

Gas and Power
Load Shedding in Industries
An Immediate Solution



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GAS AND POWER LOAD SHEDDING IN INDUSTRIES

AN IMMEDIATE SOLUTION:

Introduction:

The natural gas reserves of Pakistan have been depleting progressively for the last many years especially because no large discovery of natural gas occurred during this time. During the 1980s, it was decided to provide sui gas for power generation in the country. Almost all Thermal Power Generation Plants were based on burning of fuel (furnace oil, natural gas) in boilers, the production of steam and the driving of power generators with steam turbines. This process, as is well-known, is highly inefficient -- resulting in efficiencies of between 25 to 30% for conversion of energy from fuel to electricity. In about 25 years, the gas reserves at sui depleted to a substantially low level resulting in reduction in pressure - specially in the winters. Since 2005, we have a gradual reduction of the supply of natural gas for Thermal power generation. More and more Thermal Power Plants were switched back to furnace oil as fuel. The high content of sulphur in the furnace oil rapidly corroded the boilers with a subsequent reduction in power

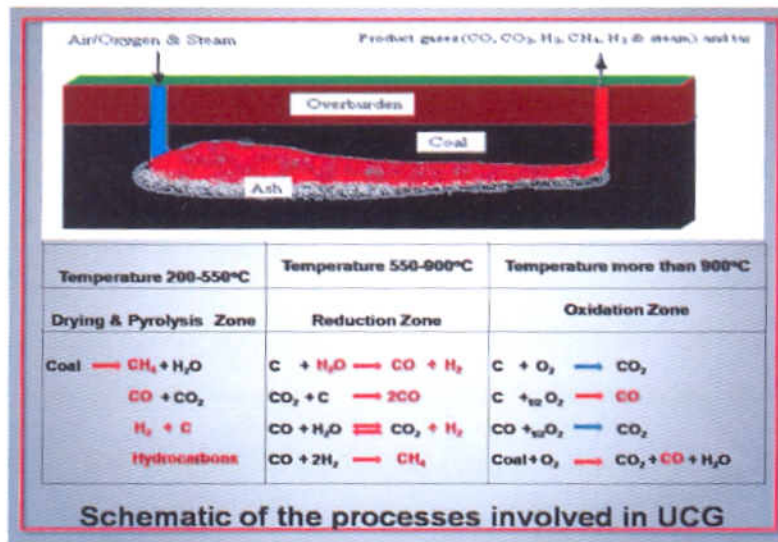
generation capacity. Presently, our total power generation from thermal plants stands at around 4000 MW which is nearly a third of the total installed capacity of these plants. This gross depletion in our natural gas reserves has caused serious load shedding in electricity as well as gas supplies in the various sectors of our industry. A shut down of many industries for 2 to 3 days a week has brought about multi dimensional effect not only as it increased unemployment of the poor labour force but it has also affected the exports of our manufacturing sector. The increasing number of unemployed youth has become a cause of serious social unrest and crime in the society. Discontent against the government and its policies is increasing.

An Immediate Solution:

We do not have to look too far beyond our borders to sense a very obvious solution to the problem of power shortage and gas shortage in our industry. In China, there are vast coal reserves and 60% of power generation in that country is based on coal. Three to four decades ago, it was considered appropriate to burn coal for steam generation and

consequent production of electricity. The smoke from the burning coal was freely released into the atmosphere through chimneys. The continuation of this practice in USA, Europe, China and in our neighborhood India resulted in appalling impact on global environment. The abnormal presence of carbon dioxide gas and carbon particles emitted by burning of coal/furnace oil trapped the heat of the sun close to the surface of the earth and resulted in global warming. The melting of glaciers and the Polar Ice Caps has increased the level of the Oceans rapidly. Many coastal areas and low lying Islands have been wiped out. The Rann of Kuch has come inland as far as Badin where one can see mangroves. This sea water is feeding the second aquifer in the Thar coal field making open pit mining a costly affair. We have witnessed prolonged winter fogs in our country. The smoke has also increased the occurrence of lung diseases and cancer in Pakistan. To prevent the increased disaster from pollution at a global scale, the Kyoto Protocol was signed a few years back. To provide an incentive for good

behavior. The policy of granting carbon credits was approved at the United Nations for activities in which carbon pollution is minimized.



