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TRANSFER OF TECHNOLOGY AND PRODUCTION OF STEEL IN INDIA

Anil Chandra Banerjee interviewed by and with a Foreword by Amiya Kumar Bagchi

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INSTITUTE OF DEVELOPMENT STUDIES KOLKATA
DD-27/D Salt Lake City, Sector - 1
Kolkata - 700 064
Phone : +91 (33) 23213120/21 Fax : +91 (33) 23213119
e-mail : idsk@idskmail.com, Website : www.idsk.edu.in

FOREWORD

A.K. Bagchi[1]

Peoples' Republic of China is the largest producer of iron ore in the world, India is the fourth largest producer, and its output (2010) was about 34-35 per cent of that of China. But India produced only about one-tenth of the steel output of China, a little more than that of South Korea (2012). The structural factors behind this gap have been analysed in several publications[1]. In India's case the structural factors are well known, a capitalist class which wanted basically to organise a cartel, primarily targeting the domestic market – and a compliant state conceding that demand. After independence, the domestic capitalists had too little resources to finance the needed expansion of the Indian steel industry. So the government stepped in, and then organised the setting up of new steel plants with technical assistance of Western Germany, the United Kingdom and the Soviet Union. But all these enterprises suffered from political interference that put patronage above efficiency, on top of that, bureaucratic delays raised costs and hampered the absorption of new technologies.

However, there were dedicated technologists and managers who really wanted to develop the public sector steel industry. Anil Chandra Banerjee, whose interview is published in this Working Paper, was one of those pioneering steel technologists. The record shows that Mr. Banerjee, along with several other technologists who grew up after independence, fought against the colonial hangover that new technologies were the province of only white men, and converted some of their disadvantages into positive assets by putting in more intensive efforts than the typical engineers and technicians from the advanced steel producing countries. The record also shows that there were far-sighted managers who shopped for the best technologies, including those for production of steel and further value added products. If such managers had been backed by the ruling class, and given the resources to buy the technologies from abroad and to adapt them to Indian conditions, the Indian steel industry would have been one of the leaders in the world. Instead, the public sector industries were made to sell products at prices which did not cover cost and were starved of funds, so that managers could not take the right steps even when they wanted to take initiatives in changing the

1 Professor Emeritus, IDSK, Kolkata

processes or composition of products. I hope that this record will persuade future controllers of the steel industry in India to resume the initiative that was stifled by short-sighted politicians, cartel seeking private capitalists and bureaucrats who tied everything in red tape.

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TRANSFER OF TECHNOLOGY AND PRODUCTION OF STEEL IN INDIA

Interview of Mr. Anil Chandra Banerjee by Prof. Amiya Kumar Bagchi

AKB : *If you tell me first, why did you study Engineering and in which Branch* ?

ACB : It is a very old story. I was brought up from age three at Burnpur which was a town surrounding a Steel Plant. My father was originally a lawyer. At Burnpur he was to look after the legal matters of the Steel Company. I had been seeing the factory from the time I could understand anything. I had relations there who were working in the factory. I was brought up in an atmosphere where Engineers and Engineering were everywhere. After I passed Matriculation, I had the aim to go for Engineering and I went to study Intermediate Science which was required for studying Engineering. Although there was no compulsion put on me by the family, but the trend at that time was that most of the students either opted for Engineering or Medicine so that one could get a job easily after passing out. I was the eldest son of the family and I had to get a job to look after my family as soon as possible. Thus, I went to study Engineering.

Your question was also which branch of Engineering I had chosen and why. My father's friends at Burnpur were Civil Engineers. They advised that I should not study Civil Engineering because they thought Mechanical Engineering would provide a better future. Then I tried to get admission in B.E. College. At that time it was a tough competition. First, one had to appear in Entrance Examination of the College and then face an Interview Board. At the interview, the then Principal Mr. Miller asked me why I wanted to become an engineer while my father was a Lawyer. I said that the present trend, as I had seen, was that most of the students were opting for Engineering. He said that Engineers earn more money than Lawyers that is why I was choosing this line. But I was admitted to the college. I opted for Mechanical Engineering. After joining, I found that in B.E. College most of the students took Civil Engineering. 40 students were in Civil branch and only 20 in Mechanical. B.E. College was basically a Civil Engineering College, C.E. College. Later it changed its name to Bengal Engineering College and divisions like Mechanical, Electrical, Metallurgy were added. After attending some classes I found that the faculty of Civil Engineering was much better. Then I tried to change my line to Civil, but they did not allow it. After two years in the college, during which all streams go through the same course, I could perhaps change my line but I didn't and thus I became a Mechanical Engineer.

