

IBM 1800 Real Time Process Control System in India – a History

In India IBM obtained orders for three IBM 1800s in my time when I was a Systems Engineer operating out of the Delhi Branch office. IBM India had 4 Branch offices, in Bombay (now Mumbai), Delhi, Calcutta (now Kolkata) and Madras (now Chennai), controlling respectively the West, North, East and South regions of the country.

1. IBM 1800 for Data Logging in a Thermal Power Plant

The first order was for Data Logging in a Thermal Power Plant. The twist was that the power plant was being constructed in Malaysia (it was called the Tuanku Jaffar Power Plant) but the entire instrumentation and data logging system was contracted to an Indian company (owned by the Govt of India) called Instrumentation Limited Kota (ILK). They had been enterprising in winning this export order against international competition. ILK manufactured instruments that are used all over industrial plants to sense physical operating conditions (temperature, flow, pressure, current, electrical contact position, etc.). The instruments were originally of Russian design, but ILK had by then re-designed and improved many of them with indigenous expertise.

Kota is in the state of Rajasthan in NW India, and was once a princely state ruled by the Raja of Kota. It was later promoted by the state government of Rajasthan as an industrial town. It had a rayon plant, a fertilizer plant, a nylon plant, the RAPP nuclear power plant (an Indian adaptation of an original Canadian reactor), and this instrumentation company, which had ordered the IBM 1800. Kota was also famous for a variety of saree called the Kota masuriya saree.

IBM sub-contracted with ILK to supply the Data Logging system, for which ILK had drawn up the specs in consultation with IBM, keeping in view the IBM 1800 capabilities. This was in 73-74. The senior engineer from IBM involved in the project was Mr Kanti Singhi. He was trained on the IBM 1800 in UK, and upon returning trained me, without benefit of an actual machine. Two IBM customer engineers were also trained in UK. I did not see my first IBM 1800 until the ILK system landed in Kota, complete with a store of spares, because the customer was going to be trained to maintain the system, for it was specified in the contract with the Malaysian customer of ILK that ILK would maintain the power plant data logging and instrumentation system for a period of several years and then train the Malaysians in turn. It was a big configuration, with lots of Digital I/O,

Analog I/O, and 12 dot-matrix printers for periodic logging situated at different places in the plant.

Mr Singhi and I trained 4 very capable engineers of ILK, 2 were senior chaps, and 2 others were going to be doing the programming to satisfy the data logging specs. We tried to put forward the use of specification-based generation of data logging programs with a package whose name escapes me now, but it was a kind of fourth generation language for the 1800. As it turned out they were more impressed with the flexibility of real-time Fortran, and the enormous number of sub-routines in MPX Fortran for performing Digital I/O, Analog I/O, setting programmed interrupts, manipulating watchdog timers, etc. We also taught them the Assembly language, identical to that of the IBM 1130 of which there were quite a few installed in India at universities. The IBM 1800 is actually identical in hardware architecture and cards, etc to the IBM 1130, except that there are specific cards for interfacing to the world of physical signals, and a completely different real-time operating system. The customer was very demanding. Mr Rajabahadur of ILK was the Project Manager, and we often had to get a earful from him, but humored him and did the best we could. Ultimately, he came to respect our commitment to making his installation successful. At ILK we would frequently meet with the General Manager (the big boss of the whole company's manufacturing unit).

It was an overnight trip by train from Delhi where I stayed and we used to make the trip and stay for a few days to a week every month. We stayed in the Raja of Kota's summer palace, Brij Raj Bhavan, on the banks of the Chambal river. This was one of the most graceful hotels I have lived in. Waited on by the retainers of the Raja, occasionally sharing the ample rooms with foreign tourists, but more often than not alone or lodged with my fellow systems engineer, Kanti Singhi, I have fine memories of this enchanting place. Peacocks would dance in the garden as we sipped a chill glass of beer seated under a spreading tree and looking out over the river from a height of a couple of hundred feet. That verse of Omar Khayyam would come to mind; paradise seemed not far away. However, there were times when paradise could turn into a devilish ambush. One such was the night Kanti and I returned from a late night Hindi movie in the walled city, a far cry from the industrial plants we visited by day on the outskirts of the city. We had barely turned into the gate of the hotel, getting out of our 3-wheeler auto-rickshaw, when a huge black animal made for us. That was the Raja's great Dane, which we saw tied up during the day. He was let loose at night in the

compound. We should be mauled in a short while, I thought. Our knees quaked and we were paralyzed. The dog barked in the rumbling deep bass of that species but did not molest us, strangely. The servants of the Raja came to the rescue. I recall Kanti poured out a stiff one when we reached our rooms. He was a gentle man, very good humored, and it was he who urged me to take back a saree for my wife when I returned from the trip.

