AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

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Fannon, R. D.

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PN-AAD-315

Battelle

December 21, 1973

Mr. A. Dale Swisher, P. E.
Environmental Health
Technical Assistance Bureau
Agency for International Development
Washington, D. C. 20523

Health 2/

Dear Mr. Swisher:

Tenth Quarterly Progress Report on
Phase III "Field Research and
Testing of a Water Hand Pump for
Use in Developing Countries"
[AID/csd-3305]
October 1 through December 31, 1973

During the past report period pump bodies with the newly designed deep-well caps have been sent to AID, Washington, and CARE and UNICEF, New York for shipment to Bangkok, Lagos, and Dacca. Initial reports of progress on field pump evaluation have been received.

New Deep Well Pumps

Pump bodies with the new sliding block deep-well cap and handle were sent by motor freight to AID in Washington and CARE and UNICEF in New York for shipment by these agencies to Bangkok, Thailand, Lagos, Nigeria, and Dacca, Bangladesh. Included in each box were the necessary patterns and core boxes so that additional caps can be made in the test areas and put into use. Letters of instruction discussing the new design, have been drafted and sent. The new design should be a noticeable improvement over the pumps first made.

The UNICEF Program

The AID-Battelle pump seems to be doing quite well according to Report #1, which is included as enclosure #1 of this report. Ten pumps have been on test and should be identified. The first three groups are clearly identified. However, four and five need a further explanation. Group 4 is the old Maya #6 pump, but modified with a plastic pipe liner and large bearing surfaces fitted with 5/8 diameter pins as the AID pump. Group 5 is an attempt to make a light weight pump.

One of the pump handles was accidentially broken on October 15 and at the request of Dick Phillips the parts with the attached letter were sent to Battelle. This letter is included as enclosure #2. The parts show little wear for the amount of use the pump has undergone.

Mr. Phillips will be in New York during the Christmas Holidays and a meeting is planned with UNICEF soon after the first of the year. The iron shortage in Bangladesh will be discussed as well as next year's program and pump modification. It is hoped that with the shortage of plastic pipe the coated cylinder will be given further consideration.

The Program in Nigeria

Two letters were recently received from the Nigerian foundries. The reports seem to be a little conflicting; however, plastic drop pipe, 3/8 pump rod, and some difficulties with the cylinders seem to be the problem areas. Mr. Barberopoulo reports 84 pumps have been made to date. A letter will be sent to them regarding these problems and hopefully a visit can be made early next year. Copies of the forementioned letters are attached to this report as enclosures #3 and #4. Enclosure #5 is a letter describing the performance of 4 deep well pumps sent to the North Eastern State of Nigeria and enclosure #6 is a letter from the Lutheran Mission describing another situation. It certainly appears that help is needed.

The Program in Thailand

No word has been received from Thailand concerning the program in the North East. Soon as the new design can be made operational then a response should be forthcoming. It is hoped that this test area can be visited also, but only after some experience with the new design has been obtained.

Program Review

In order to more easily summarize or review our program progress, Table 1 has been arranged. Sixteen points or tasks based on our contract are shown as well as an additional category entitled "Number of Pumps in the Field." It is anticipated that as the program continues even more tasks will be added.

It is sincerely hoped that this program will be extended so that more meaningful data can be obtained. A program of this nature can be quite important to many people of the world. If there are any questions concerning this report please call.

Sincerely,

Robert D. Fannon, Jr.
Research Engineer
Equipment Development Section

RDF:wc

xc: Ms. C. V. Perelli
Contracting Officer
Technical Assistance Branch
Central Operations Division
Office of Contract Management
Agency for International Development
Washington, D. C. 20523 (25)