AKB : *Do you remember any piece of excellence in teaching or any experience in your student life at Engineering College* ?

ACB : In Engineering College, the emphasis was how to pass the examinations with good marks because loss of a year would hit the family very hard. B.E. College was a residential college and we had to pay for College fees plus Hostel charges. It used to cost us about Rs. 100/- per month. It was a good sum to be spent on one son, for families like ours. I was not a brilliant student like Dr. Bagchi. 50% was pass mark on every subject separately, so it was easy to fail for an average student. The emphasis was thus on how to pass the examination with usual course work instead of going into research work. After graduating in Engineering which I did in 1948 we could get a job at that time at Rs. 200/- per month. Our aim was, therefore, to stick to the curriculum, answer the questions and pass the exams every year.

Since you asked I will mention an interesting experiment done in college laboratory I recollected after 60 years of working life. As a Mechanical Engineer we had to do laboratory work at Heat Engine laboratory. It was very interesting. In later career, I had changed myself from a Steel Plant Engineer to Power Plant Consultant after joining DCPL. We were discussing one day what is the efficiency of a boiler and what were the latest developments in that line. It reminded me how we measured the efficiency of a Loco Boiler installed in our laboratory and a small Steam Engine installed in the same place. We fed a weighed quantity of coal in the boiler to raise steam and then run the engine and measure its break horse power and thus through calculation, output by input, arrived at efficiency of boiler. Much more refined methods are available today through intricate calculations to determine the same thing. Another practical workshop that interested me was the Automobile Garage. In this shop we stripped open automobiles of that period which were not as complicated as they are to day. We used to repair cars of our teachers in this garage and learnt how to do the job apart from the theoretical lessons we had on the subject. I got so interested in cars that immediately after passing my exams and obtaining a job in IISCO, at Rs. 200/- per month I bought a 10 year old car, a Standard 12, for Rs. 2000/- after accumulating some money and with some help from my Dad. In those days cars were mostly imported and only Hindustan Motors had started manufacturing in India and prices were high, both of new and old cars. The situation is different now, old car prices are very low now-a-days. In those days I could repair my car myself except some welding etc. I had learnt driving when I was in college at the lowest allowable age of getting a license when I was 18. Thus I developed a special fascination for automobile engineering.

AKB : *After your graduation what job did you take* ?

ACB : After I finished my final B.E. Exam on 7th June, 1948, I came to Burnpur, my parent's home. Our next door neighbor was Mr. Nripen Chatterjee who worked in Simon Carves, a UK Company, which was building Coke Ovens at Burnpur's factory, Indian Iron & Steel Co. Ltd. Mr. Chatterjee told my father that I can join Simon Carves as they were looking for a young qualified Engineer to assist their Deputy Resident Engineer, Mr. Chilton. I said I haven't got my degree as yet. Mr. Chatterjee said that it didn't matter. So, I went along with him to their office in the factory. Mr. Robson, the Resident Engineer and Mr. Chilton, his Deputy interviewed me and Mr. Chilton offered me the job of his assistant although I had no experience of Coke Ovens. He asked me when I could join. I said I could join any day. On 14th June, 1948 I joined. As I did not have a Degree by then they designated me as Mechanical Assistant which they changed later to Assistant Engineer when my results were out. Thus, after 7 days of finishing my final exams I started working and there was no break until today when I am 85 (now 86) years old.

AKB : *What were the things you learnt at Simon Carves and do you think that helped you later on when you were working at steel plant* ?

ACB : As assistant to Deputy Resident Engineer of Simon Carves I got access to all the units of Coke Oven that were being constructed under their supervision. I was overseeing Civil & Structural Engineering work, Refractory work, all from zero level. I was associated with whatever construction was going on in this area. While I was there a Bengali gentleman named P. Sen known as Belu Sen joined from UK as Progress Engineer. His duty was to follow the progress of the work, expedite and report. He did not have any designated assistant. Belu Sen used to sit in the same hall where I used to sit. He was not a hard working person but he had to make progress reports etc. He asked me since I did not have enough work for Mr. Chilton, if I could help him in his work ? After obtaining agreement from Mr. Chilton, I started working for him also. My association with his work of looking after the progress gave me further opportunity and access to knowledge about all the units of the Coke Oven plant under construction. The Coke oven complex is not only just Ovens. It starts from receiving of coal, crushing it, storing and blending it, further crushing and then storing in overhead Bunkers. From there coal is fed to the ovens and after coking pushed out of ovens as coke for feeding into blast furnaces through Coke handling plant, which consists of crushing, screening, intermediate storage and finally feeding the Blast furnace through skip car. In addition coke oven plant has an annexure called by product plant, which handles the byproduct gases that come out of ovens and make it

