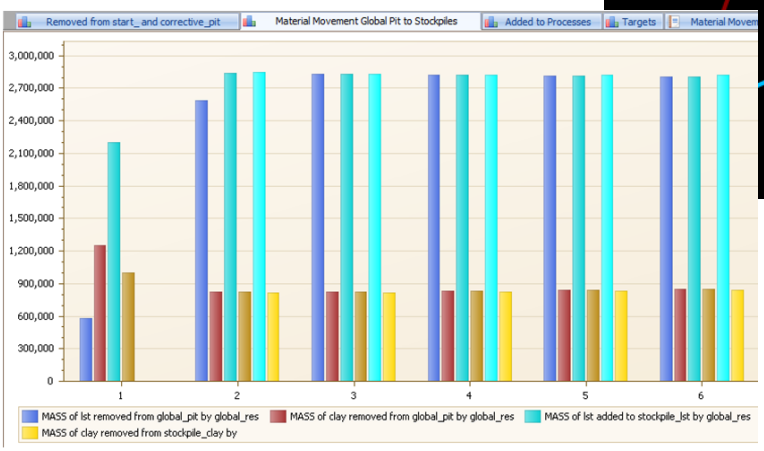
Client: **NOCIBE, *Benin.***

Project: Greenfield cement plant with 3'600 tpd clinker capacity and 1.5 mio tpy cement production.

Date: 2011 - 2013

Service provided: Following the exploration program, the chemical analysis and the construction of the 3D model of the deposit, a block model was calculated. On this basis, the detailed extraction of the deposit was modeled.





Project description:

Knowing that all of a deposit can be exploited to produce clinker is one thing, but assure that the desired raw mix in terms of quality and quantity can be produced at all times is another. To this end, detailed modeling of the exploitation of the deposit is required. It also allows calculating several scenarios to minimize waste and the use of correctives.

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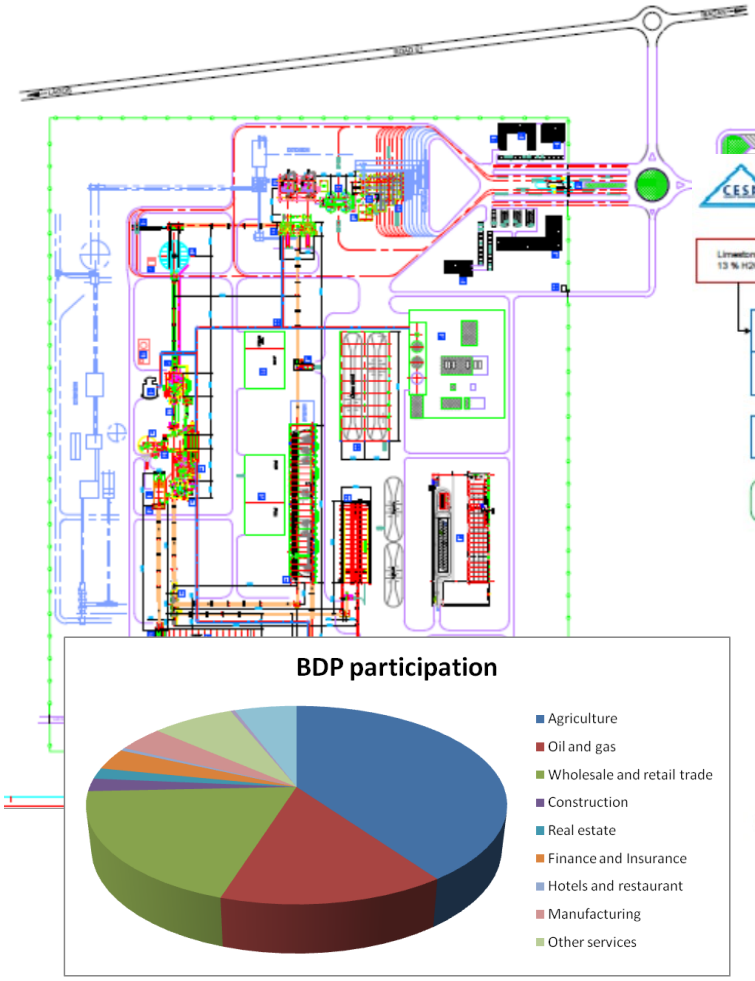
GREENFIELD CEMENT PLANT - NIGERIA

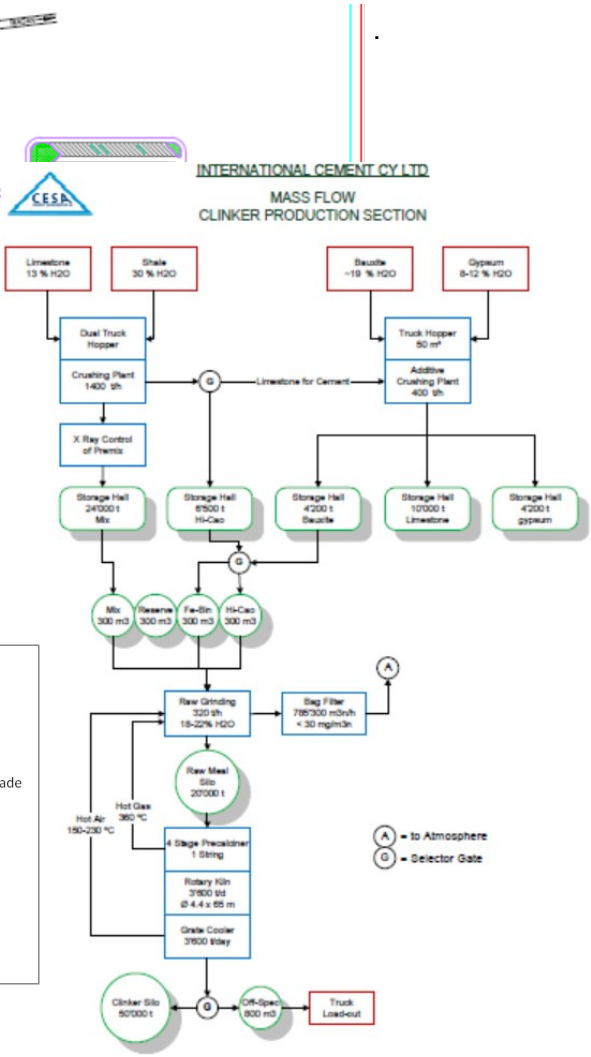
Client: **INTERNATIONAL CEMENT COMPANY LTD (ICC), *Nigeria.***

Project: Feasability study for a Greenfield plant with 3'600 tpd clinker capacity and 1.5 mio. tpy cement production.

