The Engineering Professions Association Of Namibia

YOUNG ENGINEERS' CONSTRUCTION PROJECT

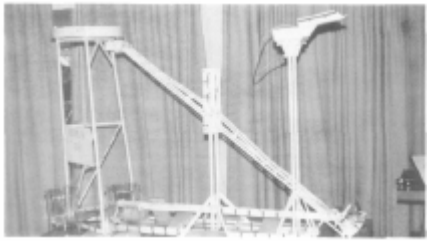
EPA Young Engineers' Construction Project 1993
Construction of a Water Pump

1 The Namibian Competition

With only three teams entering, the competition was a limited success in terms of entries, but spectacular in terms of the entries themselves.

The task was the construction of a pump using 5l of water at an elevation of one meter as an energy source, and the objective to create a pump with maximum efficiency. Sounds good until a basic calculation for about 1,2s: a whole 50 J. And you have nearly nothing to start with, what can you expect to get out? Well, youth is a fantastic thing, and the three teams of the Deutsche Oberschule Windhoek (DOSW), and Deutsche Höhere Privatschule (DHPS), and the Technical High School (HTS), completed the task and demonstrated their machines at the judging function held at the Rössing Foundation Hall on 25 September 1993.

Judges at the Occasion were Mr M Redecker, originator of the daunting task and Technical Manager of the Ohlthaver & List Group, Mr B Gericke, Chief: Engineering Services at the Department of Transport, and Mr BW Haussler, Chief: Mechanical and Electrical Design in the Department of Water Affairs. After the formalities had been dispensed with, the judging began.



The HTS team had constructed a device reminiscent of Those Magnificent Men and Their Flying Machines. It stood some 1.2m high and was about 2m long. At the start of a stroke, some of the 5l of water in the head tank was discharged into a bucket attached to a pivoted beam. As it filled, the bucket would pull down its end of the beam lifting the other end to which another bucket was attached. At the bottom of its travel the first bucket discharged its contents into a channel which acted as storage for the contents. With this bucket empty, the beam pivoted in the reverse direction and returned it to the reservoir where it activated the outlet valve and recharged. During recharge of the first bucket, the second was being charged from the channel and when the first bucket was sufficiently filled the beam pivoted to discharge the respective buckets into the channel and the pumped water collector. This process continued until the head tank was empty. The entire machine was built from plastic strip and tubing, handcrafted and customised to the design. Although it 'pumped' a lot of water with a little help and guidance from the team, it could not work without assistance and thus did not win. This entry, however, was the most original and impressive to see.

The DOSW had built a very simple device, using a Petton-type turbine to drive a crank which drove the piston of their pump. The machine was elegant in its simplicity and proved the wisdom of the old engineering maxim 'Keep it simple'. At the end of the day, this team walked away with the honours; not only because the construction was simple, but because the simplicity ensured that it was the only one to work without assistance. The machine achieved an efficiency of about 3%, earning the further distinction of beating Mr Redecker's best of about 2,5%. Unfortunately, the latter had forgotten to sponsor a bonus prize for this eventuality.

Last, but not least, were the DHPS team, who had designed and built a machine which combined some of the principles of the other two entries. In common with the HTS machine, they used the pivoted beam with a bucket at one end as prime mover, but at the other end was a borehole cylinder pump. The overall structure was even larger than the HTS entry but built with standard steel members. The machine performed well with a little help from its friends. However, when it came to the final test, this machine ground to a halt and failed to complete the pumping task.

In the case of both HTS and DHPS, the teams had lost to the art of engineering compromise. In order to conserve energy, all bearings had been made as free (loose) as possible. Consequently, certain degrees of freedom were opened up to the dynamic members of the machine, and Murphy was there to ensure that they were fully exploited. For the teams, the project had been exciting and very challenging. For the judges the job was easy, because of a technicality in the rules, but the experience of evaluating the entries was edification. Engineering should be about ingenuity. Ingenuity requires simple, effective and low cost solutions to a problem. That is the challenge of engineering, particularly in this developing country of ours, Namibia.