into different byproducts and fuel gas for plant's energy supply. This experience of mine at Burnpur became very handy when I came to Durgapur Steel Plant (DSP) as General Superintendent in 1968. DSP had a serious problem during this period with their Coke Ovens. Coke is an essential material, along with Iron ore and limestone for making iron in Blast Furnace. The iron is converted to Steel which is rolled into usable products. This is a chain operation. Any breakdown of any link in this chain breaks down the entire production of the plant. That happened when coke production in DSP was badly affected mainly due to bad operation and maintenance of Coke ovens. The production fell to a very low figure. The then General Manager of DSP, Mr. R.K. Chatterjee was stripped of all powers of GM and a Director-in-Charge was appointed. Mr. Ashok Banerjee the then GM of Rourkela Steel Plant, was given this additional job of DIC, DSP. Mr. Ashok Banerjee later became Chairman of Hindustan Steel Ltd. and then retired from Govt. as Governor of Karnataka. R. K. Chatterjee eventually had to leave. The Chief Superintendent of Coke Ovens, Dr. Datta was also sacked and the General Superintendent, C.S.N. Raju was transferred. My story starts now. My experience of coke ovens in Burnpur helped me when I came to Durgapur. At this juncture when they made this reshuffle, HSL appointed me as General Superintendent of DSP to replace Mr. Raju the Plant's main illnesses were in Coke Ovens and also in labour relations. They brought an army officer, Major General Wadhera as GM and my colleague in CEDB Mr. K.C. Mohan as Chief Superintendent Coke Ovens. To elaborate this story a bit more, I was Deputy Chief Engineer of CEDB at that time and I had very little experience of plant operation. The Chairman of HSL insisted that I take the job. General Superintendent is the boss of entire plant operation. It was a very bad time 1966 – 68, there were labour and political unrest, strikes etc. in Bengal. However, somehow I could manage.

AKB : *What did they do wrong so that coke ovens were damaged* ?

ACB : As I explained earlier, a Coke Oven Battery is a bundle of Ovens, may be 40 of them, made of refractories, held by Steel structures on two sides and Concrete buckstays on the other two sides, also having steel plates and tie rods in longitudinal and cross directions. Each oven has two doors, one at ram side and the other at coke side. These doors have to be opened, cleaned and closed after each pushing and charging of ovens, and made completely gastight. Any gas leakage will cause burning of gas at these doors, causing the refractory binding steel structures to bend. When that happens, the refractories become loose and damaged, which result in gas leakage to flue, sticker oven, and ultimate crumbling of refractories and structures. Hot repair is done but ultimately the entire battery has to be rebuilt. Till then there is loss of production. Bad

maintenance and operation practice result in such eventuality. Therefore, the bosses were held responsible and replaced.

AKB : *You had to replace many of the refractories.*

ACB : Yes. We did partial hot repairs and then built new batteries. In addition to that, we had to find if there were other technical reasons of failure of ovens, or shorter life of ovens. We considered experience of other steel plants of HSL and studied the entire operation from designer's point of view. Mr. Mohan, being a designer, was helpful in this study. Both of us after some time returned to CEDB, Ranchi. Mohan, who was my successor at CEDB, ultimately left MECON as its Chairman and Managing Director some years later.

AKB : *How did you leave Burnpur and join CEDB ?*

ACB : At Burnpur I was working with Simon Carves until the no. 7 Battery of Coke Ovens was completed. As Simon Carves left, IISCO offered that we could leave the company or get transferred to some other department of the plant. I applied elsewhere and got a job at Damodar Valley Corporation at Maithon as Assistant Engineer. They were building a Dam and Hydroelectric Power station there. But at Burnpur my father fell ill, and I could not leave Burnpur to take this job, as in that case I had to maintain two establishments. I was not married but we had a big family of cousins and relations along with my mother, two brothers and a sister all dependent on my father's income and when he had to retire, on my income. I had no option but to accept a job in another Department of IISCO at Burnpur. Engineering Design was my favourite. I joined their Design Office as Senior Draftsman, the highest position of a second staff in that office. I was offered this position as I was in the same grade when working in Coke Ovens. They did not offer me the First Staff position as Engineer. This was 1952 and Burnpur factory was dominated by Englishmen. There were three types of staff, Muster Roll, the workers, Second Staff, the Babus and First Staff, foreigners and those Indians they liked. Some time later I applied for First Staff position and was also called for interview. Unfortunately, I had no one in high position among my relations to back me for the post. So I remained a Second Staff until I joined Hindustan Steel Ltd. at the end of 1954. It was a Public Sector Company and I could impress the interviewers and got selected in a reasonably good position.