Date: 2012

Project description : Chicason Group and other local investors are willing building a new cement plant north of Lagos, in Ogun state, under the name of ICC. They awarded the consultancy services to Cement Engineering S.A. (CESA) to elaborate the best profitable solution.





Service provided by CESA:

CESA experts carried out a feasibility study comprising the following chapters:

- Technical design and choice of process equipment.
- Market study and projection of future developments.
- Financial and return on investment studies for facilities.
- Studies of raw materials in terms of quantity and quality.

This study was approved by the financial institutes and allowed the start of the project. CESA then drafted the documents for the tenders containing a detailed description of the equipment and installations.

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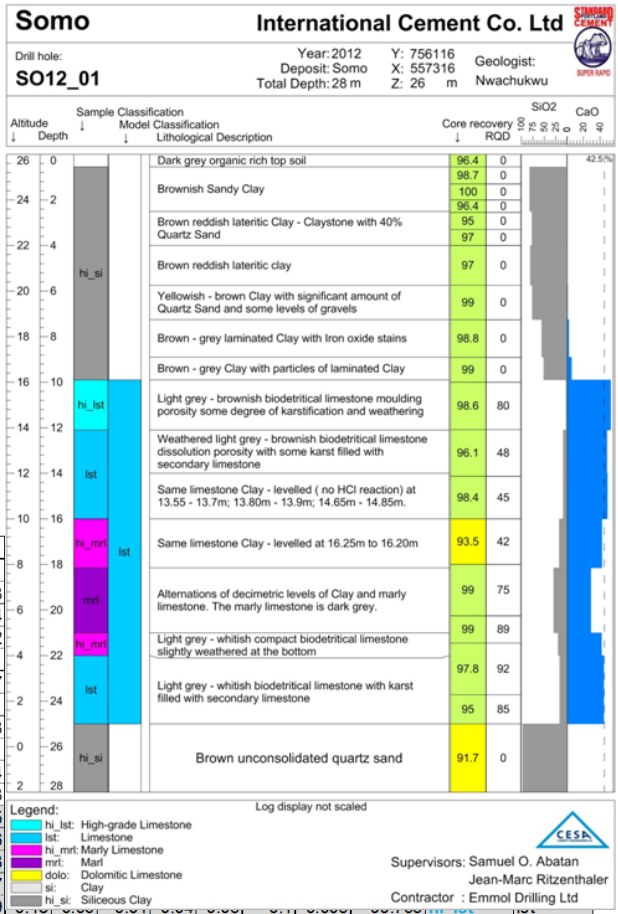
GREENFIELD CEMENT PLANT - NIGERIA

Client: **INTERNATIONAL CEMENT COMPANY LTD, *Nigeria.***

Project: Feasability study for a Greenfield plant with 3'600 tpd clinker capacity and 1.5 mio. tpy cement production.

Date: 2012

Project description : Chicason Group and other local investors are willing building a new cement plant north of Lagos, in Ogun state, under the name of ICC. They awarded the consultancy services to Cement Engineering S.A. (CESA) to elaborate and conduct a raw material exploration program.



									O3	CaO	MgO									
									7.39	1.51	0.33									
									0.9	0.86	0.34									
									3.77	0.68	2.72									
									7.48	0.92	4.1									
									6.47	10.4	3.87									
									6	11.9	3.51									
									5.84	15	2.53									
									4.55	14.4	2.21									
SO12_16	16.25	18.65		246	16.7	41.7	15	6.04	12.7	3.24										
SO12_16	18.65	18.9		247	16.9	23.5	3.85	13.6	21.7	5.93										
SO12_16	18.9	21	2.1	248	40.2	2.25	0.76	1.25	51.9	0.95										
SO12_16	21	23	2	249	42.3	1.61	0.48	0.56	53.4	0.6										
SO12_16	23	25.45	2.45	250	42	3.41	0.43	0.52	52.8	0.43										
SO12_16	25.45	26.55	1.1	251	39.6	7.56	0.81	0.95	49.8	0.57										
SO12_16	26.55	28.9	2.35	252	41.3	4.33	0.59	0.81	51.6	0.69										
SO12_16	28.9	32.2	3.3	253	30.2	23.4	4.01	3.52	35.4	1.78	1.86	0.3	0.02	0.04	0.32	0.13	0.005	100.985	hi_mrl	lst
SO12_16	32.2	35	2.8	254	36.9	12.3	0.61	1.31	47	0.55	0.9	0.06	0.01	0.04	0.06	0.21	0.005	99.955	lst	lst
SO12_16	35	37.4	2.4	255	35.9	15.8	0.63	1.08	45	0.66	0.45	0.05	0.01	0.03	0.05	0.16	0.005	99.825	lst	lst
SO12_16	37.4	40	2.6	256	35.2	18.4	0.29	0.78	44.2	0.56	0.26	0.03	0.01	0.03	0.03	0.11	0.005	99.905	lst	lst
SO12_16	40	42.3	2.3	257	25.7	39.6	0.31	1.04	32.5	0.37	0.17	0.02	0.01	0.04	0.03	0.2	0.005	99.995	mrl	lst
SO12_16	42.3	45		258	1.33	95.6	1.09	0.43	1.2	0.05	0.02	0.02	0.01	0.01	0.2	0.02	0.005	99.985	hi_si	
SO12_16	raw mix		23.4		36.42	13.82	1.02	1.29	45.61	0.76	0.64	0.09	0.01	0.03	0.08	0.26	0.005	100.04		

Service provided by CESA:

CESA was entrusted a complete feasibility study for a new 3600 tpd clinker line. A preliminary exploration campaign was conducted including 17 drill holes. The cores were geologically described and chemically analysed. A 3D geological model was constructed in order to estimate the resources.

