

VILLAGE WATER PUMPS

1. BRIEFING

Jacob Nzande is a student on the M.Sc. Operational Research at the University of Lanton. He has successfully completed his examinations and is now required to carry out a three month project. He had been discussing a project on stock control in an engineering company. Just at that time he received a telex from the Ministry of Manpower in his country of Transbabwe summoning him home. Transbabwe has just emerged from a long war of independence from post-colonial rule. The new government is committed to a rapid improvement in the lives of the majority of the black citizens which have been seriously disrupted by the independence war. Educated Transbabweans are few so that the government has been recalling students as soon as they finish courses abroad.

At first Jacob was quite annoyed to have his plans disrupted and thought of postponing his return. But he then thought that he should take the opportunity of helping his country which had subsidised his education. After discussion with his university tutor he felt more confident that he could find work in Transbabwe which would prove suitable to be written up for his M.Sc. report.

After his return to Ambrosia, the capital city, Jacob was assigned by the Ministry of Labour to Transbabwe Manufacturing Company (TMC). The Managing Director of TMC received Jacob with enthusiasm assigning him to form a trouble-shooting and planning team.

Transbabwe Manufacturing Company was formed by the new government taking over Anglo-Continental Holdings (ACH) which was the Transbabwe arm of a multi-national company. After independence ACH had withdrawn all its foreign managers leaving the company in a very bad state. The government had therefore taken over the company and put in its own managing director. He was desperately trying to rebuild the company. One of the main products of TMC is pumps for village water supply for irrigation and drinking.

The Managing Director has just come back from a meeting with the Minister of Industry who has reported to him on the recent Cabinet Meeting. Rebuilding of the villages and encouragement of agriculture has been given the top priority in order to establish the people's confidence in the new government. One of the key items discussed was the supply of drinking water and irrigation. The Minister of Industry has promised the Cabinet that TMC can carry out assessment and repairs of the present village pumps in two months.

Part of the conversation:-

Jacob I don't think that it will be possible with the present staff of two mechanics in each workshop even if they are fully occupied on the project for two months.

MD Why not? Can you give me an accurate plan?

Jacob Because of the uncertainty of the number of pumps and their state of repair I can only make a rough estimate.

MD Well work full-time for the next two days to make a plan and particularly estimate how we can do the job in two months. I will have to report to the Minister at the end of the week before he goes to the next Cabinet meeting.

2. THE PUMPS

Jacob set out to gather information about the pumps, and searched in Head Office for records before he went out into the field. It seemed that very few records were available as the ACH management has taken them away or destroyed them at nationalisation. Most of his information came from hearsay discussions with long serving clerks.

Between 1961 and 1975 ACH imported all the pumps but then in 1976 switched completely to local manufacture in Transbabwe. The average number imported prior to 1976 was estimated to be 100 per year. It is thought that about half of those never got to the villages but were sold in the small towns for a variety of purposes. The life of a pump with good care is ten years but as the standards of maintenance in the villages is usually poor only a small proportion of the imported pumps would be expected to be in use for ten years.

From 1976 ACT manufactured the pumps in Transbabwe. The production figures are known accurately.

1976	200
1977	100
1978	100
1979	100
1980	200
1981	200
1982	250
1983	250

The type of pump manufactured in Transbabwe since 1976 is an improved version, more robust for village use so its life should be extended. Also the adaption means that very few would be used in the towns. During 1977/78/79 production was only half that planned because of various disruptions due to the war. Now production has reached 250 pumps a year which is the capacity of the present factory. Any increase would need major capital investment.

Jacob was unable to get any accurate figures of the life of pumps based on his enquiries in the Head Office. He decided that he must visit some of the workshops. This meant that he could not complete the report in two days for the Managing Director. He had an extremely difficult discussion before the MD accepted that a report in two days would be of little value. The MD then had to convince the Minister of Industry to allow an extension and in his turn the Minister had to get Cabinet agreement for a postponement.

3. THE PEOPLE

The last census took place in 1971 and, because of the political and military struggle of the last few years it is very difficult to get accurate population estimates. A visit to the department of Demography, University of Ambrosia, produced the following estimates for mid-1981.