At IISCO, as a Senior Draftsman, of course, I was also benefited because I had to work on the Drafting board. I got a lot of opportunities. I was the only qualified engineer among the draftsmen of this office. There were three Englishmen in this office, Mr. Evans, Head Draftsman, Mr. Teeg, Chief Project Engineer and Mr. Norton a Project Engineer from ICC. Finding me as a young engineer willing to work hard they often gave me interesting jobs which required not only drafting skill but also knowledge of designing which other senior

draftsmen could not provide. I got the opportunity to do both, Designing and Drafting under their guidance. I worked in this position until 1954.

Then an open advertisement came out from Hindustan Steel Limited, the first Govt. Steel Plant to be erected at Rourkela with the help of Germans. They were looking for engineers experienced in Design of steel plants and allied industries, to be first trained in Germany and then placed at Rourkela. I applied for the job and again being a Second Staff at Burnpur, it became handy as I did not have to apply through proper channel. The application of First Staff engineer of our office (only one) was not forwarded. I got the interview call, attended it and got selected (in1954). We were appointed as Trainee Engineers and sent to Germany. At that time there were only two steel plants, Tata and Burnpur. From Tata came Mr. K. M. George, and R. P. Sinha who later became successive Chiefs of the organization built in India and I succeeded them. We joined at Duisburg, Germany (the company formed by Krupp-Demag) along with other Indian engineers recruited from Germany, UK and USA who were working in those countries. That is how I came to HSL.

In Germany I opted to work in Demag AG in Duisburg. Others joined Krupp at Essen depending on specialty. Demag had a Design office for designing all types of Steel Plant equipment. They had also a factory where they got the designed equipment manufactured. Design office had many divisions like Blast Furnace, Steel Melting Shop, Rolling Mills etc. I had chosen to work at Steel Melting Shop design office and learnt to design various equipment required to design such shops.

AKB : *Tell me a little about your German experience and then after joining CEDB.*

ACB : The idea of Hindustan Steel Ltd. was that they would become self-reliant in building Steel Industry. The starting point was to have the in-house capability to design and then to acquire the capability to manufacture equipment, and then that of construction and running the plant. Young engineers were appointed from all specializations and were being trained in Germany. Hindustan Steel appointed a German Consultant, Indien Gemeinschaft Krupp Demag (IGKD). They were to Design and build Rourkela Steel Plant first stage as Consultant. Their job was to be taken over by our design group formed into an Indian Organization, after the first stage was completed. In the meantime, we were supposed to work with them to learn their job in Germany and later in Rourkela. Indian Government also thought of self reliance of the second stage, i.e. manufacture of equipment. With this view they built Heavy Engineering Corporation, Bharat Heavy Electricals and other enterprises. Starting point of manufacture is also designing. Thus, there also part of our group was involved.

To learn operation of plant, young engineers were deputed at operating plants in Germany. The design and construction of Rourkela Steel plant did not start when we went to Germany. So, we worked for projects to be built in Japan, Europe etc. We were working along with other German workers. The agreement of HSL with Germans was that we would work for their company for any project they had in hand and our salary would be paid by Krupp-Demag in return. Thus, we learnt to work on actual projects, not theoretical ones, as our drawings were used for actual plants. With some background knowledge acquired at home, we could contribute to their effort and also learn. We could not speak the language, that was our drawback.

AKB : *Did you learn German* ?

ACB : Yes, we learnt German. They arranged a language class to be attended after our working hours. But it could not be learnt overnight. There were some people in the office who could speak English. They were very helpful, furthermore the language of drawing is same everywhere.

The next step – having spent some time in Germany, in 1956 we were sent back home gradually, first the Design people and then those who were meant for operation. As the Rourkela office was not opened as yet, the first batch of designers, K.M. George, R.P. Sinha, myself and Kurien John were sent to Calcutta office of Hindustan Steel Ltd. at Fairley Place. We went out in the first batch and came back first. After about six months, we were sent to Rourkela. During my stay in Calcutta I got married. At Rourkela, each of us was allotted one single bedroom house. Both the Factory and the Township areas were almost open fields as construction did not start. A Department was formed named Technical Adviser's Branch, headed by a German named Dr. Kliner as Technical Adviser (T.A.), two Deputy Technical Advisers, Suku Sen (famous in Tata and Burnpur) & D.V. Krishna Rao from Bhadravati Steel Plant of South, one Assistant Technical Adviser, K.M. George our colleague and the rest of us assisting them as Project Engineers of various Plant Units. I was Project Engineer of Steel Melting Shop division. It so happened that after some time Pandit Jawaharlal Nehru visited Rourkela and I had the privilege to show him what was happening in Steel Melting Shop area and he shook hands with me. I still have a photograph with him. The other areas of plant – the Rolling Mill, were shown by Suku Sen, Blast Furnace by D.V.Krishna Rao, Coke Ovens by K.M. George. At that age 30/31, it was a good experience to be introduced to the first Prime Minister of India.

