



M A E D ' s involvement with the mining industry has been extensive and we have successfully completed engineering design and turnkey projects for a variety of mining applications, which include gold, diamond, platinum and base metal producers in South Africa and the African continent.

SYAMA

Syama is one of the largest open pit gold mines in West Africa. It is located in the Sikasso region of Mali, 280 km south-east of the capital Bamako and 800 km from the port of Abidjan in the Ivory Coast.

SYAMA GOLD MINE

M A L I



WEALTH OF MINING EXPERIENCE

From 1996, MAED has been responsible for multi-disciplinary engineering design, procurement, construction management and project management on the Syama Gold Mine. Our professional approach and well managed and resourced engineering assisted in the change-over from marginal mine to profitable operation.



SYAMA GOLD MINE MALI

INTEGRATED ENGINEERING SOLUTIONS



Our expertise was employed in the following areas of the project:

- Housing estate - offices and administration block
- Crusher and stockpile
- Power generation
- Flotation plant
- Elution, electrowinning and smelthouse
- Mine security and access control
- SAG and regrind mills
- Warehouse
- Oxygen plant
- 140 000 tpm Heap Leach Project



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MECHANICAL ANALYSIS
& ENGINEERING DESIGN

INTEGRATED ENGINEERING SOLUTIONS



SCOPE OF WORK

The first phase enabled an increase in existing plant throughput of 35%, involving a regrind mill fed with primary SAG mill oversize. Operating in closed circuit with two classification cyclones, the overflow product reports to two pre-conditioning tanks, and on to a single air agitated rougher flotation column (92 m³), followed by two scavenger columns (58 m³), configured in series. Results indicate 90% gold recovery and 80% sulphides recovery.