TABLE I. PROGRAM SUMMARY

Tasks	Comment	AID	Thailand	Nigeria	Bangladesh
(1) Update drawings, specifications and bills of materials.		Completed see Report Dated 12/22/1971			
(2) Complete necessary pattern's and core boxes for program.	3 Sets 27 Pcs/Set	Completed 3/23/1972			
(3) Produce not less than 3 pumps (options for deep/shallow well.		Completed see Report Dated 6/28/72			
(4) Visit not less than 3 countries jointly selected by BMI/AID to introduce and demonstrate pumps.		Completed see Report Dated 6/28/1972	Completed see Report Dated 3/23/1972 Visited 4/19-5/7/1972, 10/13-19/1972 & 4/2/1973	Completed see Report Dated 3/23/1972 Visited 5/19-5-18/1973	Completed see Report Dated 11/17/1972 Visited 9/27-10/24/1972, 3-29--4/23/1973 Tech. 3/29--6/30/1973
(5) Ship materials for manufacturer of not less than 20 pumps	Wt 361#-shipped Sample Pump-Patterns, Drawings & Supplies	Completed see Report Dated 6/28/1972	Completed Shipped by AIR 4/11/1972 to USOM Bangkok	Completed Shipped by AIR 4/11/72 to CARE Lagos	Completed Shipped by AIR 3/16/73 to UNICEF Dacca
(6) Provide technical assistance.		Reported 6/28/1972	See 4	See 4	See 4
(7) Provide materials for flapper valves, cups, cylinder coatings.	Supplied 24 Leather cups 2 sq ft Valve Mat & 1 qt Plastic Coating	Shipped see Report Dated 6/28/1972	See 5	See 5	See 5 No coating 4 sample pumps
(8) Coordinate 24 month test program.		In progress			
(9) Collect and analyze data		In progress			

TABLE I. PROGRAM SUMMARY (Continued)

Tasks	Comment	AID	Thailand	Nigeria	Bangladesh
(10) Recommend design changes.	Deep well pump cap	Reported 3/27/1973			
(11) Modify drawings					
(12) Apply for patent.	Found unobtainable & unnecessary	Reported 6/28/1972			
(13) Trip report.		Dated 7/17/1972			
(14) Quarterly Reports.	8 Quarterly Reports				
(15) Annual Reports.	2 Annual Reports				
(16) Summary Report.					
(17) Number of pumps in the field.			4 (1)	84 (2)	5 (3)

(1) Number of pumps on test in Thailand is based upon visits to the area.

(2) This information based on Enclosure #3.

(3) This number from groups 1 and 2, Enclosure #1. This number might be increased 2 pumps from group 4, Enclosure #1 which incorporate much of the improved design.

UNICEF BANGLADESH

RURAL WATER SUPPLY PROJECT

File : 310

HANDPUMP TESTING PROGRAMME

REPORT NO.1

October 1, 1973.

1. As of 30th September 1973, the following types pumps have been installed and kept under observation:-

Sl. No.	Type of Pump	Number of pumps	Location	Usage	Greased Yes/ No	Date of Installation	Remarks
1.	Battelle Made in U.S.A.	1	Chauk Bazar	Heavy	No	May 1973	Functioning
		1	Kataban	"	No	"	"
		1	Joydebpur (Chowrasta)	Medium	Yes	22/9/73	"
2.	Battelle pump Made in Bangladesh	1	Joydebpur (Harinal)	Medium	No	11/9/73	"
		1	Joydebpur (Harinli)	Light	Yes	11/9/73	"
3.	Modified Pitcher Pump	1	Joydebpur (School)	Medium	No	22/9/73	Removed
		1	Joydebpur (Bazar)	Heavy	No	28/9/73	"
4.	DPHE Pump No.6 with PVC liner	1	Joydebpur (Bazar)	Heavy	Greese	11/9/73	Functionin
		1	Joydebpur(East) (Mosque)	Medium	No	11/9/73	"
5.	"Economy" Pump	1	Kataban	Heavy	No	19/9/73	"
	TOTAL:	10					

.../2

2. Each of the two Battelle pumps which have been working since May 1973 in heavy use areas pumps on an average 5 gpm with a total estimated daily discharge of 5,000 gallons of water which requires 28,000 strokes of the handle. At 5 gallons of water per capita per day each well serves a population of 1,000.

   No repair needed and no spare parts replaced so far.

3. One of the [illegible] modified Pitcher pumps failed due to failure of the [illegible] screw [illegible] the head cover with the barrel [illegible] a small hole in the barrel. The [illegible] screw is observed to be too small in diameter.

4. As many as 4 modified "Economy" pumps were [illegible] out in the field but only one was found suitable for use because of problems with the [illegible] poppet valve assembly. Minor modifications that are needed of course, are being incorporated in the final design. See Attachment [illegible] for the Record for a discussion of these modifications.

