

# The Operations Problem of Engines, an Input to Mechanised Irrigation

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**Abstract :** *The operational problems of pump sets in a representative area in Bangladesh were studied. It is rare that the sets operate upto 1100 hours in a season. The vast majority operates only upto 600-800 hours. Spare parts problem, the problems of overhaul, the engine life and the management are important issues. Even after the overhaul, the maximum number of spares are required in the first hours of operation in the season. The value goes upto 1.63 parts per engine in the first 100 hours of operation. Availability of spares and their management apparently have not been rationalised.*

## 1. Introduction :

The Government of People's Republic of Bangladesh and its executing agencies are working hard to bring more and more land under mechanised irrigation with an aim to increase the food production by a much publicised target of 50%. Unfortunately Fig. 1. shows that there is a downward trend in the irrigation of land by the power pumps (1). This is a serious threat to the national goal and needs a careful attention. One of the causes is the shorter duration of operation of the power pumps.

This paper discusses a sample study on this problem and concentrates on the areas of maintenance, overhaul and spare parts.

## 2. Selection of a sample area :

The study of power pumps all over Bangladesh is quite time consuming and needs huge resource input. Hence a representative sample space was selected. Table 1 shows the similarity of the composition of pump sets in Bangladesh and in Savar Thana, the sample space.

Table 1: Comparative study of sample space and the population (1977-78)

	Bangladesh	Savar Thana
Total area (sq. miles)	55,598	151
Working pump sets	40,685	270
Share of Ruston Sets (%)	40.50	49.25
Share of Deutz sets (%)	36.70	29.25
Share of Yanmar sets (%)	11.68	14.50

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There is a unit office at Savar, through which the mechanised irrigation in the area is controlled.

### 3. The Study

#### 3.1 Irrigated area and hours of operation of pump sets

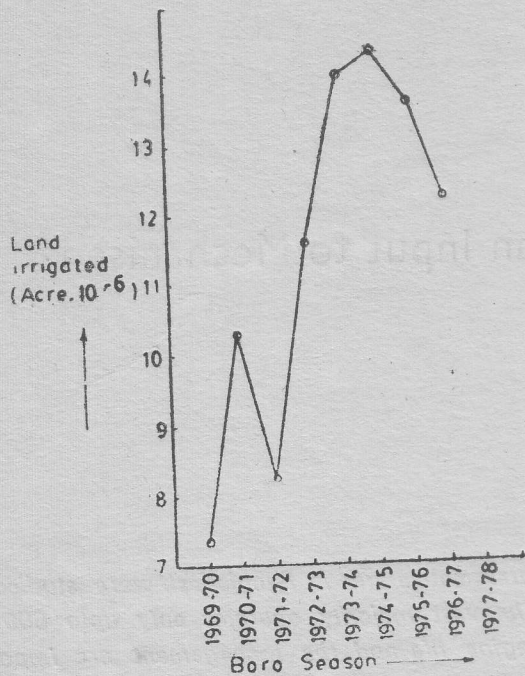


Fig. 1 Land irrigated by power pumps in Bangladesh

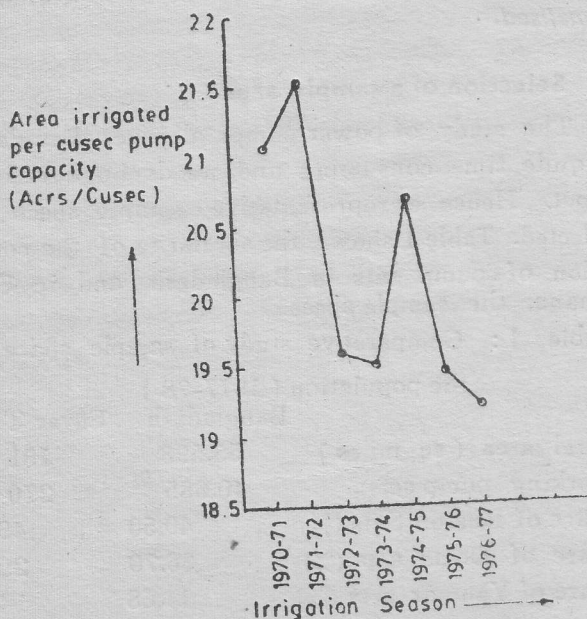


Fig. 2 Irrigated area per cusec pump capacity in Savar Thana

Fig. 2. shows the area irrigated per unit capacity of the pump sets in Savar area. This curve shows a clear downward trend. Except in the early years, the value seldom exceeds 19.5 acres per cusec.

