



CAIRN ENERGY COMPANIES
in BANGLADESH

PRODUCED WATER PLAN,
SANGU NATURAL GAS PROCESSING PLANT,
CHILIMPUR, CHITTAGONG

February 2006

**Produced Water Plan
Sangu Natural Gas Processing Plant
Chilimpur, Chittagong, Bangladesh**

Background

Cairn Energy Sangu Field Limited (CESFL) has a natural gas processing plant at Chilimpur, near Chittagong, Bangladesh which receives natural gas from an offshore platform in the Bay of Bengal, approximately 42 kms south west of Chittagong. The processing plant removes the associated liquids in the natural gas, comprising both condensate and water, and this is stored in a tank for a settling period of 5-6 days to allow condensate separation and recovery. The produced water is treated and discharged into the Bay of Bengal off the Chittagong coast at a water depth of 3-5m. Typical daily average volume of produced water discharged into the Bay of Bengal is 60 cubic meters.

Regulatory Requirements

The effluent discharge standards for the produced water, as set by Department of Environment, Government of Bangladesh (DOE GOB), are based on the requirements for inland surface waters and no separate effluent discharge standards are available for coastal waters. Present applicable discharge standards for Sangu Produced Water are:

<i>Parameters</i>	<i>Unit</i>	<i>Applicable limit</i>
Chloride	mg/L	600
TDS	mg/L	2100
COD	mg/L	200
Oil in Water	mg/ L	10

The above-approved limits are below International Standards. COD limits for World Bank and USEPA are 250 mg/l and 388 mg/L respectively, compared to the Bangladesh more stringent standard of 200 mg/L. The current limit for oil in water is 10mg/L for offshore discharge as per the applicable limit under the Sangu development EIA (1998) as approved by DOE GOB. However there is no specific limit prescribed by DOE GOB under the Environmental Conservation Act (1995) and Environmental Conservation Rules (1997) for offshore marine discharge. The World Bank Health and Safety Standard (1995) for oil in water it is 78mg/L and 48mg/L in 24 hrs and 30 days settling time, respectively.

Key Issue

The major issue in meeting the effluent discharge standards relates to chlorides, total dissolved solids (TDS), chemical oxygen demand (COD) and oil in water. To meet the discharge standard, CESFL has to aerate and dilute the effluent with surface water and groundwater, prior to discharge into the sea.

Study Results

In order to assess the impact to the coastal environment compared with a baseline study of environmental parameters, CESFL conducted an Environmental Risk Assessment (ERA) involving National Institute of Ocean Technology (NIOT), Chennai, India. After completion of the report, the results summarized the following:

- Baseline values of pollutants at all stations are similar with negligible variations between stations, even when the effluent is being discharged. This indicates that initial mixing of the effluent is rapid, reducing concentrations to background levels.
- Biological productivity measures of phytoplankton and zooplankton are similar to values measured previously in 1998 at this site, indicating that regional impacts on the biological indicators are negligible, even after commissioning of the project
- While the benthic population is high, the biodiversity index for benthos represents moderate diversity. The presence of poriferans and absence of morphological changes in the tissues are indicators of a healthy environment;
- Comparison of the intertidal fauna data collected in this survey with the data collected during 1998 show negligible change such as the presence of polychaetes and absence of amphipods. Thus, any environmental change due to the discharge has not impacted the intertidal fauna.

Corrective Action Plan

Although there is no measurable environmental impact, treatment to meet international standards will conform to the need of the precautionary principle. Three key actions have been identified in order to achieve this, as follows:

1. Submit an application to the regulatory authorities for reconsideration of discharge standards for chlorides, TDS, COD, and oil in water in consonance with international practices for marine discharges. This will be done following the formal presentation to DOE GOB submitting the ERA report. Due Date: Submission by end February 2006.
2. Complete studies into additional water treatment versus injection of the water into a suitable saline aquifer, as a long term zero emissions policy. This work will produce the scope of work for both options plus costs, so that a decision can be made during July 2006, with implementation shortly afterwards
3. On the basis of the outcome of step 2, complete modifications to produced water treatment facilities or injection facilities. Target date for commissioning of these facilities is Q2 2007.