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CHARACTERISATION OF PHOSPHATE IN CEMENT RAW MATERIALS - MOROCCO

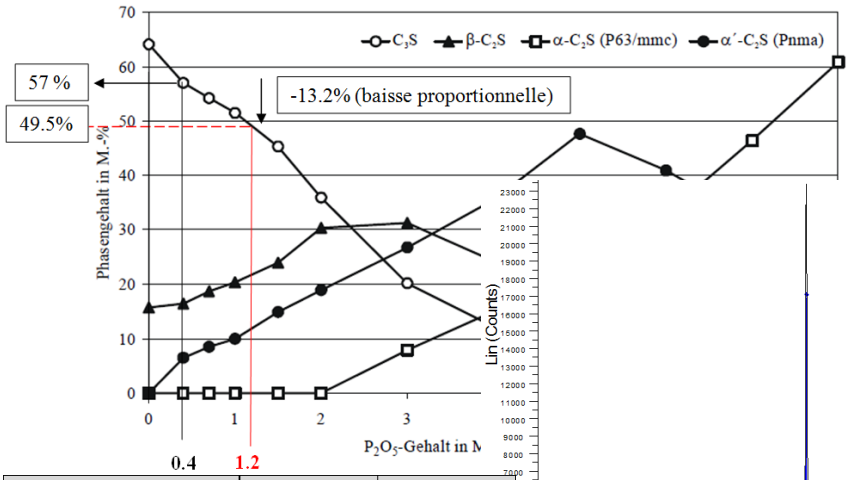
Client: **Société Générale des Travaux du Maroc (SGTM), *Morocco.***

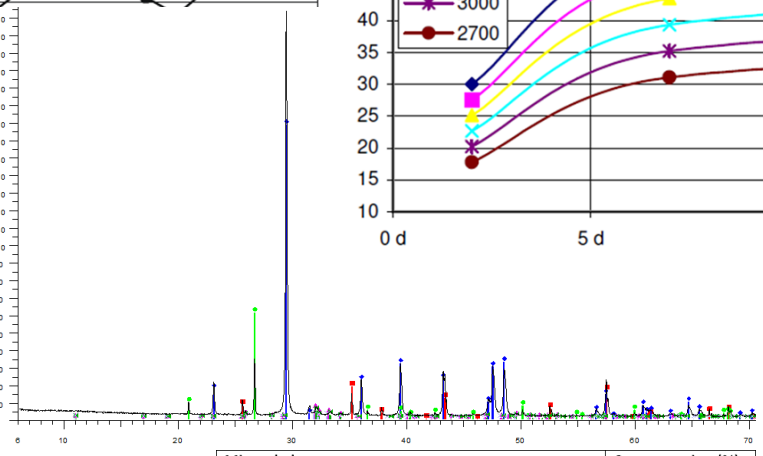
Project: Greenfield cement plant with 3'600 tpd clinker capacity and 1.5 mio tpy cement production.

Date: 2011 - 2012

Service provided: Characterization of naturally occurring phosphate behaviors during clinker manufacturing.

Following the Bovine spongiform encephalopathy (mad cow desease), large quantities of animal meal had to be destroyed. The Verein Deutscher Zementwerke (VDZ) started a study to define an upper limit for burning animal meals in cement kilns and therefore of phosphate content in clinker. VDZ was contacted by CESA for further clarifications. It was pointed out that the phosphate minerals in limestone might be in less deleterious then in animal meal. CESA undertook then a detailed study to understand the issue and assert the suitability of the deposit under study for clinker manufacturing.





	Ciment 1.28%	Ciment 1.77%
Finesse (Blaine)	4000	4050
LSF	102.17	99.32
C3S	57.3	53.4
C2S	25	31.4
Chaux libre	2.9	1.1
	Résistance à la compression	
Résistance à 2 jours (MPa)	26.6	23.6
Résistance à 7 jours (MPa)	48.1	43.4
Résistance à 28 jours (MPa)	67.3	65.1

Mineral phase	Concentration (%)
Calcite ($CaCO_3$)	75
Quartz (SiO_2)	4.9
Fluorapatite, syn ($Ca_5(PO_4)_3F$)	3.9
Carbonate-fluorapatite ($Ca_{9.55}(PO_4)_{4.96}F_{1.96}(CO_3)_{1.28}$)	0.9
Hydroxylapatite ($Ca_{10.0}(PO_4)_{5.95}(OH)_{2.29}$)	0.1

Project description:

Phosphor occurs naturally in limestone mainly in the form of apatite minerals. This mineral has three end-members: a hydroxyl, a fluorine and a chlorine form. In animal meal, 95% of the apatite is in the form of hydroxyl apatite. The study made by VDZ showed that the limit of tolerable phosphate was then by 1%.

But in this limestone deposit , mineral analyses showed that more then half of the apatite is in the fluorine form. As fluorine is know to have mineralizing effects during clinkerisation, the deleterious effect of the phosphate is in great part compensated. The cement samples done from the limestone deposit proved to perfectly fit the cement norms, this without finer grinding.

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CEMENT MILL EXPANSION - GUINEA