One of the most popular methods of using coal with minimum of pollution as an energy source, is to convert it into coal gas. This is done deep under the surface of the earth in coal seams. The process is called Underground Coal Gasification. In Pakistan, the Science and Technology Section of the Planning Commission conceived such a project to be pursued at a pilot scale in the Thar Coal Fields for the production of 100 MW of electricity. Similar projects are being currently implemented at more than forty places on four continents. Coal is also

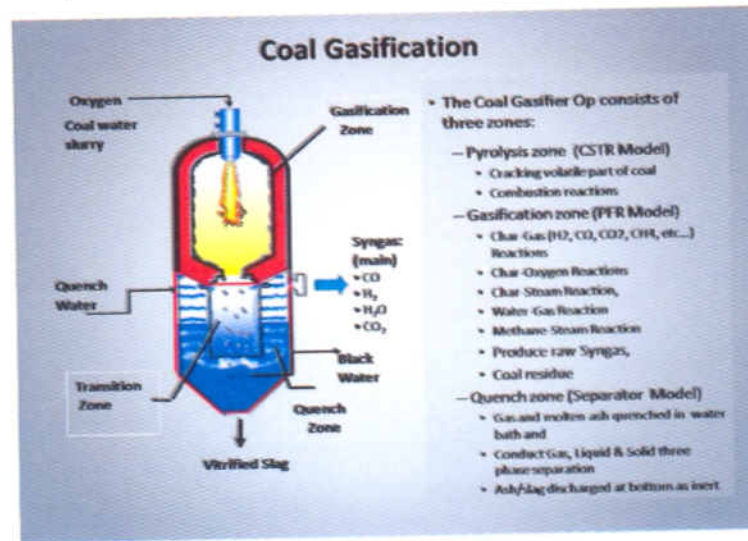
converted into coal gas above the ground in machines called surface gasifiers.



POWER PRODUCTION PLANT FROM UNDER GROUND COAL GAS

Production of electricity and gas at Thar Coal Fields is a huge national activity which will have an impact on the country's power production and production of gas and diesel in the years to come. **The present distress in the industrial sector of Pakistan cannot wait for a few years for the solution of the problem.** An immediate solution therefore, is the need of the hour. The government cannot step in to alleviate the energy crisis due to limited financial resources. The solution has, therefore, to be found and implemented with the following basic constraints:

- i) The solution should be quick and immediate,
- ii) the capital cost should be met by the private sector, and
- iii) the basic raw material available in the country should be used.



Surface Gasifiers:

In a surface gasifier, fire is maintained at the top section of this machine where a slurry of coal and water is injected mixed with either oxygen or compressed air. The coal in the slurry reacts with the water and oxygen at high temperature to produce coal gas. Such machines are being manufactured in various sizes in several countries of the world. In China many individual industries are installed with surface coal

gasifiers and coal gas engine-generator sets. With the feeding of coal into surface gasifiers, coal gas is produced in volumes depending upon the size of the gasifier installed. This gas can be used directly in the industry in blast furnaces, in the heating process in chemical plants, for the drying of cloth in textile mills, to convert iron ore into steel and also as kitchen gas. A part of this coal gas can ofcourse be diverted to generate electricity.



The efficiency of the conversion of coal gas to electricity is about 40%. The engine-generator sets are different from engines designed for operation with natural gas. These are also available from leading manufacturers in America, Europe and China.

A series of presentations and talks have been conducted by Member, Science and Technology of the Planning Commission, at the leading Chambers of Commerce and Industry in the country at which the process of surface gasification, the availability of the equipment and the cost economics of the electricity and gas produced was explained clearly.

In meetings with Chief Ministers of Punjab and Balochistan, this concept was also unfolded. A technical team was formed by the Chief Minister Punjab to take this concept to smaller Chambers of Commerce and Industry in the various industrial cities of the province. An MOU has also been signed between the Chief Minister, Balochistan and Chief Minister, Punjab for the sale and purchase of coal for industries.