Over a period of one year the system was installed at Kota and the application software was fully developed. We from IBM were there to consult and guide and solve problems: mundane things such as how to calibrate a temperature sensor, how to avoid contact bounce in digital I/O, how to multiplex several digital I/Os with one ADC (analog to digital converter), and how to find the sequence of contact closures or openings when a trip occurred in the power plant. The actual coding was done by 2 engineers of ILK. I should mention this was in the days when IBM service was included in the price of the machine, so none of our visits were separately charged to the customer.

The IBM 1800 was shipped out of ILK to Malaysia some time in 1975-76, the date escapes me now (notebooks of mine in India, which I still have, will tell the tale), after a thorough checkout. ILK engineers also moved to Malaysia to fulfill their support contract. The IBM 1800 went through its acceptance test, hardware, functional and application oriented – and there were no problems.

2. IBM 1800 for Optimal Mixing in the LD Process for a Steel Plant

The second IBM 1800 order was obtained by the Calcutta branch office which dealt with the 2 million tonne Bhilai Steel Plant in the state of Bihar, owned by the Govt of India and built with Russian assistance. The application the 1800 was meant to do here was the on-line calculation and control of the exact charge of minerals to be added to the LD furnaces in the steel plant. LD stands for Linz-Donawitz, a steel process invented in Germany, much more modern than the old Open Hearth furnace process that takes 7 or 8 hours per charge to make steel. The LD process goes much faster and is more heat efficient. You blow oxygen at pressure through the mixture of molten iron to oxidize the excess carbon and at the right moment you add the just the minerals needed (steel scrap, small quantities of other elements) to make the type of steel desired. But it is all over in 20 minutes or less. The composition in the LD furnace is tested continuously by optical and other means, and when it is just right, the correct calculated

(dependent on the measured composition and the target steel quality) and weighed quantity of elements has to be added. The different input minerals are in different hoppers and they have to be weighed and released at the right time.

It is this last control action that was to be done by the 1800 working in a more active mode, than the first 1800 in India for ILK (that was logging, this was closer to optimal control).

The year was 1975, and I was the only 1800 trained systems engineer left in IBM India, Mr Singhi having emigrated to Australia where he lives to this day (I still meet up with him in India on vacations whenever possible). In turn I trained 2 IBM systems engineers from the Calcutta Brach office, Mr Sengupta and Mr Kapoor, on the IBM 1800. Once again I spent much time at the customer installation on 3 or 4 visits, conducting classes and consulting about their application. I recall they particularly wanted to learn and use the efficient techniques of re-entrant programming, which are fully supported by MPX. The installation support was taken over by Sengupta and Kapoor and they did a bang-up job, as I heard later. Mr Ramaswamy, the DP Manger of Bhilai Steel Plant was the customer person we dealt with; he was more amiable than Mr Rajabahadur of ILK but less of a hands-on man.

3. IBM 1800 at IIT Kanpur

The Indian Institute of Technology, Kanpur (IITK), in the state of Uttar Pradesh is probably the best-known Indian technology institute for computer science. They used to have in the early 70's what was the single biggest computer installation in India under one roof at their computer center, all sky Blue: IBM 1620, 1401, 7044 and 1800. I do not have much to say about this 1800 installation, for, being a top-notch university they were pretty much self-sufficient as far as programming or systems expertise went. I do not recall conducting a single class, though the installation came under my wing, after Mr Singhi left. Besides, this 1800 was never used in a demanding industrial setting but to teach and perform experiments in support of the curriculum in Electrical Engineering and Computer Science. Later IBM tried to sell a S/370 Model 158 or 168 to IITK, but by that time IBM was in disfavor, and they settled for a DEC 10 mainframe.

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I am sorry I cannot tell you the later history of what happened to these three 1800s, whether and when they were retired. IBM closed its operations in India in 1978, refusing to dilute its 100% US ownership. According to a new law in India called FERA, IBM and all other foreign-owned companies were given 5 years to dilute their equity; a mandatory dilution to the extent of at least 25% was stipulated for high-tech companies. Hundreds of other foreign companies like Procter and Gamble, Levers, etc. found no difficulty in doing so, diluting to a much greater extent even, but IBM and Coca Cola refused to comply and left. Ironically, when IBM returned in the early 90s, it came in with about 50% equity, sharing the rest with Tata, a well-known Indian industrial group!