SYAMA GOLD MINE

MALI

FLOTATION

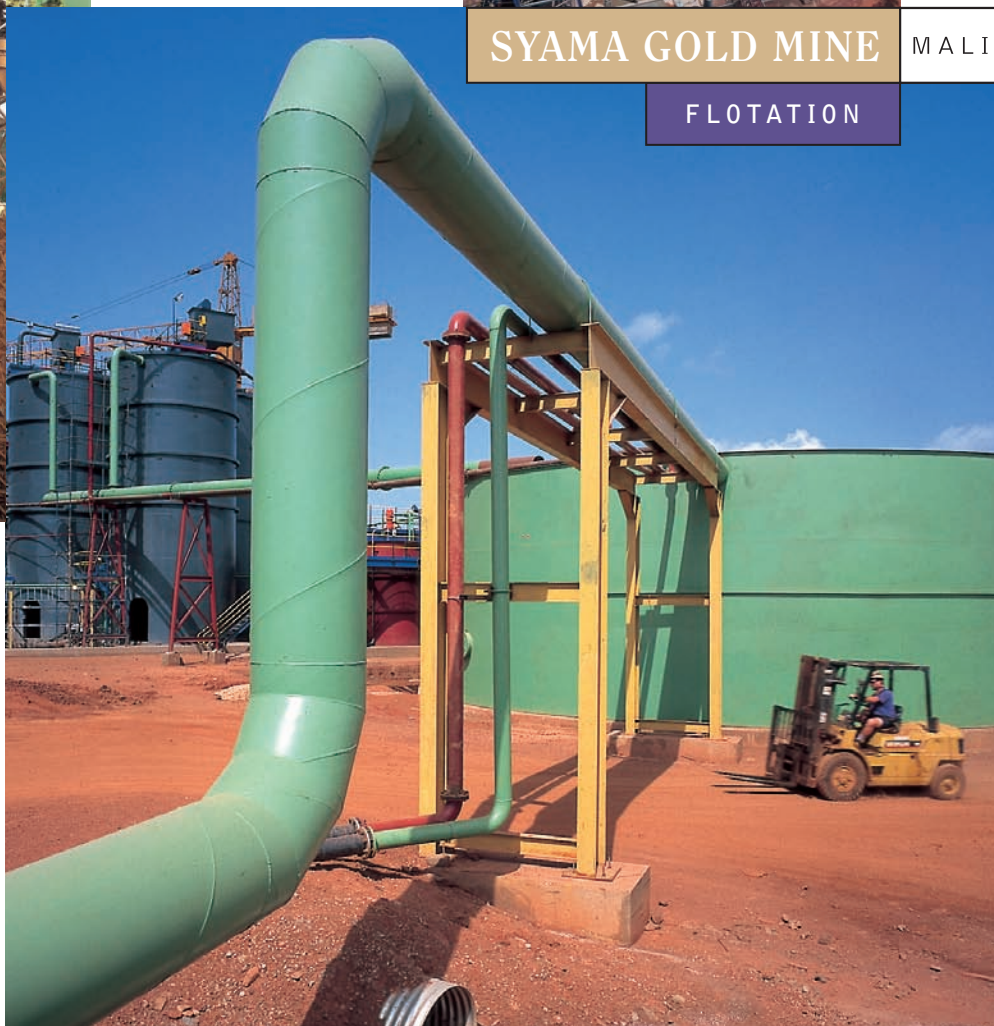




SYAMA GOLD MINE

MALI

FLOTATION

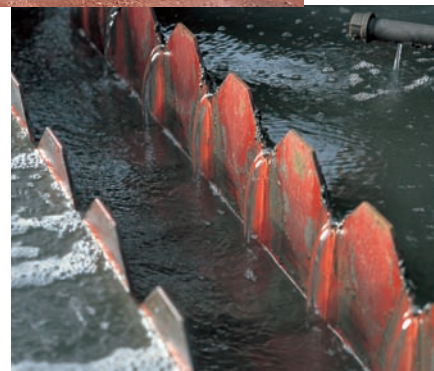


Concentrate is thickened to 60% in a 6m diameter Bateman's Ultrasep high rate thickener and pumped to a filter press plant. The concentrate filter cake is then conveyed to the SAG mill inlet, where the fuel content (as sulphide and organic carbon) supplements fuel addition to the existing whole ore roaster. This process considerably reduces fuel costs. Tailings are thickened similarly prior to being pumped to the slimes dam. Water recovered from the thickeners is recycled to a 1500 m³ mill return water tank.

Automatic samplers installed at the feed and discharge ends of the plant facilitate mine accounting systems.

An Atlas Copco rotary screw compressor was installed for air supply at 6 bar and 2100 m³/hr to the flotation columns. A PLC system controls airflow to the flotation columns, column slurry level, thickener flocculent addition and thickener underflow density.

The use of column flotation technology and high rate thickening resulted in an economical plant in terms of lower capital cost of equipment and minimised area required for the installation, when compared to conventional processes.