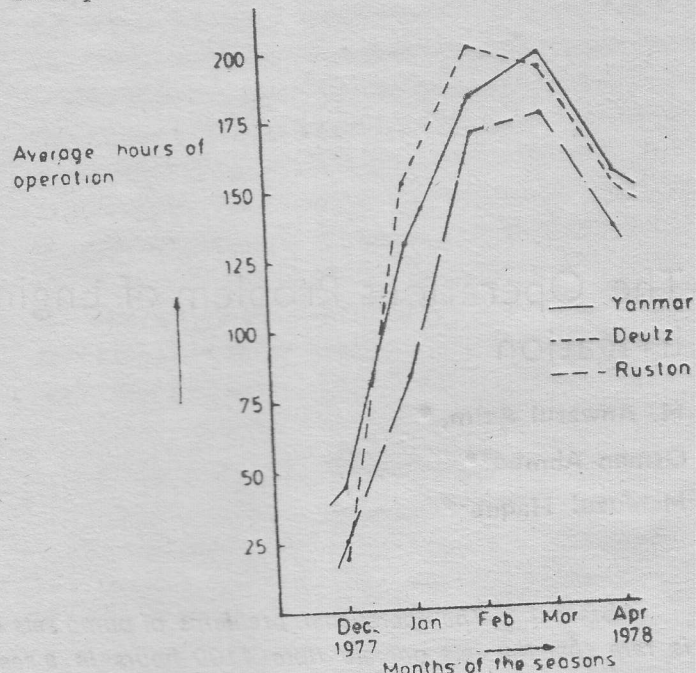


Fig. 3 Average hours of operation during irrigation season 1977-78

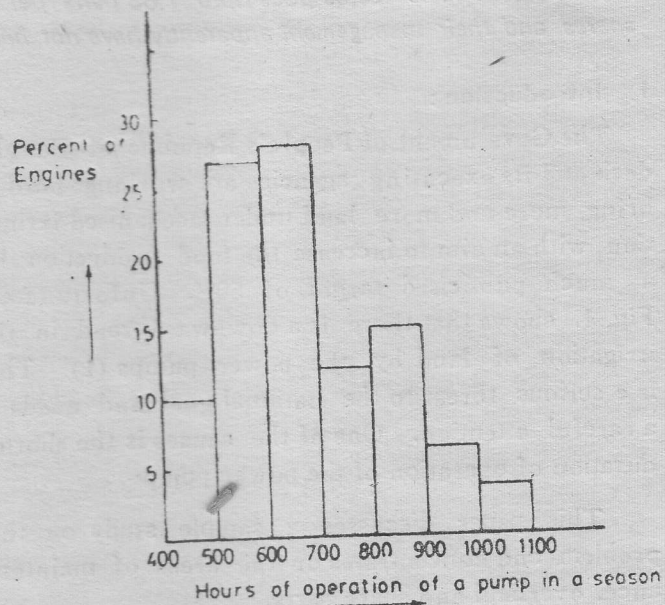


Fig. 4 Frequency distribution of operational duration of engines (Ruston) in irrigation season 1977-78



Fig. 3. gives the values of average hours of operation of three different pump sets during the irrigation season, 1977-78. The average value does not practically exceed 200 hours per month. The Ruston set crossed the value of 150 hours per month for only half the season.

Figs. 4-6. represent the frequency distribution of operational duration of the three categories of pump sets in 1977-78. 55% of the Ruston engines ( Fig.4 ) operated between 500 and 700 hours, while 78% of Deutz engines operated between 600 and 900 hours. For Yanmar engines the respective values are 74% and 600-800 hours.

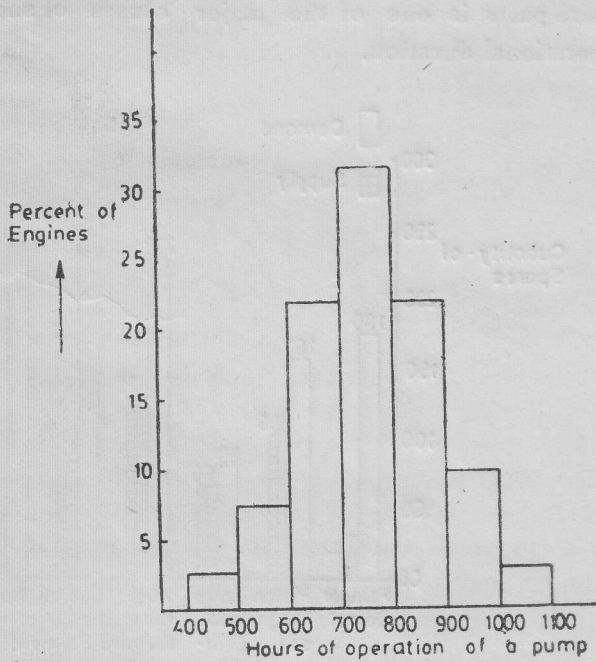


Fig. 5 Frequency distribution of operational duration of engines (Deutz) in irrigation season 1977-78

A study of the life of the engines shows the following values (tab. 2).