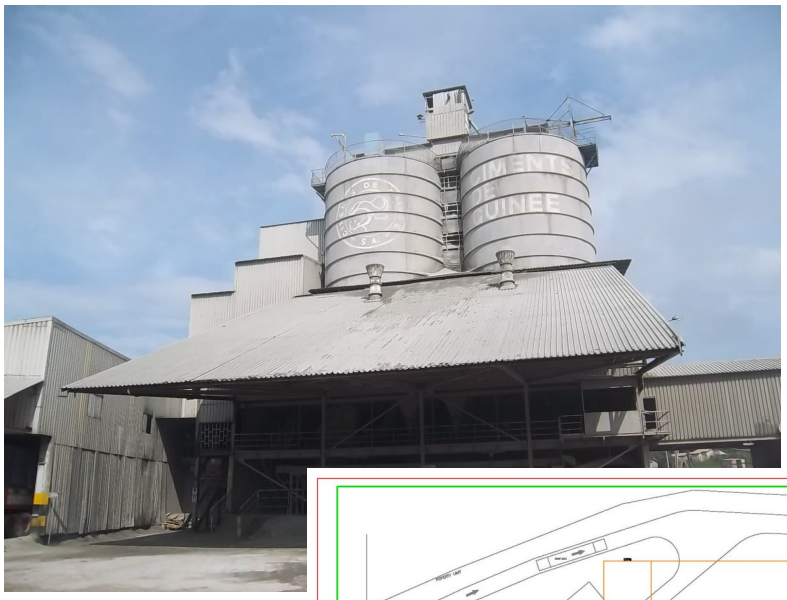
Sheet no 010 - 064

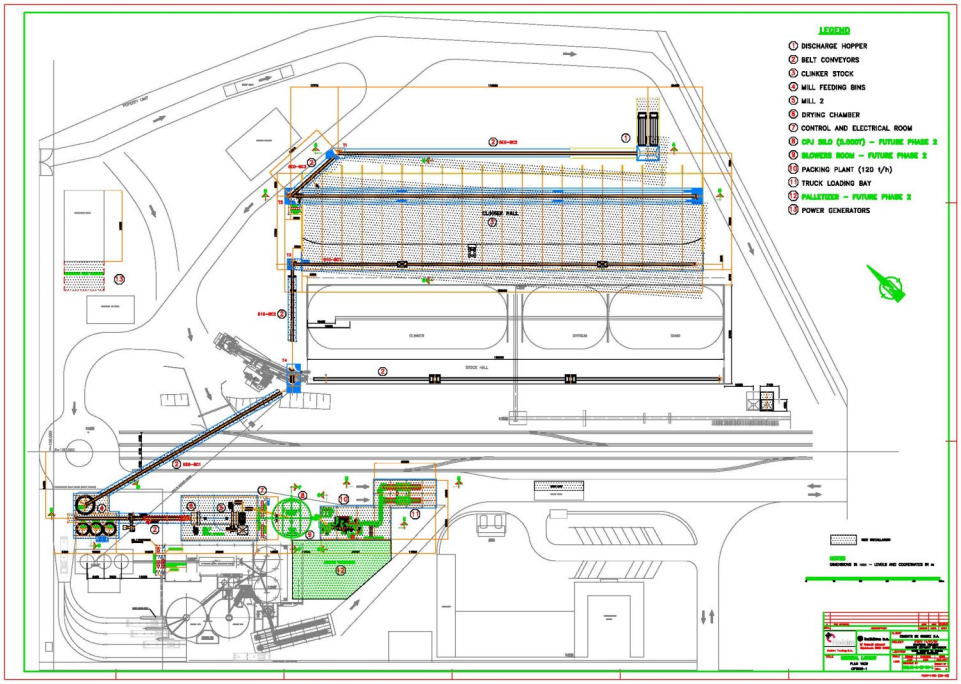
Client: **HOLCIM, *Guinea.***

Project: 80 tph Cement Mill Addition to Existing Plant.

Date: 2011

Project description : Design estimation of a turn Key Grinding Terminal Expansion Project.





Service provided by CESA:

- Clinker & additive material handling design.
- Cement mill 80 tph G.A. design for estimates.
- Equipment inquiries for project cost estimation.
- Complete project budget estimate.
- Preparation of turn key proposal.

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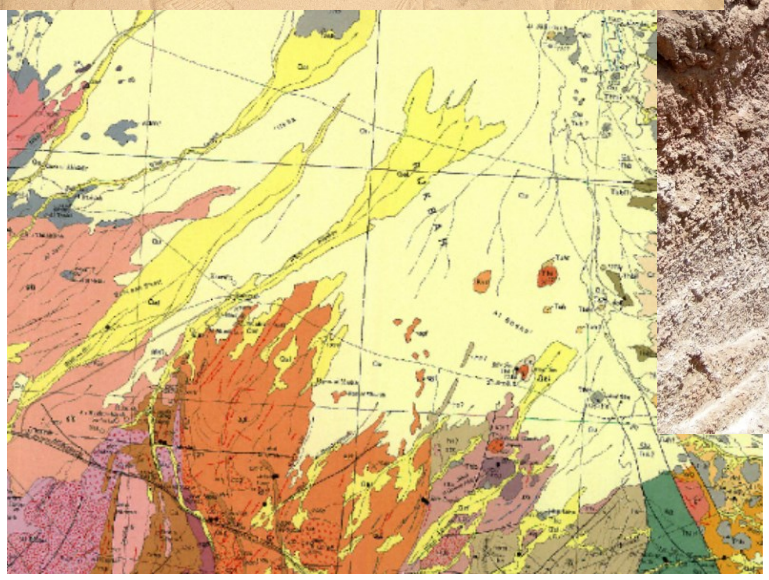
RAW MATERIAL AUDIT - KSA

Client: **Petro-Hunt Middle East, *Kingdom of Saudi Arabia.***

Project: Prospection and Surface Sampling of the Harrat Hadan licences, KSA.

Date: 2011

Project description : Petro-Hunt Middle East (PHME) was invited to participate in the bid for two licenses covering cement raw material deposits situated about 120 km northeast of Taif, Kingdom of Saudi Arabia.



Service provided by CESA:

- Review of available data.
- Visit of the site and collection of surface and trench samples.
- Supervision of the chemical analyses.
- Estimation of the raw material resources.
- Evaluation of raw mixes.
- Reporting and recommendations.

For more information, please contact:
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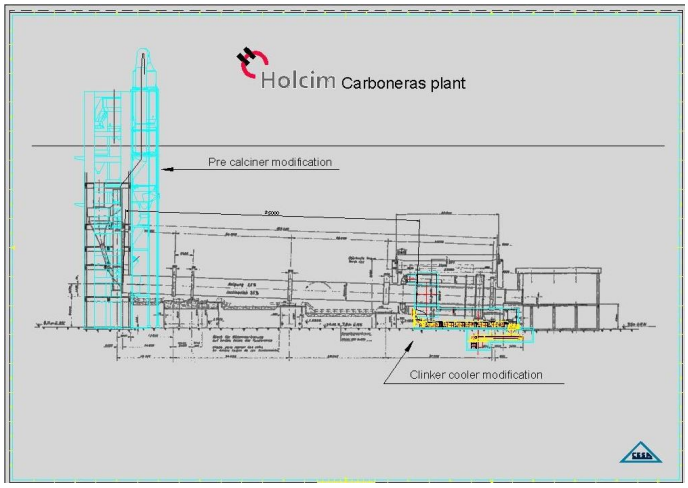
FEASIBILITY STUDY - SPAIN

Client:	**HOLCIM, Carboneras plant, *Spain.***
Project:	Feasibility study for the replacement of the calciner and clinker cooler (3300 tpd).
Date:	2011
Service provided:	Market survey, feasibility study, project management and basic engineering.



Project description :

The objective of this study commissioned by Holcim Spain was to investigate the feasibility of modifying the pyro processing system at their Carboneras facility, in order to increase the system efficiency and the steadiness of the quality of the clinker production. The increased use of alternative fuels was also taken into account. The capability to burn higher percentages of these fuels allows reducing the production costs. In order to attain these goals it has been shown that extensive modifications and equipment replacement must be made to both the existing preheater and the clinker cooling systems.

