

## Linear Programming - my role at BP

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Note: Everything here is from memory. All of it is from over 50 years ago, and therefore may be unreliable.

I joined the BP Computer Department in BP's Moorgate head office in 1966, with a Mathematics degree from Oxford University. I had not encountered anything to do with computers at Oxford, and I barely knew what a computer was. When asked about the BP Computer Department, I would describe it as being three men and a dog, and I was the dog. One of the three 'men' though was Paula Harris, to whom I reported. Her boss was Des Harriss, no relation and different spelling, but it did cause confusion.

The department was indeed very small at that time, although it did grow very rapidly. Our computer was the Atlas computer at London University. My understanding was that BP had bought the computer for the university's research, with an agreement that BP could use it at night and at other times when the university was not using it. Paula Harris then created a model of the company's world-wide operations, to run on Atlas using linear programming for optimisation.

There were variations of the model for different periods of operation - daily, weekly, monthly, quarterly and annually. Each day, all parts of BP submitted data to be keyed in for the overnight run, and Paula Harris would also submit any changes to the program. I actually don't remember quite what I did at that time, but I think it involved advising and helping with the preparation of data. I certainly had to know how everything worked and what was in each overnight run, because I was often on call overnight to sort out any problems the Atlas operators might have. All data and code was keyed by a specialised head office typing pool into punched cards. Each card was 80 columns by something like 12 rows, and they were stored 2,000 cards to a box. Columns 73-80 were a sort key, so each box carried about 150k to 200k of data. At the end of each day, I also had to load all the boxes of cards into a van and drive across London to deliver them, with operating instructions, to the Atlas team at London University. Someone else would drive the van from London University to BP Head Office in the morning, so that all the print-outs, on large continuous stationery, could be delivered to all the managers' desks before the start of their day. I discovered just how useful the sort key in the cards was on the night that I didn't close the van doors properly, and several boxes of cards spilled out into the street. I stuffed the cards back in, in a bit of a panic, but when I arrived at the university the operators didn't bat an eyelid. They just sorted the cards before starting the overnight run.

A mixed-integer linear program was particularly suitable for the oil industry. Basically, all refinery operations were linear, in that each barrel of crude oil could be refined into certain amounts of various products. The producers would tell the model how much of each kind of crude oil each oilfield could produce, the refiners would tell the model which combinations of products each kind of crude oil could be refined into, and the marketers would tell the model how much of each refined product they wanted to sell, and where. With various other inputs from everyone else (transport, eg.), the model would then calculate each night what every part of the organisation needed to do the next day (or week, month, etc) to maximise profit, and of course there were overall summaries for senior management. The mixed-integer capability of the model was needed for operations that had an integer component, for example you could send a tanker from A to B, or from C to D, or not send it at all, but a tanker was always one tanker.

I was in this part of BP for four years. One day, Paula Harris asked me to make a change to the linear program. I thought the request was curious, because I hadn't done any programming, but I just did it anyway. I think it was in a low level language, not Fortran. The change worked, and soon

after that I was offered a job as technical programmer in BP's Abu Dhabi offshore operation, ADMA. So off I went to Abu Dhabi.