After a few units of Rourkela plant were constructed and commissioned, on First April, 1959 an organization named Central Design Bureau (later named Central Engineering and Design Bureau CEDB) was formed headed by K.M. George with

his Deputy R.P. Sinha. We were heads of different Divisions assisting them designated as Senior Design Engineer, Design Engineer etc. The numbers of engineers to start with were 13. Only one unit of the plant, the Coke Oven had been commissioned by them. We started taking over residual responsibility of the German Consultant, IGKD slowly. The then General Manager of Rourkela was Mr. Ganapati. He wanted to light up Blast Furnace of Rourkela before that of Bhilai Steel Plant. IGKD was against it for technical reasons.

He was furious and ultimately Blast Furnace of Rourkela was commissioned one day before that of Bhilai. Perhaps, the incident resulted in a better relationship of our Department with the GM. Thus, the Indian Consultant company was formed, named at that time as CEDB as part of HSL which became an independent company named MECON when SAIL was formed.Going back to IISCO days at Burnpur – they made so much difference between the First Staff (Covenanted) and the other staff that the rule was that if anybody at any time of his career was involved in any movement against the company like strike, lock out etc. then his name would go into the black book of IISCO management and he would never be considered for any senior post. That happened in my case. At that time, there was a Union leader named Abdul Bari who was also leader of Burnpur and Tata Unions. There is an open ground in Burnpur named after him Bari Maidan. After Abdul Bari accidentally died, his place was taken by Michael John. Some of us thought that John was not looking after the interest of workers, instead he was helping the Company management. So an action committee was formed. Drawing office staff joined the action committee. Although I was the youngest of all, I was chosen by the staff to be their spokesman. Soon after I joined, perhaps in 1951, there was slowdown, and strike in the factory, followed by lockout declared by company. We were locked out being associated with action committee. People could not carry on for long without job and salary. So the action committee surrendered and asked all to join. The Company lifted lockout but kept their right to keep the so called leaders out of employment and take in people of their choice. Mr. Hunter, our boss came to the gate and took all the staff except myself and Amulya Mukherjee, almost my father's age. When our colleagues went to the office they were told that we will be coming later. But at 4 PM when we didn't come, all the staff returned their special pass to Mr. Hunter and told that they would not come from next day unless we two were admitted. Next day, Mr. Hunter came to the gate with two additional passes one for me and the other for Mr. Mukherjee and we all went in. Thus my name was in the Black list. Mr. Hunter told me that I had no future in this company. I was in the highest grade of second staff and if I continued there I would retire in the same grade. It was an irony that as Director SAIL when IISCO was acquired by SAIL I was a member

of their management committee and visited IISCO to see how it was being run, when Arobindo Ray was its head.

AKB : *Industries mainly fail because of faulty management. Tata could survive because they maintained a good employer–employee relation. Biren Mukherjee was quite unfit to run such a big thing as Martin Burn. When I was doing my Ph.D. I had studied the speeches of both JRD Tata and Biren Mukherjee. JRD Tata was statesman-like in his speeches, the steel plants were badly overworked and they needed modernization, they needed money for that, if the Govt. gave us money we will be able to do it. If the Government does not give us money and if India needs steel then we will help govt. by producing more steel. Biren Mukherjee, on the contrary, said the government was the only trouble maker. They are not helping us, the country is going to ruin. So, mostly it is the caliber of management and their incapability that is responsible for that quandary.*

ACB: Coming back to Rourkela :– Rourkela had a pioneering role in Steel technology development. Steel making technology is a very old technology, it developed by evolution slowly, but there was hardly any sudden change to a new technology until LD process was adopted in post war Europe. In old days Steel was made in Open Hearth Furnaces and in Thomas Converters. Open Hearth process was time-consuming and Thomas steel was not acceptable for all purposes and the process was also wasteful. Burnpur and Tatas modernized their steel making process by adding Duplex converters but it was a wasteful process and created lot of pollution. A new development came up in Germany and Austria called LD process or Basic Oxygen Furnace (BOF). LD stands for either Linz-Donawitz process or Linz Dusen Farfahren. Two plants in Austria were pioneers in having this technology one at Linz of Voest, and the other at Donawitz. (One of the Directors, Dr.Schaden of Voest told me that it was a Long Discussion Process thus LD.) Wherever he sold the process, in India and Japan he had long discussions with the authorities to build up their interest. In later years one will not find a single steel plant that does not use LD plant all over the world. Hindustan Steel had the courage to accept this revolutionary process, of course after lots of debate and experiment. Tata was at that time going through their modernization programme and first they agreed to accept this process and share the royalty payment with HSL but later backed out and had put old Open Hearths in their expansion project. Bhilai and Durgapur came after Rourkela with Russian and English help, but both adopted Open Hearth process as in those countries they had no experience of LD process. Life of refractory lining in converter is crucial to the process. Refractory lining then were made by Dolomite which in later years changed to much better materials. Before adopting the process, HSL sent Indian Dolomite to Linz to test in their Converters, to see how they behaved. Having been satisfied with the performance HSL agreed to go ahead.