Table 2: Average life of engines in Savar in 1977-78

Type of engine	Average life ( years )
Ruston	7
Deutz	3
Yanmar	1

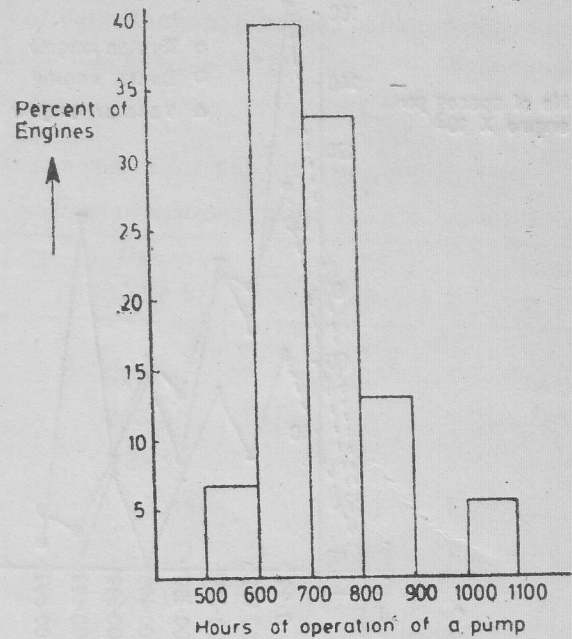


Fig. 6 Frequency distribution of operational duration of engines (Yanmar) in irrigation season 1977-78

From the discussion of the above facts, it is evident that there is enough scope for the improvement of the irrigation management in the studied area.

### 3.2 Maintenance problems :

Major causes of poor utilization of pump sets lie in the poor maintenance and the non-availability of the spare parts.

#### Poor Maintenance :

The engines are overhauled during the dull season. The objective is to keep the pumping set fully in operational condition during the irrigation season.

Fig. 7 shows the spare parts for every type of engines during the overhaul and in the season. The maximum number of spares was needed at the beginning of the irrigation season. The demand falls with the duration of operation of the pumps. Another remarkable feature is that the number of parts changed during the overhaul is much less than the peak requirement.

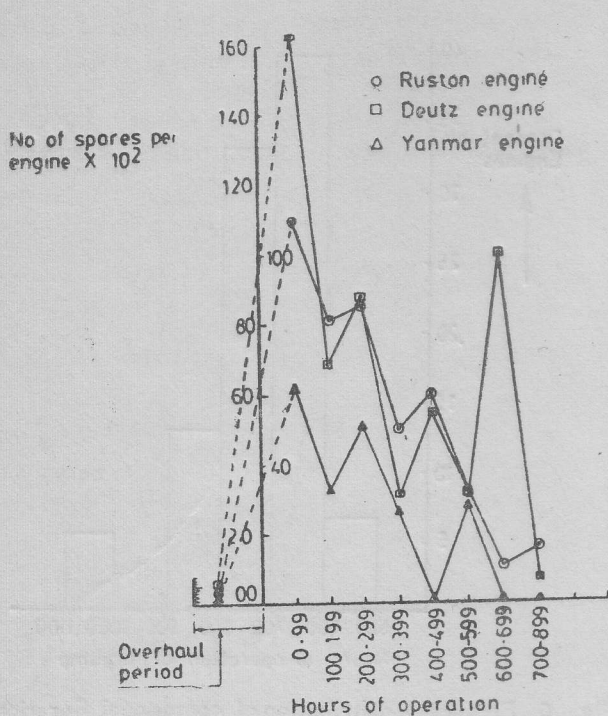


Fig. 7 Spares required by different engines during boro season 1977-78.

Ideally, the case should have been reverse i.e., the maximum number of spares should have been needed during the overhaul. Under the present system the average hours of operation a pump set is bound to be low, as it was established earlier. Over and above, acreage per engine falls and huge man-hours are lost in the process of repair of engines during the operational season.

Such a system complicates the control of spares and is liable to misappropriation.

Comparing the spares of different engine types, it is understandable that Yanmar engines require

less number of spares. But Ruston engines having double the life of Deutz engines, need less spare parts. This may, among other factors, influence the engine fleet.