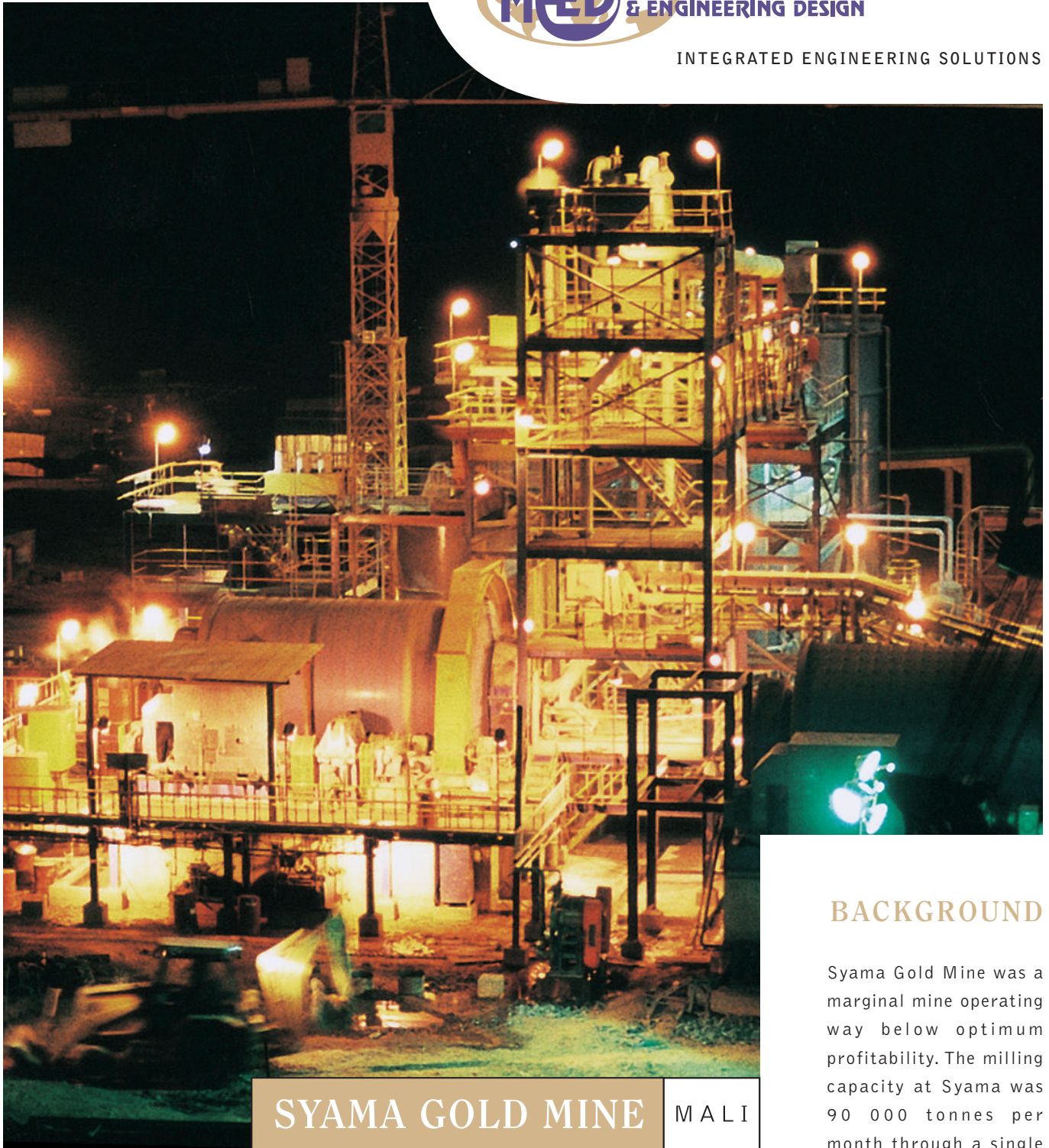


Roaster fuel consumption decreased by more than 50%.

Throughput: 120 tph per stream

Completion: 11 months following confirmatory testwork

Total Cost: \$8m US



SYAMA GOLD MINE

MALI

MILLING



BACKGROUND

Syama Gold Mine was a marginal mine operating way below optimum profitability. The milling capacity at Syama was 90 000 tonnes per month through a single dry SAG mill. Since the mine had the capacity in the rest of the plant for significantly greater throughput, it was decided to increase the milling capacity to 240 000 tonnes per month. This represented a 260 % increase.

SCOPE OF WORK

MAED redesigned the existing mill circuit to incorporate a regrind Ball mill which was purchased from Benoni Gold Mine in South Africa. The Ball mill was completely refurbished and then shipped to Syama, where it was installed as a regrind mill. The mill is a 14 ft diameter by 22 ft long Vecor with a 1.8 MW 6.6 kV motor.

The mill has the capacity to regrind up to 120 tonnes per hour of dry SAG discharge to 70% - 75 microns. The new circuit immediately increased milled tonnage to 140 000 tonnes per month.

In addition, a completely new circuit with a wet SAG and a Ball mill for regrind was designed by MAED to further increase the tonnage milled to 240 000 tonnes per month. The new circuit consists of a 16 ft diameter by 36 ft long wet SAG mill purchased from Durban Deep Gold Mine, together with the second Vecor mill purchased from Benoni Gold Mine.

