Boskalis
Dredging & Marine Experts

PROJECT SHEET

THE PORT OF POTI, GEORGIA

REHABILITATION OF THE OLD CUBE BREAKWATER WITH XBLOC® ARMOUR UNITS

INTRODUCTION

The city of Poti is located at the mouth of Georgia's largest river, the Rioni. It has been an important trade centre for centuries. Since the early 19th century, many plans have been developed for the creation of a major sea port. Construction work started in the 1850s on the main breakwater that is still protecting the port today. During its long lifetime, this structure has been maintained by frequently adding 20-60 tons of concrete cubes to the armour layer. Significant settlement of the structure over time has lowered the crest level considerably, resulting in large overtopping volumes and therefore in port-operation downtime. As a result, a rehabilitation project was executed between 2006 and 2008 by Royal Boskalis Westminster nv to reduce the downtime caused by overtopping waves. The project financing was organized by Boskalis Westminster and, as a result, the project was partly financed by the Dutch export stimulating subsidy for developing countries (ORET) and partly by a soft loan from the ING bank. In total, 50,000 tons of filter material, 100,000 tons of rock and 6,000 Xbloc units were placed.

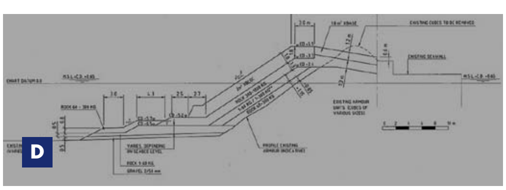
DESIGN

The cross-section consists of an impermeable wall structure with a homogeneous body of large cubes in front. Hydronamic, the Boskalis in-house engineering consultant, designed -in consultation with DMC, the license holder of Xbloc- an alternative solution. In this new design, the existing cubes on the breakwater slope are covered first with a number of layers of rock before final covering with a single layer of 2 m^3 Xbloc armour units.

FEATURES

Client	Poti Sea Port
Contractor	Royal Boskalis Westminster nv
Location	Port of Poti, Georgia
Period	2006 - 2008

A Location map
B Xbase layer on breakwater crest
C Quarry with rotating screen
D Cross section of the new breakwater
E The completed new breakwater



QUARRY OPERATIONS AND ROCK TRANSPORT

Rock materials were required for the breakwater filter, core and under-layer. The rock was supplied from a quarry located in the Kursebi area, 120 km away from the works by rail. The quarry had been used before the start of the

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project to produce small stones and large rocks for cutting tiles. Boskalis provided support for the quarry operations in order to get the right gradations. Surveys were conducted to establish the characteristics of the terrain, to design the haul roads and to develop the working faces. Trial holes were drilled with the drill crawler to check the thickness and the extent of overburden. Blasting techniques were adjusted and the selection results were monitored in relation to the drilling and blasting parameters.

ROCK TRANSPORT

Most of the rock material was transported from the quarry to Poti by rail. There were three sections:

- Kursabi – Gelati – Kutaisi(about 15 km single track)
- Kuatisi – Poti siding (about 100 km)
- Poti siding – offloading yard (about 5 km)

The railway had a small siding in Kursabi suitable for about 4 wagons. The wagons were assembled at Kutaisi in groups of about 20 wagons for the daily transport to Poti. The wagons were unloaded by tipping at Poti.

XBLOC ® PRODUCTION

The Xblocs were cast on site using 30 steel Xbloc moulds produced in the Netherlands. The moulds were filled directly from concrete mixing trucks that reached the moulds along an elevated roadway.

PREPARATION OFBREAKWATER AND ROCKPLACEMENT

In order to create a platform for the new structure, 8,200 m^3 of existing concrete cubes had to be removed. Lifting these cubes was considered to be a potentially unsafe operation and a safer solution was found that consisted of destroying the blocks in a controlled manner using hydraulic hammers.

PLACING ROCK LAYERS

The different gradations of rock were placed partly with the Side Stone Dumping Vessel (SSDV) Arca and partly with land-based machinery. The Arca's ability to operate in shallow water (2.6 m) and the long reach of the excavator (21 m) meant that the two types of equipment were able to cover each other's working area. The Arca works with a multi-conveyor-belt dumping system for regular spreading of the rock. A DGPS system ensures the correct position for dumping and sailing speed while dumping. The excavator used for the actual construction of the breakwater was equipped with the Boskalis Crane Monitoring System based on GPS. This system enables the operator to view the design and the location of the bucket of the machine in real time on a screen in the cabin.

XBLOC ® PLACEMENT

The Xblocs were transported by barge from the storage area to the breakwater where they were unloaded by excavator and positioned with the long-boom excavator. The availability of the crane monitoring system, the effective quick release hook and the simplicity of the Xbloc placement procedure allowed high placement rates to be obtained.

F The SSDV Arca placing a rock layer
G Crushing concrete blocks on crest
H Snijder excavator loading rail wagon
I Railwagons unloading rock in Poti
J Concrete mixing truck on the elevated roadway preparing to fill an Xbloc mould
K Placing the Xblocs

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