5. Other observations : The plunger which is changed to be thinner than before usually fails. It should be made more [illegible]

AA/WKJ/NR:

Enclosure #2

File: 615

November 5, 1973

In accordance with the desire of Mr. Phillips, enclosed herewith are the following

1. The upper end of a broken handle
2. The worn out bucket (Leather)
3. The pins (Three nos.)

All these are removed from a Battelle pump installed on 10th May 1973. The pump handle was broken accidentally on 15th Oct. 1973, after 158 days of operation without any trouble.

The pump was operating in a Heavily conjested area in old part of Dacca city (Chawk Bazar Mosque).

The pump discharge was measured for a continuous period of 6.5 hours on 8th Sept. 1973. The calculated discharge is 5,000 gallons per day in about 28,000 up-stroke of the handle. The average discharge is nearly 5 gallons per minute. It is calculated that three-fourth of a million U.S. gallons of water was pumped out of the well during its service life of 158 days.

The well is estimated to be used 10 times more than well located in a typical rural area

It is to be noticed that the wear on the pin in the fulcrum as well as on the hole there is greater than any other points.

The cotter pins become due to rusting because one body and removed is difficult in times of [redacted] replacement.

The ease of pumping due to long handle makes it popular to the elderly women as well as children alike.

To:

Mr. Robert D. Fannon, Jr.
Battelle Memorial Institute
505 King Avenue
Columbus, OHIO, 43201
U.S.A.

Abdul Awal

Enclosure #3

NIGERIAN FOUNDRIES LIMITED.

ILUPEJU INDUSTRIAL ESTATE.
P. O. BOX 3574, LAGOS NIGERIA

OUR REF: NF/SS-53/SHOWP
YOUR REF:

CABLES: FOUNDRIES - LAGOS
TELEPHONE: 33266
33267
34602

31st October 1973

Mr R. O. Fannon,
Battelle,
Columbus Laboratories,
Columbus, Ohio 43201

Dear Robert,

Thank you for your letter dated 14th May that I received together with the picture of the new design of pump, as well as your letter dated 17th October received together with the colour pictures that we find of interest.

I should first of all apologise for not replying to your first letter before now. The fact is that it arrived when I was in Europe for two and half months.

While I am now trying to gather as much information as possible for the performance of the pump, I wish to let you know our basic observations so far in a short report. I also enclose one report for a pump installed at thirty feet deep well that speaks well of the pump and another of pumps installed in wells deeper than fifty feet that speaks of the problems we face with deep wells:

1. Performance of Pumps in Wells Up To 50ft. Deep

It appears that for wells up to a depth of 50ft. the performance is good. The PVC drop pipe vibrates but we are not in a position to say yet if this will affect the life span of the pipe. The PVC cylinder als performs well but we had to enlarge the size of the flapper in the botto so that it will function better.

The anticipated disadvantage of the both-end-sealed PVC plunger cylinder appears to be in the lack of access for repairs. This we decid to overcome by using cast iron plugs in both ends of the cylinder that they will be held on by screws fitted in the side of the cylinder. (Sket is enclosed).

2. Performance of Pumps in Wells Over 50ft. Deep

The major problem here appears to be the force required on the handle to lift the collumn of water. In this case, a smaller diameter plunger and the use of 1" drop pipe, likely of G.I., may be the answer. In this respect, your assistance for the supply of the patterns for both 2" and 1½" diameter plungers and the new type of the pump rod guide will greatly help us to speed up the making of samples of the new design of the pump for the assessment of its performance in wells up to 100ft. deep and over.

3. Our Alterations in The Design

Before receiving your letter of 14th May, we had for economic and practical reasons altered the existing design in the following ways:

a) We cast the main body of the pump in one piece thus saving cost of machinery in four occassions.

b) We cast separately a base for the pump where the drop pipe will be supported by means of two locknuts. By doing so we saved the machining of the threading where the drop pipe will be supported while we made the installation easier as one has only to tight the usually heavy drop pipe to the base and then fit the actual pump. This change proved to be practicable in installation. Sketch is attached.

I am planning to make a trip to assess on the spot the performance of the pump and I promise to let you have more details.