The wet SAG mill was originally manufactured in 1986 for ERPM but never commissioned. The mill is a Vecor mill with a 3.5 MW 6.6 kV motor with a shell weighing 120 tonnes. The shell was cut and flanged for transport to West Africa. Due to access constraints the total size and weight of the mill did not allow transport in one piece.

The regrind Ball mills were overhauled in South Africa and shipped to Syama.

SYAMA GOLD MINE

MALI

MILLING

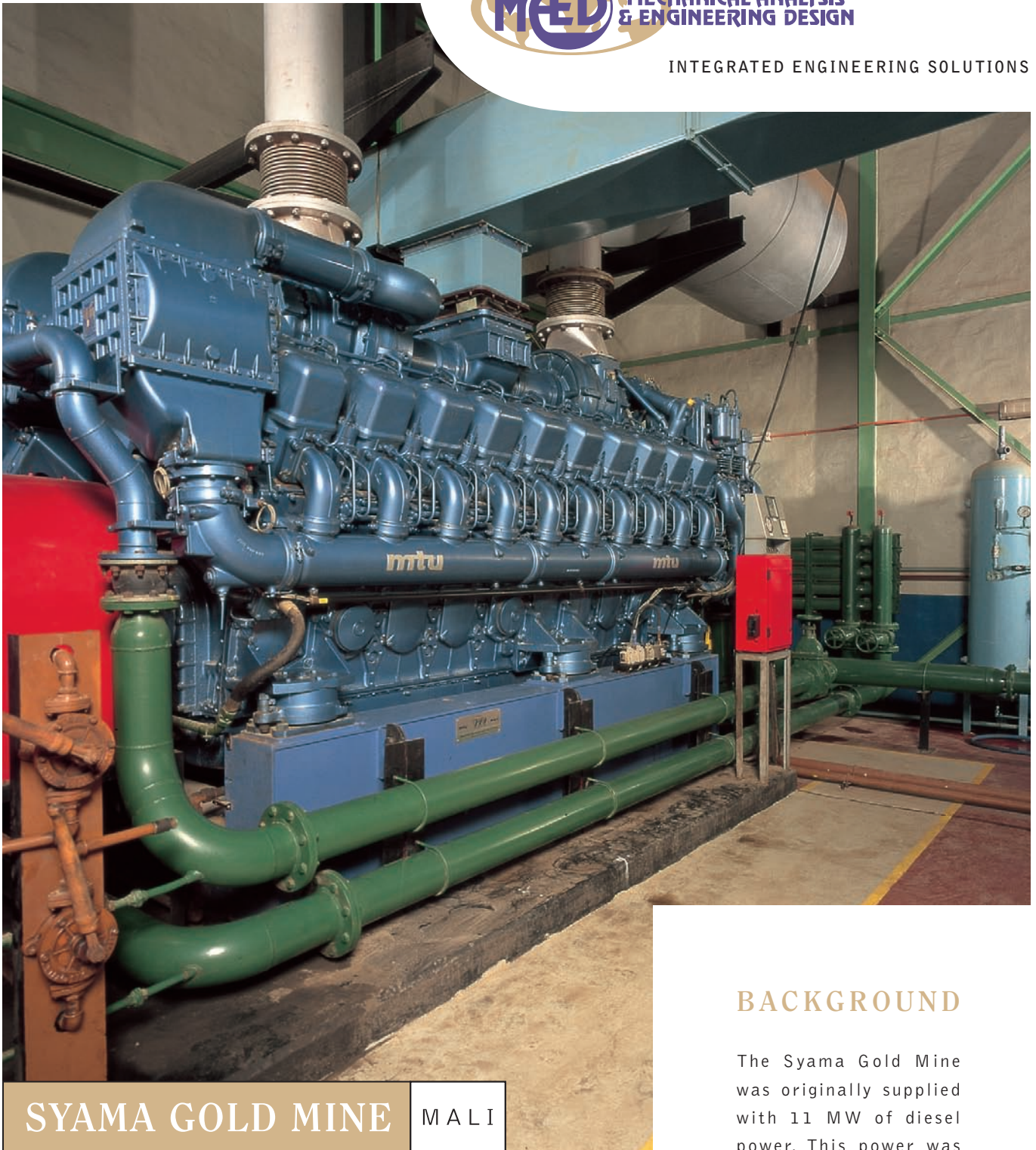


INCREASED OUTPUT

The new circuit is unique since it allows changeover with the existing circuit. In the event of either SAG mill not operating, both regrind mills are able to increase milling of the regrind product from the other SAG mill.

Both mill circuits are operated and controlled by state-of-the-art PLC systems. These systems are housed in a new control room that was built to control all plant functions.

The project was completed in 12 months at a total cost of \$14.4 million US.



SYAMA GOLD MINE

MALI

POWER GENERATION



BACKGROUND

The Syama Gold Mine was originally supplied with 11 MW of diesel power. This power was generated by way of fifteen Caterpillar portable, container-mounted generator sets. These units had been in operation for eight years, but had proven to be too expensive to maintain and had come to the end of their useful life.

SCOPE OF WORK

The new process plant expansion undertaken by MAED, required a power supply of at least 21 MW to be available, at any time, with a peak of 23 MW during startup. New equipment that was due for installation, required 6600 volts and 550 volts, while the existing plant was running at 3300 Volts and 380 Volts.

A new power station for the mine, was therefore required. MAED utilised its superior engineering design and construction capabilities in the design and building of a suitable power station, which included a new reticulation system.



SYAMA GOLD MINE

MALI

POWER GENERATION

GENERATOR SETS

MAED procured and installed 10 Fairbanks Morse 1.8 MW reconditioned generator sets, together with two MTU 4.1 MW sets. The resulting power supply of 26.2 MW became available.

The generator sets were installed in a purpose-built power generation building complete with GEC switchgear and external radiator type cooling systems. The building incorporates two overhead cranes and a purpose-built maintenance bay.

A diesel storage and feed system was installed.

STATE-OF-THE-ART

The control and synchronisation system at the Syama gold mine is all state-of-the-art PLC controlled.

TIMEOUS COMPLETION

The first phase of the project was completed in seven months at a cost of \$ 3.9 million US. Phase II has been undertaken and the final cost upon completion in September 1998 is \$11 million US.