#### Availability of spare parts :

Alone Ruston engines needed more than 50 different spare parts during the operational season (1977-78). Fig. 8 shows the demand and the supply of six important spare parts for Ruston Engines. The supply hardly meet 50% of the demand. The cases of plunger barrels and nozzles were quite critical. The supply of the former was only 10% while that for the latter was 20%. Thus shortage in supply of spare parts is one of the major causes of shorter operational duration.

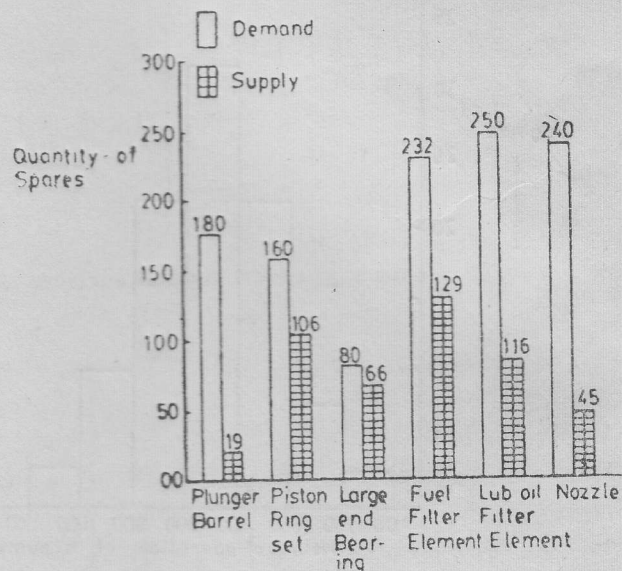


Fig. 8 Demand and Supply of six important spare parts for Ruston engines in 1977-78.

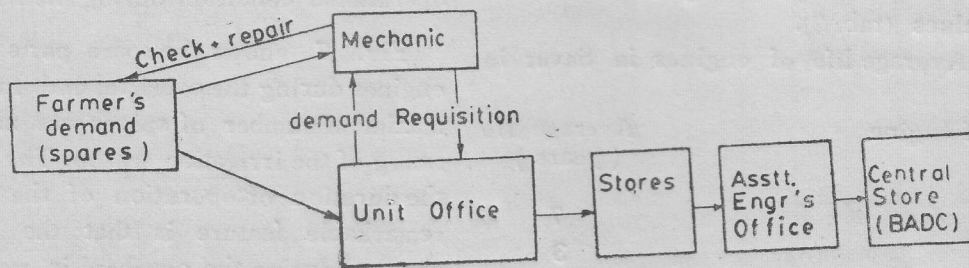


Fig. 9 The Method of Procurement of Spares in Bangladesh Agriculture Development Corporation (BADC).



Due to administrative mechanism of material spares in the studied area, lengthy official procedure, control a time element has also crept into the lack of coordination, purchase oriented policy and lack problem. Fig. 9 shows the method of supply of of scientific analysis of problems are the major causes.

TABLE : 3

Comparison of the unit price of some of the spares for different engines

Name of spare parts	Cost of spare parts in Tk/unit for the Engines			
	Ruston	Deutz F21-812	Deutz F21-912	Yanmar
1. Cylinder liner	312.00	375.00	389.00	
2. Piston assembly	518.00	296.00	320.00	529.37
3. Piston ring set	71.35	38.50	51.25	113.23
4. Large end bearing	53.10	25.35	39.10	
5. Nozzle	109.70	49.00	69.90	135.38
6. Pressure barrel	237.00	87.67	143.00	397
7. Fuel filter element	34.20	—	—	25.37
8. Oil filter element	67.25	56.37	56.37	—
9. Air cleaner	—	564.53	530.33	370.52
10. Fan belt	—	—	—	23.11
11. Fuel injection pipe	26.97	225.57	15.64	84.35
12. Fuel injection pump assembly	313.33	313.33	313.33	1369.54
13. Exhaust valve	—	37.67	52.02	—
14. Inlet valve	—	37.67	31.61	—

The probable life of spare parts, their price and the local manufacture along with other economic factors should influence the procurement of engines and their spares. It appears that no critical study has been undertaken in this direction Table. 3 gives a list of spares and their price, and it is not exhaustive.

The diesel irrigation sets in a representative thana were studied. The average duration of operation pump sets, which is 600-750 hours in a season of 5 months, is quite low. The maximum value does not exceed 1100 hours. Poor overhauling, in-sufficient supply of spares and poor management are the major constraints.

#### Conclusion :

Agriculture is the backbone of our economy. The Government has rightly stressed it. The mechanised irrigation system is going to play a vital role to increase the food production by 50%.

#### Bibliography :

1. The Yearbook of Agricultural Statistics of Bangladesh, 1976-77
2. Data Source of B. A. D. C. ( Savar Unit and others )