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GEOLOGICAL SURVEY - BENIN

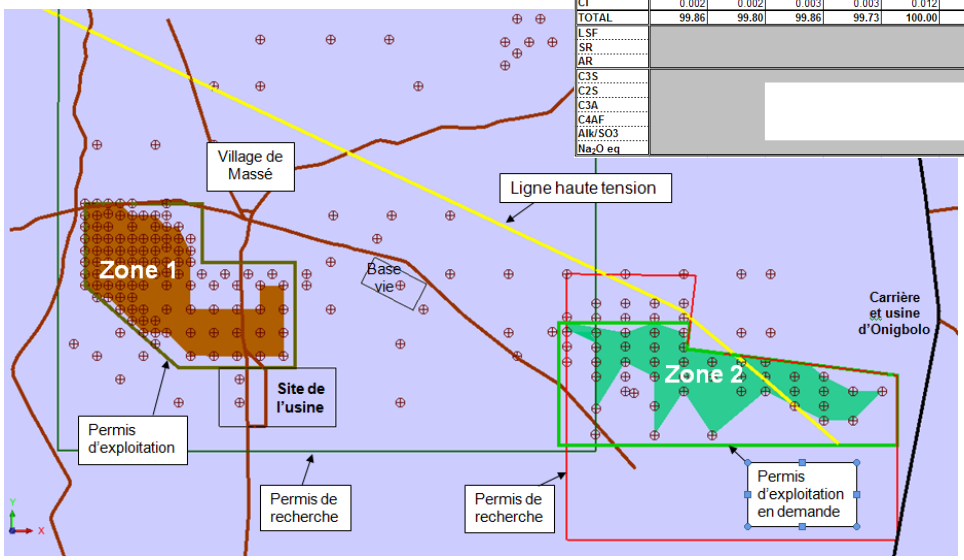
Client: **NOCIBE, *Benin.***

Project: Greenfield cement plant with 3'600 tpd clinker capacity and 1.5 mio tpy cement production.

Date: 2009 - 2011

Service provided: Planning and management of the exploration campaign, sample preparation and chemical analysis. Construction of a 3D model of the deposit and resource assessment. Calculation of raw mixes.

Materials	>50 CaO	50-46 CaO	46-43 CaO	43-35 CaO	Argile	Cendres			Bauxite	Mix	Clinker
>50 CaO										0.00	0.00
50-46 CaO										47.70	47.70
46-43 CaO										13.50	13.50
43-35 CaO			Massé: tous les composants sauf calcaire haut titre							34.94	34.94
Argile										1.60	1.60
Cendres										1.20	1.20
Al										1.06	1.06
TOTAL										100.00	100.00
L.o.I.	41.06	38.93	37.08	32.98	28.59	0.00				35.56	
SiO_2	4.30	8.32	12.91	20.25	41.56	49.60			10.00	14.15	21.96
Al_2O_3	0.96	1.79	1.97	3.07	8.97	26.40			65.00	3.34	5.18
Fe_2O_3	1.27	1.54	1.74	2.42	4.99	4.40			12.00	2.07	3.22
CaO	50.99	47.78	44.41	39.30	10.57	8.85			1.00	42.80	66.42
MgO	0.58	0.76	1.18	0.97	3.25	1.60			0.50	0.94	1.45
SO_3	0.06	0.04	0.08	0.04	0.11	3.80				0.09	0.14
K_2O	0.10	0.14	0.15	0.17	0.75	0.70				0.17	0.26
Na_2O	0.02	0.02	0.03	0.05	0.19	0.20				0.03	0.05
TiO_2	0.10	0.10	0.11	0.15	0.42	1.55				0.14	0.22
Mn_2O_3	0.05	0.12	0.15	0.27	0.40					0.18	0.27
P_2O_5	0.36	0.27	0.05	0.07	0.21	2.15				0.19	0.29
Cl	0.002	0.002	0.003	0.003	0.012					0.00	0.00
TOTAL	99.86	99.80	99.86	99.73	100.00	99.25			88.50	99.66	99.48
LSF										95.28	95.28
SR										2.61	2.61
AR										1.61	1.61
C3S											64.02
C2S											14.73
C3A											8.28
C4AF											9.80
Alk/SO3											2.00
Na_2O eq											0.22



Survey Company: Foratec.

Chemical Analysis Laboratory: Les Ciments du Sahel.

Modeling software: Gemcom Surpac.

Project description:

See sheet 128-1 for the main project description.

The only exploitable limestone formation to cover the needs of such a project is the limestone of the middle Paleocene. This is a layer of about ten meters thickness that has undergone different levels of karstification. These karsts are filled with clay creating a natural blend of the desired raw mix. It is therefore essential to know the deposit in detail to plan its extraction.

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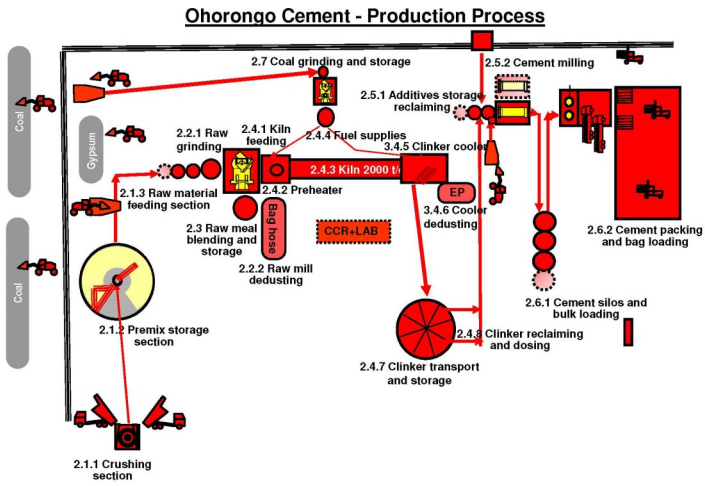
FIRST CEMENT FACTORY IN NAMIBIA

Client: **DEG – SCHWENK Group, Ohorongo Cement, *Namibia.***

Project: Greenfield cement plant with 2'000 tpd clinker capacity and 830'000 tpy cement production.