SCOPE OF WORK

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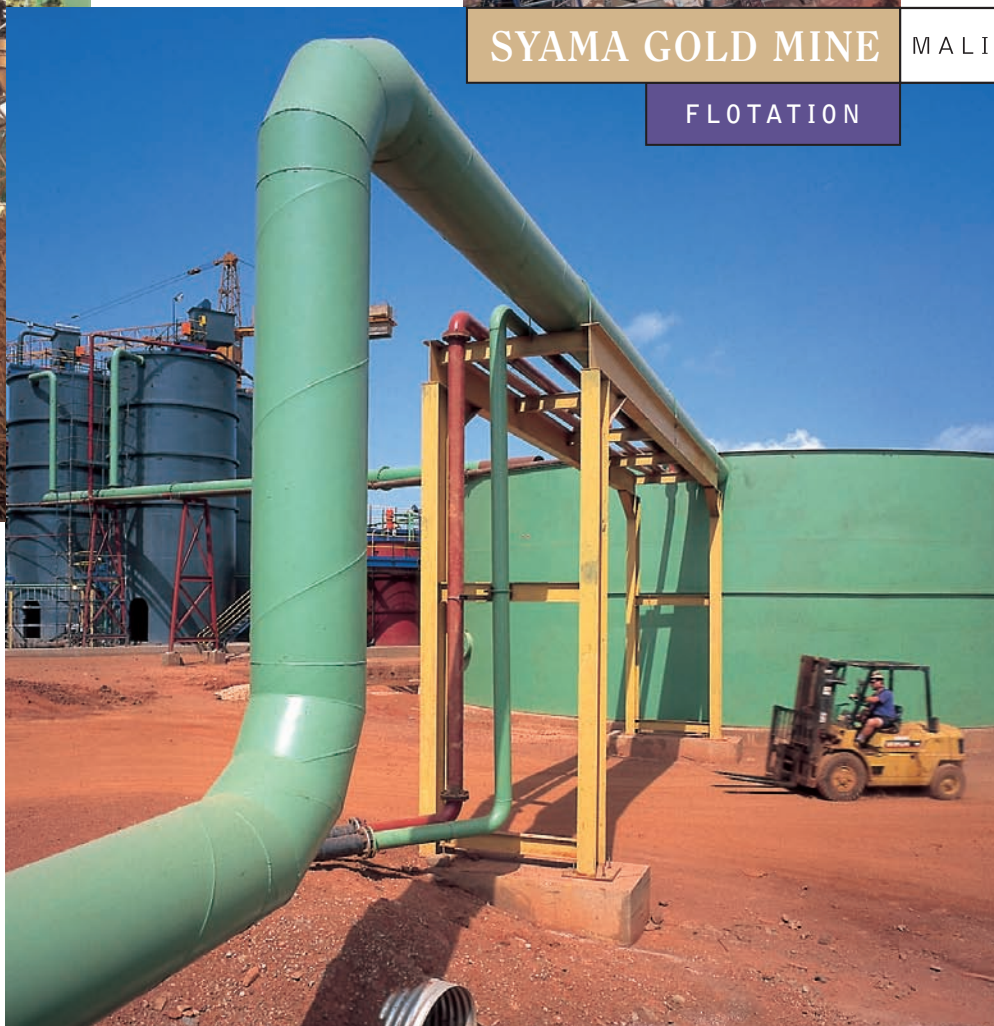