Further, Rourkela did not go for 100% production by LD. There were debates and ultimately the final decision was to make 75% by LD and 25% by Open Hearth. Rourkela took this bold decision when there were very few, may be four such plants in the world using LD that is why LD process could be tested in India for making steel with Indian raw materials. No other steel plants in India, TISCO, IISCO, Bhilai, Durgapur adopted this process even in their expansion projects until much later. The first plant in India producing 100% steel by LD process was Bokaro.

I found while working in Demag that this was something new that was coming up. At that time there were very few designers who could design and engineer LD plant. Demag gave me an opportunity to learn it. I had taken part in the discussion in India when the order for Steel Melting Shop with LD and Open Hearth was finalized. Unfortunately, Demag did not get the order, Voest got the order for the LD part and Krupp the OH part. I had visited Russia and had seen their LD plants there (they call it Basic Oxygen Furnace so that they do not pay royalty) before we adopted the same process in Bokaro. First stage of the plant had 100 ton capacity converters and second stage had 250 ton converters. Later it was found that 300 ton was the optimum size of the Converter, considering all aspects. Answering AKB's question, I did not work in Bokaro but for some time I was their Chairman of the Board, CEDB was consultant for knowhow agreement with Gipromez of Russia for Blast Furnace and Steel Melting Shop Converters, for tall Coke Ovens with Giprokoks of Russia and for Rolling Mills with United Engineering of USA, SMS of Germany and for Converter gas cleaning plant with a French company Crouset Loire.

Going back to training arrangement with the Germans for Rourkela, Hindustan Steel's agreement stipulated that we would work for German companies where we would be posted, like any other German engineers and we would be paid a fixed salary per month by them. This was supposed to meet our expenses in Germany although they provided a subsidized hotel accommodation for us. This arrangement of working for them, enhanced our prestige as we were contributing something to them instead of being on their charity. Hindustan Steel paid us 80% of our Indian Salary at home. If this part was not given to me I would not have been able to go to Germany leaving my family here. It so happened that Germans were short of trained engineers and it was boom period for their rebuilding programme after the war (1954). They used to work 5 and a half days per week and often half a day as overtime on Saturday. We were offered to work extra if we wished, and earned extra remuneration.

After return to Rourkela, we took over from the German Consultant and organized our Design office, to start with 13 Engineers on 1st April, 1959. More joined from

India and others, who were sent to the USA under Ford Foundation or other plans, were taken in. In the meantime Engineers were sent from Bhilai to Russia for training under Bhilai Steel plant's agreement. They, on return, formed an office in Bhilai. Later, this office came under the central office of CEDB. Engineers for Durgapur Steel Plant which started a little later were trained in the UK under their agreement with HSL and the UK Govt. After completion of the first stage by British group, for the second stage expansion CEDB opened an office in Durgapur and some UK-trained Indian engineers joined us there. Under Colombo Plan, four(4) British Engineers joined us- one for Civil, one Electrical and 2 General engineering. One of them was posted at Durgapur as Resident Engineer and others at headquarters of CEDB, first at Rourkela and then at Ranchi. I was transferred to Durgapur as Deputy Resident Engineer.

Durgapur Steel Plant was to be expanded to 1.6 million ton from 1 million ton capacity per year. At the same time, it was decided that Rourkela would be expanded to 1.8 million from its first stage of 1 million ton capacity and Bhilai to 2.5 million. CEDB's first job was to prepare Detailed Project Reports for these two expansions. Rourkela's job was easier as we were involved in the first stage. We prepared the report sitting in Rourkela. For Durgapur's report it was decided that a team would be sent to the UK who would sit with the original designers of Durgapur plant and prepare the report there. This method had an advantage that the report was prepared quickly but more or less the report represented the views of the original UK designers. Any snag in their first design remained unrectified. During later period of operation at 1.6 million ton stage when the plant could not produce its rated capacity, the basic issue of original design had come up.