Date: 2007 - 2011

Project description: OHORONGO Cement, situated in the North of the country, is a Greenfield project whose capacity is 2000 tpd. The project consisted of debushing the area, construction of a 11 km access road, opening the quarries and construction of the plant with all process and non-process facilities. A biomass plant for bush wood firing was also constructed. Total construction time was 32 months.



Project description :

Lenders Technical Advisor Services as independent Engineer for DEGmbH mandated by Schwenk Group to finance the project.

CESA has been awarded to control and validate:

- The compliance with technical requirements.
- Realistic implementation scheme.
- Realistic time schedule.
- Monthly progress of realization.
- Eligible cost certificate with forecast and real cost review.
- Technical completion report.

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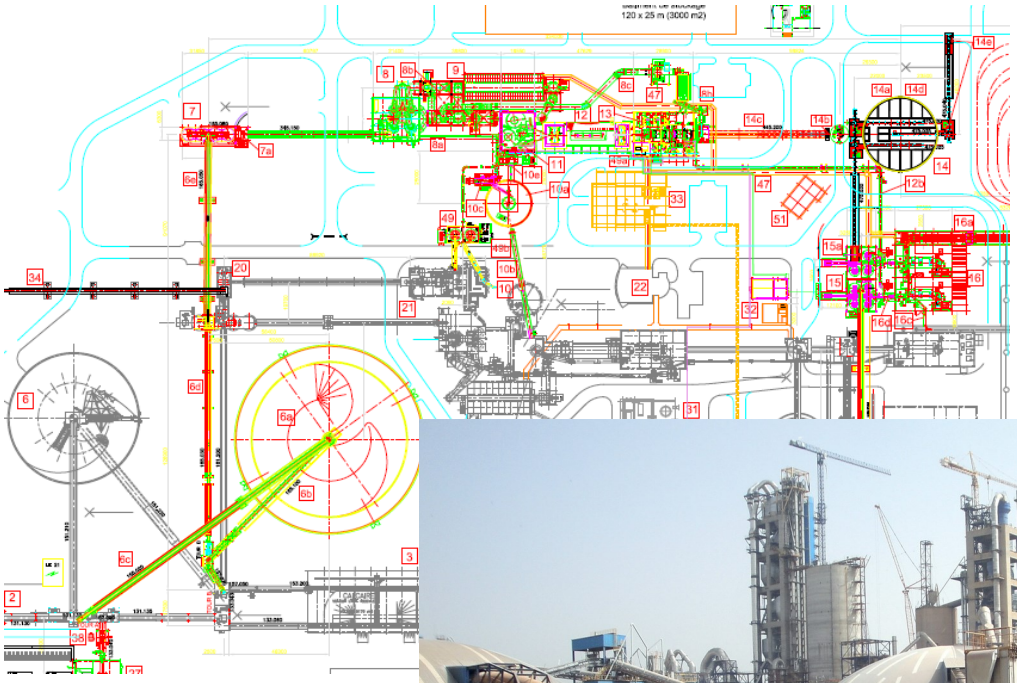
CEMENT PLANT EXPANSION - SENEGAL

Client: **Les Ciments du Sahel, *Senegal.***

Project: Second clinker production line of 3'600 tpd in order to increase the cement production to 2 mio. tpy

Date: 2007 - 2011

Service provided: Full engineering responsibility, i.e. feasibility study, engineering, call for tender, management of all contracts, management of project execution, supervision and commissioning.



Construction: Multiple Package.

Equipment Supplier: Polysius.

Electricity and automation: RMT (Group Clemessy), FLSA.

Project Description:

The Company "Les Ciments du Sahel (CDS)" was founded in 2000. A first line was built between 2001 and 2004 with a capacity of 1750 tpd supplied by FLS. As the the market situation was favorable, CDS decided to build a second line to upgrade the plant capacity to 3600 tpd clinker production.

For more information, please contact:
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EXPLORATION OF CEMENT RAW MATERIALS - MOROCCO

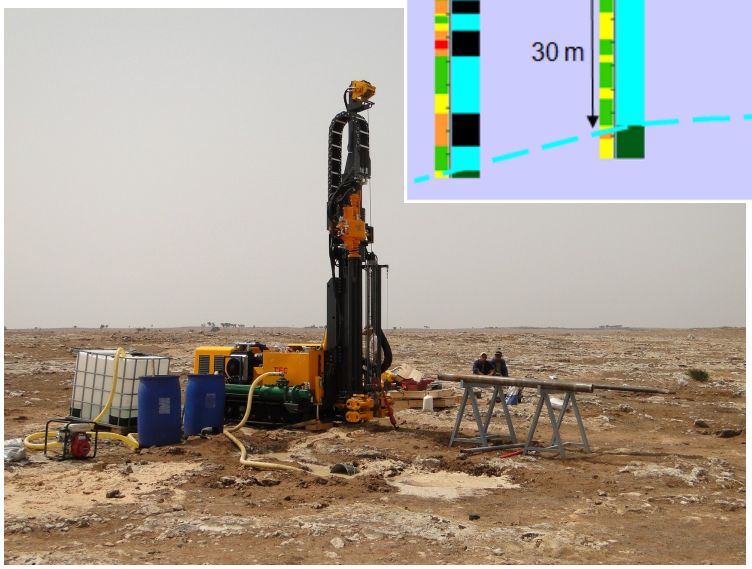
Client: **Société Générale des Travaux du Maroc (SGTM), *Morocco.***

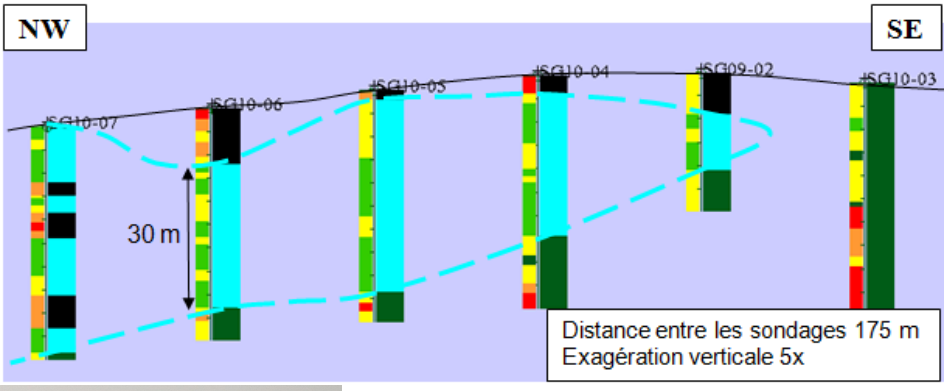
Project: Greenfield cement plant with 3'600 tpd clinker capacity and 1.5 mio tpy cement production.

