SYMPOSIUM ON CORALS AND CORAL REEFS

12 — 16 JANUARY 1969
MANDAPAM CAMP

SOUVENIR

CORALS IN THE CARBIDE INDUSTRY

By

K. S. KASIVISWANATHAN,
Industrial Chemicals Ltd., Sankarnagar,
Tirunelveli (Madras State).

THE carbide industry in India had till very recently depended for raw material largely on imported petroleum coke. Nearly a decade ago Industrial Chemicals Ltd., Sankarnagar, in Tirunelveli District, the pioneer manufacturers of calcim carbide in the country, started looking for indigenous raw material. In processing calcium carbide from lime and carbon, they knew they could very well put local wood charcoal to use, but the samples of limestone from all over India tried, were found far from adequate to make first-class carbide conforming to the rigid international standard. Ultimately, the corals available in the seas around Rameswaram, on analysis, were found to conform to all the requirements as per standard specification to make 'A' grade calcium carbide. The company soon put it on commercial basis and to date they appear to be the only concern to exploit corals on a large scale for the industrial manufacture of calcium carbide.

The Raw Material

Regarding the availability of raw material in sufficient quantities, the coral formations around the islands in the Gulf of Mannar, running parellel to the Ramnad and Tirunelveli coasts, constitute a good source. These islands, particularly those from Pamban island to Valinokam Point, are surrounded by fringing coral reefs, which extend from one island to the other. These reefs vary in width and thickness from place to place, their form depending upon currents, action of waves and wind etc. The width varies from a few yards to as much as 400 to 500 yards. The reef itself is composed of dead and decaying coral with colonies of living coral on the surface.

The dead reefs of these waters were being exploited for other purposes locally, even before its use as raw material for the carbide industry was found out. As building stones such as granite, laterite or bricks are not readily available in the locality, it has been an established practice to cut and remove coral limestones for making buildings and roads. The removal of coral stones has thus been going on for many years.

The coral skeleton is deposited by the living polyps and therefore the reserves can be replenished in the course of years if conditions are favourable for the growth of corals. Though not much scientific work has been done to determine the rate of growth of corals in the Gulf of Mannar, some interesting experiments carried out on the coral reefs of the Maldives and the islands in the Pacific Ocean showed that massive corals grow about an inch in height per year while their lateral growth may be still greater. If the corals are worked carefully and systematically at selected spots in the different islands, without harm to the living corals, it should be possible to obtain limited supplies of the material for a reasonable length of time. However, there is need for a study of the rate of growth of these local forms, and until that is done nothing positive can be said about it.

M/s. Industrial Chemicals Ltd. started exploiting coral limestones from 1960 onwards. Because of the restrictions imposed as per the agreement entered into by the company wtth the Government the industry is unable to collect coral stones in sufficient quantity to work to full capacity. And in the experiences of the industry, no other raw material can replace the corals in quality for the production 'A' grade calcium carbide.

The Process

Calcium carbide is prepared from quicklime and carbon at 2000 to 2200°C in an electric arc furnace. The source of carbon is usually coke and charcoal, with a low ash content. The quicklime is produced by burning coral limestone containing at least 97 per cent calcium carbonate. The process involves the chemical reaction :—

1. $CaCO_3 \longrightarrow CaO + CO_2$
2. $CaO + 3C \longrightarrow CaC_2 + CO\uparrow$

The limestone suitable for calcium carbide manufacture should comply with the following requirements, as per I.S: 3204–1965.

Loss on ignition, per cent by wt. max.	46.0
Silica (as SiO_2) per cent by wt. max.	1.0
Alumina (as Al_2O_3) and Ferric oxide (as Fe_2O_3) together, per cent by wt. max.	0.5
Calcium (as CaO) per cent by wt min.	54.0
Magnesium (as MgO) per cent by wt. max.	0.8
Sulphur per cent by wt max	0.1
Phosphorus per cent by wt. max.	0.01

The presence of silica and iron influences the course of the reaction and often yields ferro-silicon, thus affecting the gas yield of calcium carbide. Magnesium oxide has a deleterious effect in increasing the temperature of furnace charge and the energy consumption, thereby affecting the production. Phosphorus in limestone comes out as phosphide in the finished product which yields poisonous PH_3 gas when calcium carbide is treated with water to manufacture C_2H_2. So phosphorus in limestone should not be more than 0.01 per cent by weight.

Coral limestone gives the following analysis which complies with the above requirements :—

Loss on ignition	44.00 %
Silica (as SiO_2)	0.50 %
Combined oxides of Alumina & Iron	0.30 %
CaO	54.30 %
MgO	0.40 %
Sulphur	0.05 %
Phosphorus	0.009 %

Coral limestone also stands the process of calcination in kilns well and the lime obtained after calcination does not crumble to powder and so is better suited for the carbide furnace.

Uses of Carbide

Calcium carbide is consumed mostly in the manufacture of acetylene by reaction with water. Acetylene which is a combustible gas is essential for a great variety of chemical syntheses and as a fuel for welding torches.

Thus the significance of the coral reefs of our shallow waters from the point of view of the carbide industry in this country is considerable. But more has to be known about these in order to arrive at the proper sustainable level of exploitation. In this connection it is a happy augury that the "Symposium on Corals and Coral Reefs" is being conducted at Mandapam Camp, so near to the site of these coral beds. This should serve to focus attention on this resource of ours and act as an impetus for much specific work on these lines in the near future.