This engineering competition is organised annually by the EPA at significant personal expense to a handful of active members. These people are to be commended for their work. The Young Engineers Competition is an education to even the most experienced engineer. It is a fresh breeze in a somewhat stagnant environment and an incisive revelation of our roots.

2 The SAICE International Bridge Building Competition 1994

The Namibian team consisted of three Standard 9 pupils from the Deutsche Oberschule, Windhoek, this school having entered the winning team for the Young Engineers' Construction Project of 1993. Kai Geschke, Heiko Hennis and Rainer Schullenbach, were accompanied by Mr. E Hackl of Hackl, Kleber & Associates Consulting Engineers.

The international SAICE Bridge Building competition for 1994 was organised by the Free State Branch of the S.A. Institution of Civil Engineers, and formed part of the proceedings of the Institution's annual congress. The congress took place between 18 to 20 April and the bridge building and testing was done on 19 April. A total of 14 teams from South Africa took part, all consisting of 3 members. With the exception of the Cape Town team, which included one girl, all participants were boys, mostly matric pupils.

Because of overbooked flights, the Namibian team had to travel to Bloemfontein on Sunday, 17April and returned on Wednesday, 20 April. The team arrived in Bloemfontein on Sunday night and was transported from the airport to the Bloemfontein Civic Centre. Mr G du Pisani, member of the organizing committee, welcomed the team there and after a short sightseeing tour through the town, took the team to its place of stay, "Die Herberg".

On Monday, all teams that had arrived by then were taken on a tour of two interesting building sites in Bloemfontein, namely the reconstruction of the rugby stadium and the new regional headquarters for Sanlam. These visits were of great interest to the scholars and definitely aroused interest in the profession of Civil Engineering.

The most important day, of course, was Tuesday, when the actual bridge building and testing took place. The team were given a set of material consisting of square timber sticks, glue, a cutting device and an instruction book. The task was to construct, with the material given, a model lattice truss bridge which had to meet certain dimensional requirements. The apparatus used for the testing was brought into the hall where the teams were assembled. This was of great assistance to the participants to form their ideas on the shape and size of their model and also resulted in the achievement that all l4teams met the dimensional requirements. The teams had 6 hours (from 9.00 to 15.00) to complete their task, but in the early afternoon the organizing committee decided to add half an hour, because the majority of teams were running short of time. After completion, the bridges were put onto a scale in order to get a second criteria of adjudication (the first, of course, was the load carrying capacity of the model). Thereafter the bridge models were stored for three hours to allow for setting of the glue.

The teams were invited to attend the Institution's official Cocktail party which took place in the very impressive new Civic Centre of Bloemfontein and the congregation was addressed by the Major of Bloemfontein and the President of the Institution of Civil Engineers. Thereafter the big moment, the testing of the models, began and a large crowd attended and enjoyed it. One onlooker remarked quite correctly: "We engineers seem to be fascinated by failing structures".

The contest was won by the team from Pietermaritzburg, second was the home team from Bloemfontein, and the team from Port Elizabeth came third. The Namibian team's bridge broke at a load of 16.5 kg, which earned them the eighth place (out of 14consistants).

Evidently, the most important factor for a strong bridge was the care taken in gluing the members together. The top teams were equipped with clothes pegs and clamps and obviously knew exactly how to go about it. Considering the fact that the Namibian team had never before built a model bridge, and only had a "crash course" on terms like tension, compression, and slenderness ratios, among others, the Namibian team could be satisfied with its performance. A further, very positive aspect of the competition was the good spirit that existed amongst all the teams, and the Namibians contributed greatly to this. The organisation went without a hitch and the organisers are thanked for their efforts. All members of the Namibian team behaved well, and left a good impression with our colleagues in South Africa.

In conclusion, the following comments were offered on the event as such, and possible steps to be taken by EPA to enhance the chances of future Namibian teams:

The idea of the competition is wholeheartedly supported, because interest among young people in engineering is definitely generated by such an event. It was encouraging to watch the competitors and the enthusiasm with which they tackled their task for the best part of` the day.

Some other teams arrived in Bloemfontein better prepared (or informed) than the Namibian side, and it was suggested that the EPA committee tries to improve on the intensity of coaching of the team for future events like these.