Date: 2010

Service provided: Exploration of limestone and clay deposits in order to find suitable raw materials for clinker manufacturing.

Desk study, field visits, planning and management of the exploration campaigns, sample preparation and chemical analysis. Construction of a preliminary 3D model of the deposit and resource assessment. Calculation of possible raw mixes.





Survey Company: Laboratoire Public d'Études et Essai (LPEE).

Chemical Analysis Laboratory: SGS Analabs.

Modeling software: Gemcom Surpac.

Project description:

The limestone deposit is as such very large. Unfortunately, some layers show a level of phosphate that would reduce the reactivity of the clinker. Detailed geological mapping and correlation between drill holes allowed to find enough resource of good quality for the project in mind.

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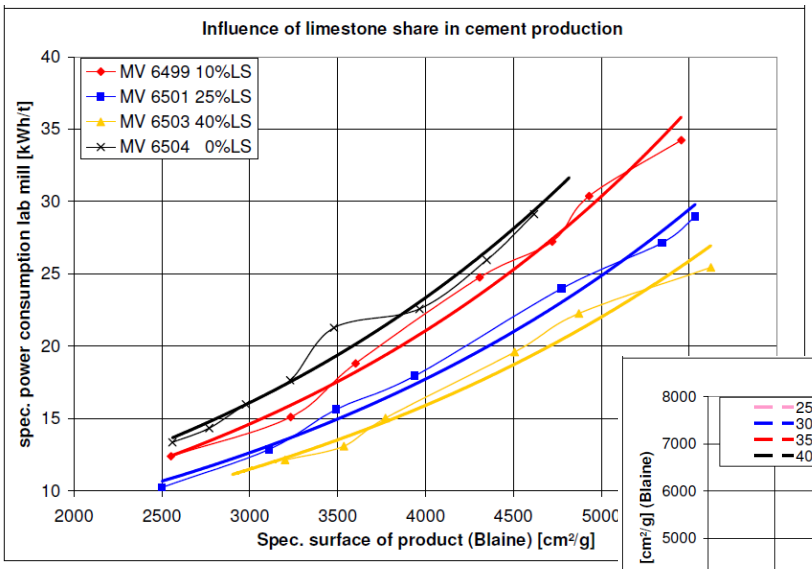
GRINDABILITY STUDY - NIGERIA

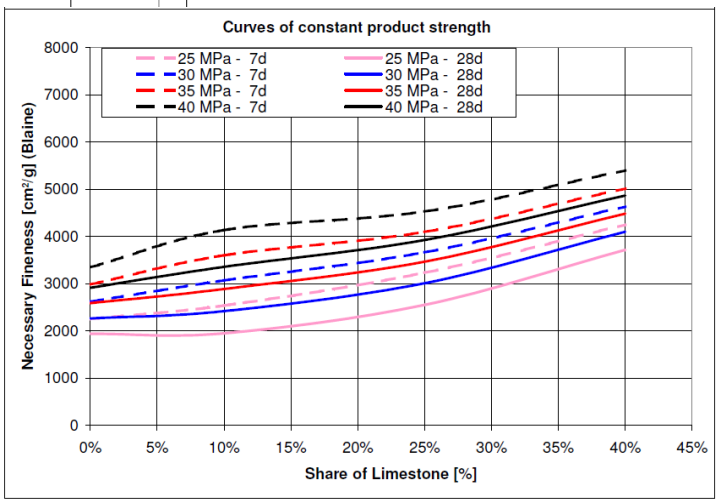
Client: **Obajana Cement, *Nigeria.***

Project: Study of grinding optimization.

Date: 2009

Service provided: Evaluation of test results and recommendation for grinding optimization.





Laboratory: Loesche GmbH.

Project description:

In order to optimize the production of cement CEM II-B, Class 32.5-N, of two 335 tph vertical roller mills, a set of grindability tests were conducted to determine the optimal conditions of profitability. In particular, the content of limestone additive was determined. The tests showed that it was adding up to 35% of limestone was possible while still respecting the European and Nigerian standards.

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CEMENT PLANT FEASIBILITY STUDY

Client: **Les Ciments du Sahel, *Senegal*.**

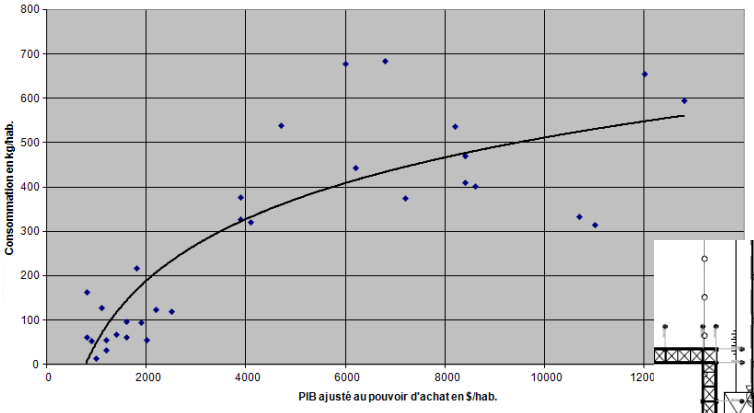
Project: Second clinker production line of 3'600 tpd in order to increase the cement production to 2 mio. tpy.

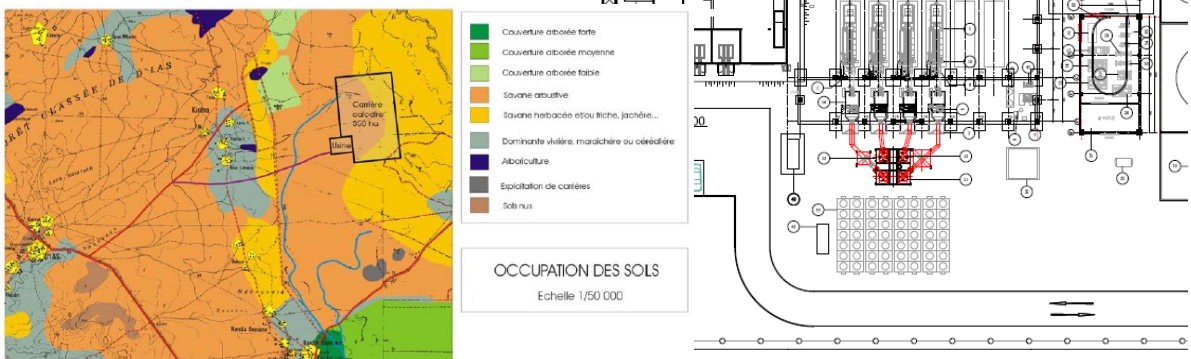
Date: 2006 - 2007

Service provided: Feasibility study for project extension.

