

# J.C. HOWARD

## the oxfam sanitation unit in bangladesh

CHAIRMAN: R J HOLLAND

THE CHAIRMAN introduced Mr Howard as a public health engineer interested specifically in developing countries who was effective in the field. The Oxfam sanitation unit was an excellent example of what could be achieved. It looked relatively simple, but anyone with experience of trying to make something simple that really worked and which could be made up by local people in developing countries would realise how very difficult it was.

2. Mr J.C. HOWARD said Oxfam was one of the largest of the British Charities and this year would raise a record £7 million. It had been in existence for 30 years and was one of the larger international agencies involved with relief and development work in poorer countries. Oxfam received very little finance from government sources, the main funds being raised from the British public.

3. Agencies like Oxfam working for the relief of suffering and for development were very conscious, particularly in times of hardship or disaster, of the importance of finding ways of coping with sanitation of large communities. This was an area in which civil engineers would have to stretch their minds much more in the coming years. On his travels Mr HOWARD had seen the growth of slums within cities like Bombay, Delhi,

Calcutta, Dacca, Lima, Mexico City, with immense influxes of people from rural areas. These people who were unable to earn a living in their traditional way from agricultural work were now crowding into the city slums at an ever increasing rate - it was estimated that 600 000 such people had moved into the already crowded city of Dacca, Bangladesh over the past four years.

4. The size of this human problem and the complete lack of basic public health facilities lead to appalling amounts of gastro-intestinal diseases. Sanitation and sewage disposal was a key problem in the health of the people.

5. An extreme example of this problem had been seen in 1971 when there was a sudden migration into India of an estimated ten million East Pakistan refugees. Refugee camps containing up to 100 000 people suddenly appeared. The Indian Government did a magnificent job of coping with the overall situation, but the medical and health problems were immense. Sanitation in many camps did not exist and areas of the camps were thick with human excreta. Cholera broke out as did many gastro-intestinal diseases due to the lack of sanitation and agencies like WHO and Oxfam arranged to fly in I.V. Fluids for the treatment of Cholera cases.

6. Clearly the situation that had arisen was the classic one of the basic preventative measures having not been provided - the inevitable medical work became necessary on a massive scale. Some attempts were made to build areas where human excreta could be contained. This was attempted by building simple embankments and lining these with plastic sheeting to provide a containment area where people could excrete. There were great problems even with the simplest of proposals in these conditions, a great shortage of skilled labour, suitable materials, suitable sites, costs or socially acceptable techniques.

7. Arising from this very alarming and frustrating experience Oxfam decided that there was an urgent need for a sanitation-sewage treatment system that could be supplied on-site ready for immediate installation - a unit that would provide an acceptable place to excrete, and which would hold that excreta in a safe location and treat it. The unit had to be lightweight because it needed to be manhandled in; low-bulk because bulk was costly in transportation; inexpensive; complete with tools etc; capable of rapid installation. The unit needed to be installed on any sort of ground, whether it was waterlogged or not; the unit should not be powered by electricity or require any form of chemical treatment; maintenance needed to be simple, mainly involving keeping the latrine area clean or desludged; and owing to this migrant population which could be moved at any time, it would have to be possible to dismantle the unit and move it with the population. This was an unusual set of parameters.

8. The Oxfam Sanitation Unit was researched and developed and it was decided to use large flexible butyl rubber tanks which were also used for the storage of aviation fuels by the RAF. The sanitation unit could be used with one tank only as a short term measure for sewage containment and it could be used as a long term public health facility by connecting two or more tanks together to provide an anaerobic treatment or condition for the sewage to be held for a determined length of time. These tanks could be added to or replaced quite quickly and had a working life of ten years or more. These tanks could be used to improve ordinary sewage treatment situations such as country hospitals which may already have some internal drainage system but inadequate sewage treatment facilities. The squatting plates which were specially designed for the unit and stacked for ease of transport, were made of fibreglass and could be used both with the unit and external to the unit.

Thus there was a multiple use for the squatting plates and this applied to the tanks as well. They had already connected two of these tanks into a cholera hospital in Bangladesh, which had provided a sewage treatment unit for that hospital which had previously passed all its waste straight into the local river. The flexible tanks of course could also be used for water storage.

9. Microbiologists working with the Oxfam Unit had shown that a massive reduction in cholera could be expected in infected sewage or water that was held in these anaerobic conditions for 8-10 days. It therefore was highly desirable that a flow time or retention time of 8-10 days within the Sanitation Unit would reduce cholera to non-infective levels and there would be more or less total precipitation of the parasites *Trichuris* and *Ascaris*.

10. Mr HOWARD showed some slides of typical camp conditions. A traditional latrine consisted of putting up a simple hessian arrangement and excreta just went into a hole. He then showed slides of the Sanitation Unit which had come about with the aid of many people. The unit was tested at Loughborough University and two years work at Surrey University investigated the effect of containment on cholera-laden sewage. Immediately after, the unit went to Dacca to the cholera hospital where there were 3000 cases of cholera in six weeks. At this hospital prior to installation of the unit, the stools from the patients were sterilised but other contaminated waste from the hospital flowed into paddy fields. Tests taken on the paddy fields showed that the wastewater was thick with cholera.