Availability of Coal in Pakistan

i) **The Chamalang Coal Field**

This coal field has known reserves of approximately 50 million tons. This coal field has production of 2000 tons per day. The coal is high volatile, A bituminous coal with heat value between 12500 to 14,357

Btu/lb. The total sulphur content of this coal is between 3 to 8.5%. The price ranges between Rs 8000 to 9000 per ton.

ii) **Khost-Shahrig-Harnai Coal Field**

These coal fields have total reserves of 76 million tons. Annual production from the mines is about 225000 tons. The coal is high volatile, A bituminous coal to sub-bituminous B coal with the heating values between 9600 to 15500 Btu/lb. The sulphur content varies between 3.5 to 9.5%. However, after washing the sulphur content is reduced to about 0.5%. Coal is priced between Rs 6000 to Rs 8000 per ton.

iii) **Dukki Coal Field**

This coal field has a total of 51 million tons of coal reserves. Deposits are of highly value B bituminous coal. Annual mining capacity is almost three hundred thousand tons and the heat value of this coal is between 10131 to 14164 Btu/lb per pound.

The sulphur content of the coal ranges from 3.5 to 9.5%. The price of coal of Dukki Coal Field is between Rs 7000 to 9000 per ton.

iv) **Quetta Coal Field**

The reserves of this coal field are about 50 million tons. This coal field is sub bituminous to highly volatile. The heat value of this coal is between 11250 to 13900 Btu/lb. The sulphur content of this coal ranges between 4 to 6%. However, after washing the sulphur is reduced to below to 0.2%. The coal is available at a price of Rs 6000 to 9000 per ton.

v) **Much Coal Field**

The reserves of this coal field are 23 million tons. The sulphur content of the coal is about 7.2%. However, after washing sulphur content is reduced to 0.2%. Coal is available at a price of Rs 4000 to Rs 5000 per ton.

vi) **Lakhra Coal Field**

Average annual production is 1.1 million tons. This coal has a heating value of between 5500 to 9160 Btu/lb. The sulphur content in this coal field varies between 1.2 to 14.8%. A washing facility to remove

sulphur has now been installed near the Lakhra coal mines. The total reserves of Lakhra are estimated at 1328 million tons.

vii) **Salt Range Coal Field**

These coal fields have reserves of about 235 million tons. The average annual production is 1699 million tons. This type of coal is sub-bituminous C to highly volatile A bituminous. The heat value of this coal ranges between 9400 to 15800 Btu/lb. The sulphur content in this coal field is between 2.6 to 10.7%. The Price of the coal at the mouth of the mine varies between Rs 4000 to Rs 7000 per ton.

Cost Economics

In any commercial activity, cost economics is the most essential criterion. The keeping of cost of production at reasonable and competitive level depends upon the cost of labour, the cost of raw material, the cost of energy consumed and the interest on the capex which is the capital expenditure on the industry.

On the average, one kilogram of coal produces 2.2 m³ of coal gas and 1Kwh of electricity. If the cost of the coal is Rs 6000 per ton then one unit of electricity will cost approximately Rs 7.5. Surface gasifiers are being manufactured in sizes from 300 KW upto several MW/hour of electricity. The engine-generator sets are available from 400 KWe upto 1500 KWe.

The impact on Industry

After finalizing the surface gasification solution for the implementation in the industry at the Planning Commission, several presentations were given at various Chambers of Commerce in the month of February 2011. To-date three surface gasifiers have already been installed and are in operation in different industries. Another 18 gasifiers are currently on order awaiting delivery within the next 6 to 8 weeks. **This solution has become highly popular in the manufacturing sector of Pakistan.** It is expected that by the end of the current year, significant number of our industries will be generating their own gas and electricity from coal. This will greatly impact the economic growth of the country through enhanced manufacturing, increased employment,

competitive exports as well as an increase in the intensity of our mining sector. **In line with the newly developed Economic Growth Strategy of the Planning Commission**, a considerable increase in GDP will be observed in the coming years in the production sector without any burden on the public sector development programme. The Planning Commission has provided the technical impetus and intellectual inputs to advance the economy of the nation.

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