Répartition de la population par départements

Département	Population	Densité hab./km 2	Poids démogr.	Population rurale	Population urbaine
Alibori	521 093	20	7,70%	78.26%	21.74%
Atacora	549 417	27	8,12%	62.32%	37.68%
Borgou	724 171	28	10,70%	56.57%	43.43%
Donga	350 062	31	5,17%	69.12%	30.88%
	rd 2 144 743	26	31,68%		
	es 535 923	38	7,92%	78.01%	21.99%
	au 407 116	125	6,01%	70.08%	29.92%
	ou 599 954	114	8,86%	71.71%	28.29%
	re 1 542 993	68	22,79%		
	ue 801 683	248	11,84%	62.02%	37.98%
	fo 524 586	218	7,75%	79.38%	20.62%
	ral 665 100	8419	9,82%	0,00%	100,00%
	no 360 037	224	5,32%	78.63%	21.37%
	ne 730 772	570	10,79%	55.73%	44.27%





Project description:

Technical studies, market studies, financial studies and profitability studies for the construction of a second line of 3'600 tpd capacity. Call for tender and contract negotiations.

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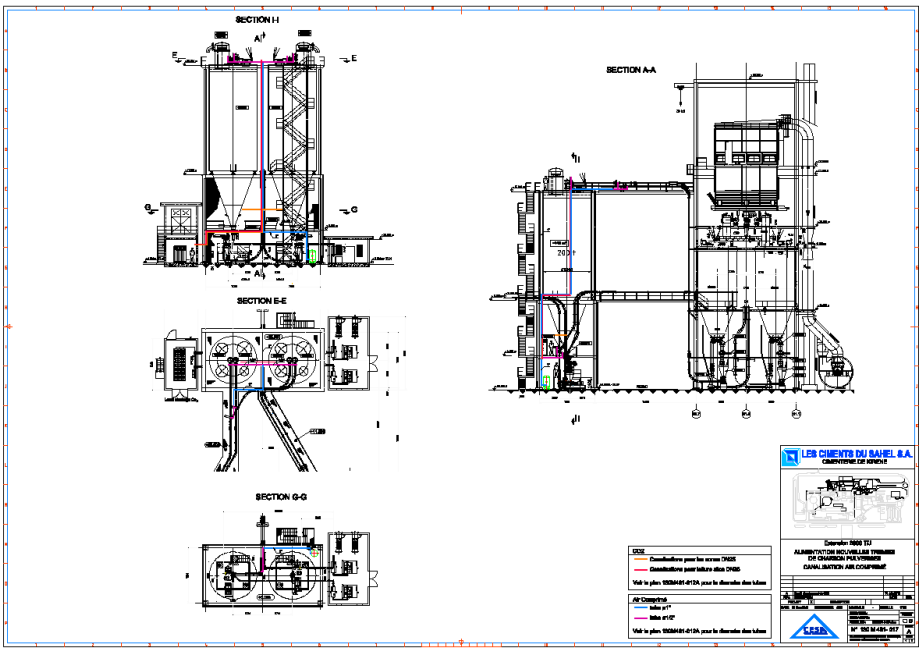
PULVERIZED COAL TRANSPORT SENEGAL

Client: **Les Ciments du Sahel, *Senegal.***

Project: Pulverized coal transport and storage.

Date: 2004 - 2006



Project description :

Full turnkey project for a pulverized coal conveying system and storage, engineering, civil design, materiel supply, erection, supervision and commissioning.

Transport capacity: 2 x 19 tph.

Storage capacity: 2 x 400 m^3.

Inertisation: CO_2 high pressure 60 bars.

For more information, please contact:
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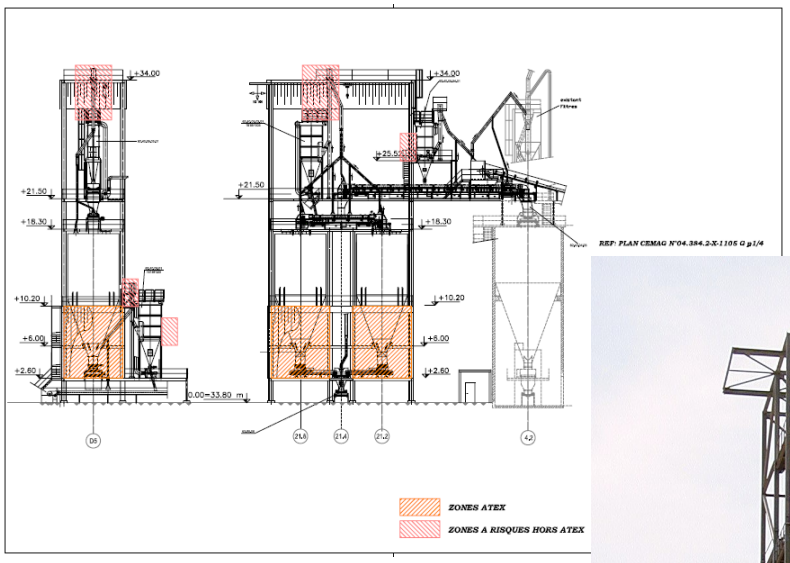
COAL GRINDING PLANT - SENEGAL

Client: **Les Ciments du Sahel, *Senegal.***

Project: Coal mill 28 tph.

Date: 2004 - 2006

Service provided: Full engineering responsibility, i.e. feasibility study, engineering, call for tender, management of all contracts, management of project execution, supervision and commissioning.



Equipment Supplier: CEMAG.

Electricity and automation: FLSA.

Project description:

- The client built this equipment in connection with the transformation of its cement factory from heavy fuel to coal firing.
- The project include the coal storage, transport and raw coal dosing as well as the mill with a capacity of 14 tph extensible to 30 tph in a second step.
- Coal dust storage and burner feeding.

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