SYAMA GOLD MINE

MALI

FLOTATION



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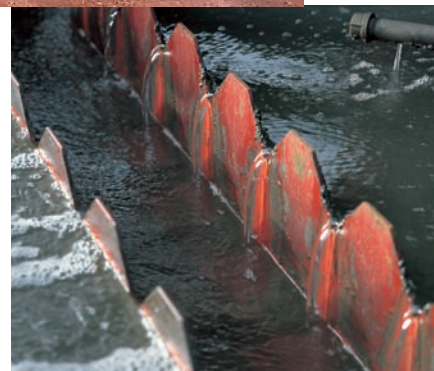
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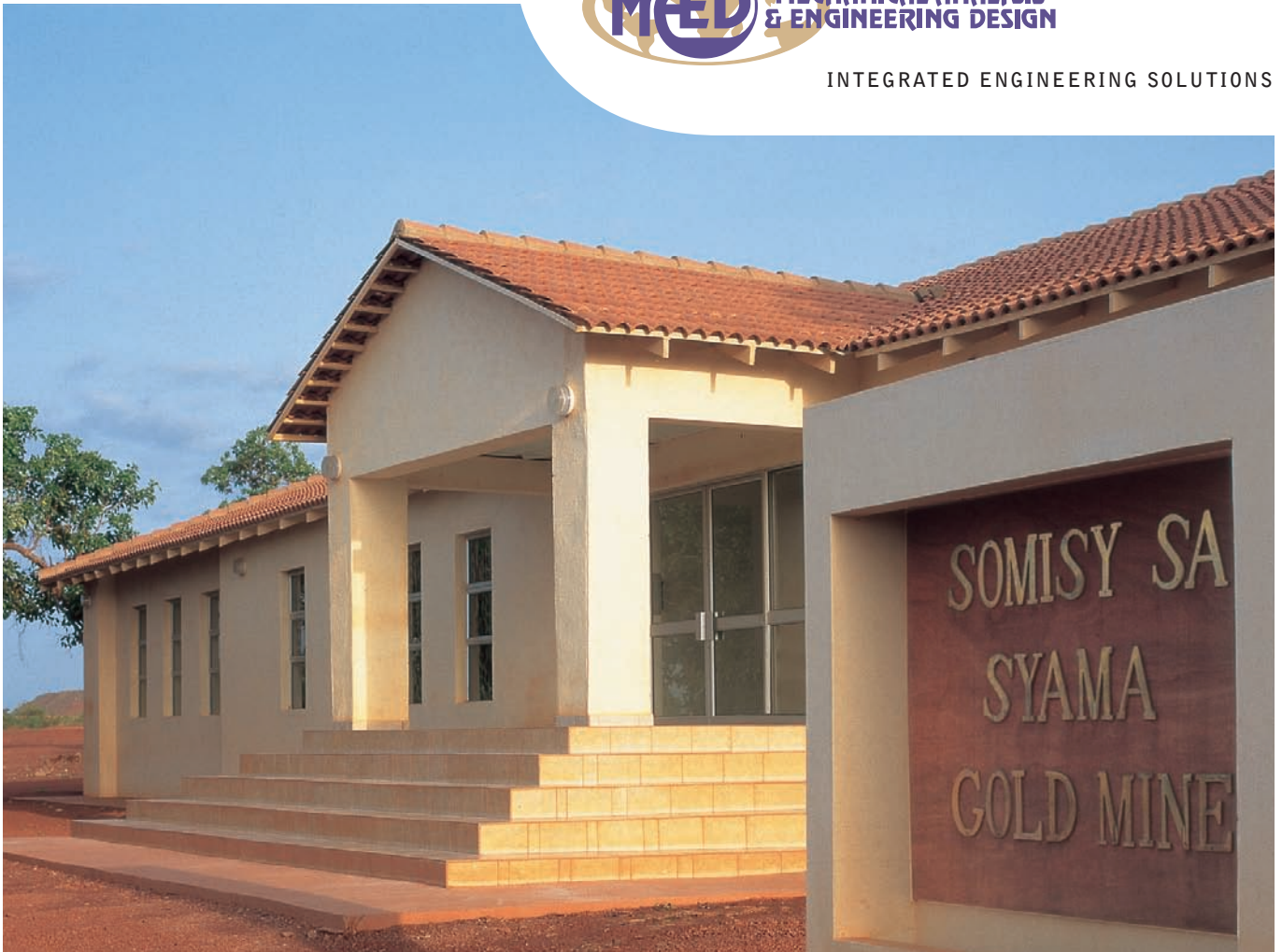
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BACKGROUND

The staff housing on the Syama Gold Mine consisted primarily of single quarters with some families being accommodated in Bamako. This arrangement, was deemed too costly, disruptive and inconvenient to staff.

A senior staff housing estate was designed and constructed. The estate consists of thirty air-conditioned housing units of varying grades, ranging from four and three bedroom units with two and one and a half bathrooms respectively.

SYAMA GOLD MINE

MALI

OFFICES, HOUSING & INFRASTRUCTURE



TRAINING AND UPLIFTMENT

MAED embarked on a programme of training in which local labour was extensively trained in all construction and allied trades. This MAED trained local labour force, was then utilised for tiling, plumbing, bricklaying, carpentry, electrical and general construction on the project.



SYAMA GOLD MINE MALI

OFFICES, HOUSING & INFRASTRUCTURE



SCHOOL, COMMUNITY CENTRE AND OFFICES

A three classroom, school was constructed and currently accommodates fifteen pupils from the estate, while a 1000m² community centre containing kitchen, bar and pool area was designed and constructed for the convenience of the staff members.

A new 900m² office block was designed and constructed in close proximity to the plant area and the existing office block.

The project was completed with a total value of \$3.1 million US.

SABS STANDARDS

Building standards throughout are consistent with the South African Bureau of Standards code of practice for residential buildings. Conventional building materials were sourced locally and standard fittings were utilised from South African and local ranges.