Total population	=	6,000,000
the population of the three major towns is		
Ambrosia	=	500,000
Bandara	=	250,000
Cresgi	=	250,000
in addition there are thirty small towns with average populations of 50,000		
	=	1,500,000
there are estimated to be about three hundred villages with an average population of 1,000	=	3,000,000
in addition there are nomadic people in the isolated eastern region		
	=	500,000

Like most developing countries the population is young and growing - 45% of the population are under the age of 15, and the annual growth rate is 2.5%.

So far there has not been the heavy influx of rural population into the towns and cities which has occurred in so many developing countries. The government has stated that it wants to build up the services in the villages in order to prevent rural-urban migration.

Although the government has nationalised several subsidiaries of multi-nationals which were particularly exploitative it is not setting up a completely controlled economy. It is permitting a market economy but with import and investment controls. The government's stated objectives include: the spread of labour intensive industry to soak up urban employment; the production of simple but not luxury consumer goods; the building up of a transport and communications infrastructure; the achievement of self-sufficiency in agriculture, together with the development of villages, health services, etc., to stem the migration to the towns.

4. THE WORKSHOPS AND THE MECHANICS

Jacob decided that it was essential that he visited some of the workshops to find out what the mechanics could do and what they knew about the pumps in the villages.

In each of the thirty small towns there is a workshop with two mechanics capable of the repair and maintenance of the pumps. Major repairs require dismantling the pump and bringing it into the workshop. Few of the workshops had records of the current state of pumps in their neighbouring villages. One or two had some rather out-of-date records of the life of pumps which Jacob thought could be useful. A major repair of a pump takes one mechanic about five days in the workshop if there is an adequate supply of spare parts. Installing a new pump in a village takes about five days.

The mechanics have to divide their time between major repairs in the workshops, travelling to the villages for assessment, and minor repairs. A proposal was made by one mechanic that they should train village maintenance workers. His experience was that pumps were often out of operation for very minor reasons which should not need a mechanic travelling out from the town. He estimated that ten villagers could be trained together for a week up to an adequate standard. Jacob's assessment of the mechanics was that the majority were quite competent and quite highly motivated considering that they had been left very much to their own devices in the past few years with little supervision, limited transport, and, what they complained about most, an erratic supply of spare parts.

Jacob decided to take three of his precious days to make a trip out with a mechanic to some of the villages. He thought that this was the only way that he could get some idea of the real problems that he had to advise on. He was thus able to observe directly the situation, admittedly in a very small number of villages in one locality. But he was also able to draw on the mechanic's wide experience and talk much more openly than they could in the office in the town.

They started with travel to the first village. This took about three hours. Later, work with a map measuring a sample of inter-village journeys showed that three hours was quite a good estimate of the average travel time between villages.

Next, the mechanic carried out a preliminary assessment of the pump, if there was one there. The records were not accurate enough to be able to bypass a village. The assessment took about two hours. The pump may be judged beyond repair and scrapped, or needing minor repairs which could be carried out in the village provided that the mechanic could start off with a full set of spare parts.

Minor repairs would take about three hours. On the other hand if the pump needed major repairs it has to be dismantled and taken on the vehicle to the workshop. If there was time at the end of the day the mechanic would travel on to the next village before nightfall. The situation was too dangerous in most parts of the country for night travel as well as the poor state of many of the roads. The total working time including travel for the mechanics is supposed to be nine hours. Given the difficulties of the work and travel Jacob felt that this was fair. He felt quite exhausted himself at the end of the day. Admittedly he had been outside the country for two years and needed to get re-acclimatised.

If the village had no pump or the pump was scrapped Jacob and the mechanic spent about three hours trying to assess the needs of the village for a water pump. It seemed to Jacob that there must be differences in priorities for allocating new pumps but no procedure had yet been developed.

Overall, Jacob felt that his three days travel had been extremely useful in getting a general feel for the situation on the ground and also for getting some specific estimates of activity times which could be used for a first attempt. Of course, these would have to be revised and updated.

5. MORE ON THE PUMPS

When Jacob returned to head office he was told that a report had been found on the life of pumps manufactured in Transbabwe since 1976. This suggested that for the first five years of life about five per cent of the working pumps failed and had to be scrapped each year. From the sixth year it was predicted that the failure rate would increase linearly and that by the twelfth year virtually all pumps would have been scrapped.

6. THE TASK

Produce a short report for the Managing Director, with technical appendices as necessary, setting out a feasible plan for the project to assess and upgrade the village pumps. Include a procedure for Jacob's planning unit to monitor and control the progress of the project.