At that time, Government had an UK Consultant named International Construction Company for all plants of HSL and IISCO. Our report for Durgapur and Rourkela expansion were sent to them and they approved it with very minor comments which were incorporated. I must admit that at that time we were all young and had much less experience and was very much guided by British engineers for Durgapur plant expansion and mistakes could have been committed as British did not have much experience of running plants in India. For Rourkela, we were more knowledgeable because of our earlier association with the first stage plant. Durgapur's construction was not faulty as was often told, as the suppliers had supplied and built the plants as per specification prepared by us. Mistakes were elsewhere. Say, for instance, for steel making to get additional production we had added one new Open Hearth Furnace and we added extra facilities in existing furnaces to produce more with improved

technology. This was perhaps an ambitious programme which did not materialise along with other pitfalls of the plant.

While the expansion project was going on in Durgapur I was transferred to Ranchi, headquarters of CEDB as Deputy Chief Engineer as the then Dy. C.E., R. P. Sinha took over from K.M. George the then Chief Engineer, who was transferred to Bokaro as its Managing Director. After working for some time there I was transferred to Durgapur Steel Plant as its General Superintendent, whose position is next to the Head of the Plant, General Manager. This was 1967. I was not keen to take this position as I never liked operation job, but the then Chairman, M. S. Rao insisted that I should go even if it is for six months. He wanted to solve some internal personnel problem. Mr. A.N. Banerjee who was then G.M. of both Rourkela and Durgapur and succeeded M.S. Rao and insisted that I continue at Durgapur and promised me that he would make me next GM, in which post I was not interested as I did not like operation job. But I had to stay there until 1968/69. Then Mr. A.N. Banerjee was transferred to Delhi as Secretary and Mr. K.T. Chandy took over as HSL Chairman.

AKB : *Tell me about the dramatic incident when the workers were about to kill the union leaders. Did the management behave well with workers because they trusted you*?

ACB : Rivalry between two unions often led to such incidents. Such an incident happened when I was in Durgapur. It was my good fortune, or the workers were kind to me, that I was never Gheraoed in Durgapur during those troubled days of Gherao in that area. Lots of officers of Durgapur Steel Plant were gheraoed and the worst one in my experience as G. S. there was, when a worker was killed in an accident when a crane hook fell on him. It is a long story how that gherao was tackled and resolved.

Mr. Chandy after becoming Chairman of HSL felt that CEDB has to grow. CEDB was then headed by two persons Mervyn Silgardo and Kurien John, two assistants of mine. Mr. Chandy decided that I should go back to CEDB as its Chief. He asked me to select some one in Durgapur to take over as GS from me in Durgapur and that I should come back to CEDB.

At that time CEDB was a small organization, having no importance. Its first Chief, K.M. George, left to become M.D. of Bokaro Steel, its second chief, R.P. Sinha, left to become GM of Rourkela Steel Plant, myself was sent to Durgapur as G.S., CEDB was working for three steel plants of HSL only. For the first stage of Bokaro, Dastur Co. as Consultant, worked with the Russians. For the second stage, Mr. Chandy and myself had put our claim for consultancy. (Bokaro Steel Plant was an independent Co. under the Ministry, not in HSL). We went to Delhi and explained to the then Secretary, Mr. R.C. Dutt that we had a lot of plant experience etc. etc.

and the job of Bokaro expansion should be given to us. It was agreed and we got the job, the first job outside HSL. But I told Mr. Chandy that it would not be possible to do the job with the existing staff of CEDB. It was also not possible to recruit new people and train them within the short time available. Then Mr. Chandy said that you take 100 experienced Engineers from 3 Steel Plants who would be willing to join CEDB. I said if I asked the GMs to part with 33 engineers from each plant, they would give me those whom hey want to get rid of, but I want the best ones. Then he said that he would ask the GMs to send all applications to me without screening, everyone should be free to apply. I received about 300 applications and we chose100 as I promised and they got merged with the core engineers we had. This is how we mobilized CEDB engineers.

Mr. K.T. Chandy became the Chairman of Hindustan Steel Limited after Mr. A.N. Banerjee, as I recollect, in 1968 or so. He had a vision that the Steel Plant Design Organisation created in the public sector in fifties by the then Nehru government, as a necessary tool to become self-reliant in steel industry, the backbone of all industries. The basic requirement of a Design Organisation is its Designers, men not machine as in other organisatons. He therefore, wanted to hasten the development of the Design office helped me to strengthen the manpower by getting good trained men from our plants. Then men must have jobs to perform. So he arranged jobs for the organization by getting the expansion project of Bokaro.