11. On arrival with the Sanitation Unit the drains of the hospital were blocked and sewage pumped into the unit, where it was held for ten days - the capacity of each of the two tanks was 5000 gallons and a thousand gallons of sewage per day was allowed through. At this hospital project there was no filtration, just anaerobic treatment (the cholera vibrio is aerobic). By using the unit the cholera concentration was reduced by about one thousand fold. The parasites roundworm and whipworm were reduced by over 99%. Mr HOWARD said the medical value of the Sanitation Units must be immense. For example, about 95% of people in Bangladesh had parasites and there were many typhoid and cholera carriers, and the unit could reduce or eliminate the constant reinfection from one human to another by faecal contamination.

12. It was then decided to take the first complete unit into the field and Mr HOWARD showed a slide of one of the units in a camp. On both sides of the unit there were ten squatting plates - one side for males and the other for females. In the foreground could be seen the government-installed pit latrines with concrete squatting plates which all filled up with excreta within three or four weeks and were then unusable due to the total lack of maintenance.

13. Oxfam had continued this project in Bangladesh and there were now approximately forty units installed - and one or two units a week were being flown to Dacca. Each unit cost £2500 ex works. It was estimated that about 50 000 people each day now used an Oxfam Sanitation Unit. The unit had been accepted socially - there had been no objections to using it that could not be met and the users clearly valued the cleanliness and the privacy the unit provided. Although the tanks were vulnerable there had been no wilful damage and there had been a surprising and pleasing interest and responsible attitude by local people. A reasonable supply of water was important for the functioning of the unit and in that part of the world people required and used water as part of their toilet use. The life of the Sanitation Unit was thought to be at least ten years with fair and regular maintenance. There had been no serious engineering problems - four or five tank seams had split - probably due to excessive hydraulic head.

14. One of the current problems was in fact the popularity of the units which attracted up to 1500 people a day to use them which was much above the original design of 500 persons per day. One compensating factor, however, was that not so much water was going into the system as had been assumed at the design stage. It had been estimated at 9 litres/person day (2gpd) on a 500 person loading, giving 4500 litres/day (1000 gal/day), whereas the input per person was about 3 litres/day. The tanks were desludged every eight or ten weeks into an adjacent lagoon area and left till it dried and then it was stacked in a compost heap within the compound for yet another ten weeks. Therefore the sludges which were being put out on the land as compost were something like thirty weeks old and so far nothing had been found in them.

15. Mr A.J.H. WINDER asked whether Oxfam received any contribution from the Bangladesh Government now that the system had been proved. Mr HOWARD said they would probably get very modest help but not

financially because they did not have the money. He said the British Ministry of Overseas Development had provided 50% of the cost of all the units.

16. Mr C. PEEL asked about smell owing to it being an anaerobic system and the tanks being vented. Mr HOWARD said there was a pungent smell and there were large quantities of gas coming off tank number 1. Ideally this gas should be used.

17. Mr J.M.G. van DAMME noted that the units were being made in England and he wondered if there was any possibility of the method being passed over to the developing countries in order that they could make the units themselves. Mr HOWARD said they wanted to get the unit established and working before they moved onto cost economies or economies in terms of the manufacture elsewhere or whether the squatting plates were too expensive and whether they could make a less costly squatting plate rather than the hand made one they were currently using. Oxfam had a patent on the unit but this was obtained to allow the unit to be developed on as wide a base as possible and certainly with manufacture in the country of use in mind.

18. Mr K.G. STRATFORD gathered that the main principle of the process was to ensure a minimum retention time through the system so as to exterminate the pathogens. Therefore a man must control the quantity of flushing water to ensure this and not merely to ensure transportation of solids into the tank. Mr HOWARD said this was correct and it was important to know the input into any unit to ensure that a retention time of sufficient duration was being achieved. The retention time also affected the precipitation of the parasitic ova, as did the water content of the sewage.

19. In reply to a question from Mr M. LAMBERT, Mr HOWARD said in Bangladesh there was very little temperature rise in the unit. The ambient temperature was around 25 or 30°C, falling to about 20°C during the winter.

20. The CHAIRMAN said one of the difficulties he had found in developing countries with public latrines of any sort was that people often misused them. Had Mr Howard found this difficulty with the units? Mr HOWARD had been impressed at the general care and attention shown towards the units although this was not true of Indian latrines generally. However, the communities really treated the units as their own.

21. Mr WINDER asked whether water for washing was provided. Mr HOWARD said it was, together with some lotas which were litre pots, although some people provided their own pots. There was always someone in attendance at the units.

22. Mr HOWARD did not think the unit was the complete answer but he was convinced that this was the type of engineering which engineers needed to think about in the coming years. Sanitation at £50 per head for the poor world was not on: it needed to be done for about £3-5 per head installed capital cost. Lightweight engineering with perhaps a 10 or 15 year life was needed, particularly for populations which might move. On occasions when communities had moved they had taken the Oxfam units with them.

23. Mr A.W. SHILSTON asked whether there had been any religious hurdles. Mr HOWARD said that on their first camp unit they had managed to get their squatting plates in the wrong orientation to Mecca (Bangladesh is a predominantly Muslim population) so they had corrected the positioning of the plates and they were now fully acceptable. It would also be interesting to see how effective the units would be with hygiene-conscious Hindu communities.

24. The CHAIRMAN thought everyone would agree that it had been a fascinating talk and it was delightful to meet a practical field worker with real achievements to his credit. In thanking and congratulating Mr Howard he also included other people who had been concerned with the project.