

PROJECT SHEET

ESCRAVOS GAS TO LIQUIDS PROJECT
DREDGING, RECLAMATION AND DEWATERING WORKS

INTRODUCTION

The Escravos Gas-to-Liquids facility (EGTL) converts natural gas feed into high quality, environmentally superior, liquid GTL fuel, naphtha, and LPG products. The facility feed is approximately 320 million SCFD of natural gas and the facility produces approximately 33,000 BPD of products. The EGTL facility will be built on the north bank of the Escravos River tidal outlet, in the Niger Delta about 2 kilometers north of its confluence with the Atlantic Ocean on the Bight of Benin, approximately 100 nautical miles south east of Lagos, and 37 nautical miles west of Warri, Nigeria.

PROJECT SPECIFICATION

The EGTL facilities will be built adjacent to the existing Escravos Terminal and Gas Plant. The building site consists of a greenfield site, with the existing environment consisting of man-grove and freshwater elements, typical of brackish water sources dominated by the sea, and geotechnically very poor soil conditions. Chevron Nigeria Limited selected a piled raft foundation for its plant structures, and this was used as the basis for defining the Dredging, Reclamation and Dewatering Works. The work consisted of dredging 3,000,000 m³, hydraulic sandfill of 70 ha (max. 8 m thick), the installation of closely spaced prefabricated drains, the lowering of the water table over an area of approximately 30 ha

FEATURES

Client	Chevron Nigeria Limited
Location	Escravos, Delta State, Nigeria
Period	2002 - 2006
Performed by	Boskalis International bv

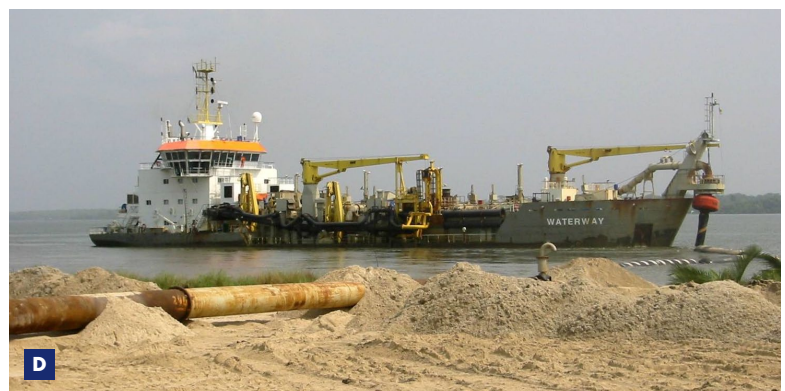


- A** Aerial view of EGTL site with adjacent Gas Plant and proposed reclamation area
- B** Local employees
- C** Hydraulic fill in progress
- D** Waterway pumping ashore

by active pumping and the installation of the necessary monitoring instrumentation.

DREDGING AND HYDRAULIC FILL

The sand for the hydraulic fill was dredged by a large trailing suction hopper dredger from a borrow area located offshore the Lekki Peninsula near Lagos. From here the sand was transported over a distance of approximately 135 kilometers and dumped in a rehandle pit dredged previously near the entrance of the Escravos River. Two medium-size trailer dredgers were used to redredge the sand from the rehandle pit, transport it some 30 kilometers



upriver and subsequently pump it ashore at the EGTL site. The entrance channel to the Escravos River had to be deepened first to make this approach possible. The dredging and reclamation works were carried out between May 2002 and July 2003, after which the period of monitoring, dewatering and recharge started.

PREFORMED VERTICAL DRAINS

A total of approximately 7,000 km of preformed vertical drains were installed, some to a depth of 17.5 m and some to a depth of 40 m. This required a total of nine installation rigs mobilized from both Europe and Singapore. This equipment included four mega-rigs, each weighing over 100 tons.

DEWATERING AND RECHARGE SYSTEM

The area was raised at the location of the proposed GTL plant with 8 m of sandfill. A dewatering system consisting of 135 deep wells was installed around this platform. The wells were drilled to a level of 22 m with the screen in the sand layer being located at between 16 m and 22 m. The purpose of the wells was to lower the water pressure in the sand layer, accelerating the consolidation process in the cohesive layers overlying the sand. To control the lowering of the

water table near the existing plant, an additional line of 100 recharge wells was situated at the refinery site.

ENHANCED CONSOLIDATION PROGRAM

The dewatering systems went into operation in 2003 and appeared to be effective. However, the pressure drop in the center of the sandfill was less than expected, especially in the rainy season. Consequently, the following additional steps were taken in early 2005.

- An LDPE rain cover (350,000 m²) was placed over the EGTL site to stop rainwater entering the subsoil.
- A watertight Geolock cut-off wall (11,000 m²) was installed around the EGTL sandfill area to prevent the ingress of groundwater from the surrounding areas. This cut-off wall was designed and installed by Cofra, a Boskalis associated company.
- An additional 101 dewatering wells were placed on and around the sandfill to accomplish extra draw-down in the centre of the area.

These additional measures proved to be very effective and resulted in an increase in settlement of more than 0.50 m in less than 6 months. The final overall settlement of the EGTL site amounted to approximately 4.85 m. The overall contract was satisfactorily concluded on March 31, 2006.

DESIGN ENGINEERING

For the Escravos Gas to Liquid project, Hydronamic (the Boskalis in-house engineering consultancy) performed extensive engineering in order to optimize the overall design of the dewatering, and of the fill and drainage operations. Hydronamic also monitored stability, settlement and environmental impact during and after construction.



E Installation of the vertical barrier
F Dewatering system
G Installation of the vertical drains
H EGTL site after completed ECP works

Royal Boskalis Westminster N.V.
PO Box 43
3350 AA Papendrecht
The Netherlands
T +31 78 69 69 000
F +31 78 69 69 555
royal@boskalis.com
www.boskalis.com