Development in design of any industry is a continuous process and therefore initial training, education, databank all become obsolete after sometime. Research in heavy industry is costly and time consuming. Therefore there was a stress on buying know-how license agreements with foreign countries during Mr. Chandy's tenure in HSL as Chairman.

Although he was not a technically qualified person, I believe, while discussing technical matters he would go through the intricate details to understand and then in his own simple language would explain it all to the Board Members, as to what we were looking for. In his time, a Board Meeting would start in the morning; discussions would continue after lunch and would be finished after dinner. I have attended other Board Meetings which lasted for only the morning or half of the day and was finished at lunch. There was hardly any opportunity to have detailed discussions on the Agenda and decisions taken. Everyone has his own style of Management.

The other boost that CEDB/MECON got was from the Minister Mohan Kumarmangalam around 1972. He also had a vision to develop the public sector Steel Design Organisation. When SAIL was formed he made CEDB which was

so long a part of HSL into an independent public sector company named MECON, myself being Chairman of the Board in addition to being Technical Director of SAIL and K.C. Mohan as Managing Director. Thereafter, MECON could work independently and became a very big organization.

AKB: *Tell me about American Technology*

ACB: Today, in the Globalised World, it is not very relevant. We can buy anything from anywhere and we have no dearth of foreign exchange. In those days we neither had enough foreign currency resources nor was the required equipment manufacturing technology easily available. The story started – desire to become self-reliant – not to depend on any country, particularly for Steel and Heavy Industries, those being the backbone of a country. We have all the raw materials in the country for making steel but there were not enough steel making facilities. The British, before our independence, did not allow the growth of steel industry, like many other industries in the country in order to sell their products here. I have seen joist with mark "Dormanlong" in old houses of Calcutta. After independence, One of Panditji's theme was to become self-reliant in Steel and Heavy Industries. It is not enough that we buy steel plants from abroad and put them here and there. We have to learn how to make our own plants ourselves in the country. In order to do that we have to design those plants and then manufacture them. To start with the Consultant Engineer has a function for putting up integrated Plants like Steel, Power etc. A Consultant has information from manufacturer of various equipment, they do not design those equipment themselves always. They put the different units in suitable places in the layout and interconnect them with supply of water, power, gas etc. then design the foundation and structures to put them in position etc. and supervise the building up of the whole plant. To manufacture any equipment one has to prepare manufacturing drawings. Some foreign companies refuse to part with their drawings. If you always buy the equipment or plant, you become dependent on them for all time to come. They can ask high prices or put various conditions. One such classic example was Coke Ovens. The Refractories of Coke Ovens are of very intricate design.

These are of complicated shapes. They were developed over the years by specialized Coke Oven builders like, Simon Carves, Dr. C. Otto, Didier, Karl Steel, Coppe etc. Like other units of Plant, we wanted to build Coke Ovens ourselves. We approached Dr. C. Otto with whom Rourkela had a license agreement, paying royalty for every oven we build with their design. They did not like to part with their design of refractories. They would give us the designs of binding structures, gas lines, trestles etc. Their then chief Von Rando said that Refractory design is our bread and butter. We will not part with it. We can give

you such knowhow which will replace our draftsman's work. I said thank you we do not want your technology. At that time a Belgium Company named Coppe was selling their technology and we bought their knowhow, developed it, Indianised it and built a battery of 40 ovens at Durgapur with their design. That design was thus owned by CEDB. We were however not fully satisfied with Coppe design. It needed further development. But development with further research would have cost lot of money. Soviet Union was ready to part with their drawings and design. We made agreement with them, their Design wings Gipromez and Giprokoks for providing knowhow for Coke Ovens and Blast Furnace. About 40 engineers of ours were posted in Russia in their offices and a number of Russian Engineers headed by Mr. Gara were posted at CEDB's office in Ranchi. Rolling Mill technology was not so advanced in Russia. So we went to the USA, a company named United Engineering and later to Schloman of Germany for knowhow of Rolling Mills. Our conception of having knowhow is not purchase of bunch of manufacturing drawings to make the equipment but we must know the basic calculations on which those designs and drawings were based. We must have Knowhow and also Knowwhy. United Engineering and later Wean United provided us all drawings and basic calculations of how the mill equipment was designed. We had sent our engineers to work in their Design Office. We signed a 10 years' agreement with a yearly royalty and a percentage of sales value of the equipment. It worked satisfactorily and we built a few mills, large and small with the knowhow. I mentioned earlier our knowhow agreement for Coke Ovens, Blast Furnace and Steel Melting Shop were signed with Soviet Union Companies.

(The interviewer acknowledges the assistance of Gorky Chakravarti in finalizing the text of this interview)

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