We are happy to learn that you are ready to assist us further in improving the pump. Believe me, we really need your help as we are serious on the subject. We have so far spent much more than we received from the making of the first 84 pumps but we believe it is money well spent.

We have not yet received new orders for pumps and I understand the performance of the pump has not been fully assessed by the States concerned so far. Furthermore, the failure of good performance of the pumps in wells over 50ft. deep may impede the placement of these orders.

I should not fail to mention that Mr. R. F. Linder of Care Nigeria Limited works vigorously on the subject of the pumps.

In my next report, I shall let you have our cost of production which as you may understand we reduced a lot by eliminating almost all the lathe machining for threading, leaving only drilling, fitting and finishing.

I am anxious to hear from you on the subject.

Yours sincerely,

R. V. BARBEROPOULOS
DIRECTOR

xc: Swishe
Frink

NIGERIAN FOUNDRIES LIMITED.

ILUPEJU INDUSTRIAL ESTATE
P. O. BOX 3574, LAGOS, NIGERIA

OUR REF: NF/SS-53/SHOWP
YOUR REF:

24th November 1973

Mr R. D. Fannon,
Battelle,
Columbus Laboratories,
Columbus, Ohio 43201,
U. S. A.

Dear Robert,

My letter of 31st October 1973 refers.

In paragraph three of the said letter, I mentioned enclosing a short report on a pump installed at thirty feet deep well and another report on pumps installed in wells deeper than fifty feet.

Regretably, I noted that these reports were not enclosed and please find them attached.

Yours sincerely,
NIGERIAN FOUNDRIES LIMITED

R. V. BARBEROPOULOS
DIRECTOR

ALL.

C O P Y

Ministry of Works & Housing,
Headquarters,
North Eastern State,
P. M. B. 1048,
Maiduguri.

4th September 1973.

The Director,
CARE (Nigeria) Limited,
P. O. Box 2941,
21, Marina,
Lagos

Dear Sir,

Performance of 4 Battele Type Hand Pumps

I am directed to refer to 4 hand pumps manufactured by Nigerian Foundries, Lagos and supplied by you to this Ministry in July 1973, for experimental installation on existing wells in this State.

2. The well-tops for wells were casted as per your sketch and design received vide your letter of 11th July 1973. Three of the four pumps were installed under the supervision of your Mr. Bob E. Chaples who was here during the 3rd week of August.

3. The performance of these pumps had been hopeless and these pumps seem to stand no place near to their claimed performance. Out of the three pumps, one with a drop pipe of 40 ft. is still working productively. The other two hand pumps failed only after one or two days operation. The forth pump could not installed because of damaged barrel.

4. Most of the trouble seem to come from following items:

(a) P. V. C. drop pipe

(b) Eccentricity & buckling of ¾ Ø rod

(c) P. V. C. Barrel

(d) Non return P.V.C. disc plate in barrel.

5. The claim of its adaptability at 100 seems doubtful. At this depth, the pump is too heavy to be operated by children, women and old men.

6. I suggest you may please send some representative of Nigerian Foundries and CARE to investigate the causes of failure.

(Z. I. CHAUDHRY)
for: Permanent Secretary,
Ministry of Works & Housing

C O P Y.

Evangelical Lutheran Mission,
P. O. Box 495,
Jos,
Nigeria.

10th October 1973

Mr. R. F. Linder, Director
CARE
P. O. Box 2941,
Lagos

Dear Bob,

Once again a special thank you for supplying us with one of your pumps. We are indeed grateful. We shall inform you when the pump is installed and how it operates.

At this point we are very satisfied with the pump that has been installed. Children have no trouble operating the pump. During my last visit to Yaba, where the pump is installed, I had the cpd supervisor measure the rate of flow from a 25 ft depth. He found that a slow steady rate of pumping it took 22 strokes to fill a four gallon pail with water. It took him two minutes to perform this. The pump would produce approximately 2 gall per min. or 60 gal. per hr. I trust this information will be helpful in evaluating the pump.

Unfortunately I have not been able to make contact with your two fellows as yet. There just seems to be a shortage of hours in each day.

Thanks again for the help.

Sincerely yours,

Kenneth L. Reiner, Chairman