Economics of Prime Movers for Oil Lifting

By R. K. OWEN
Southwestern Public Service Company

ECONOMICAL WAY TO LIFT OIL

Production people occasionally have to calculate the most economical way to lift oil. This study is designed to discuss the factors involved and some typical cost figures of oil production. The factors here are the common ones. For a specific case some special factors may need to be considered. Each case is unique, and, as such, should be studied.

Only the two most common ways to turn a production shaft will be considered here. They are the electric motor and the internal combustion, gas fueled engine.

The engines will be considered in two classes:

1. Multiple cylinder - high rpm range
2. Single cylinder - low rpm range

The economic study should include the following factors or classes of costs:

1. Initial investment
2. Annual investment costs
   a. Interest
   b. Depreciation
   c. Property taxes and insurance
3. Operation Costs
   a. Labor-including overheads, housing and transportation
   b. Fuel or electricity
   c. Small parts - oil filters, sparkplugs, etc.
   d. Supplies - oil, grease, etc.
4. Maintenance costs
   a. Labor
   b. Parts
   c. Down time, production lost, etc.
5. Miscellaneous
   a. Safety or other special equipment, if any
   b. Other special considerations

Now we are ready to set forth typical values for some of these costs. These are arrived at by studying operating records of production companies, and are considered average. They may be used as guideposts, but are not binding for any particular case.

Costs of gas and electric lines to a lease vary greatly and are not included in this study.

I. Electric motor drive:
   A. Investment is about $35.00 to $45.00 per BHP, including controls.
   B. Investment costs - per year
      1. Interest - 6% to 8%, depending on company financing ratios, etc.
      2. Depreciation - 4%, unless faster depreciation is desired for financing purposes.
      3. Taxes (property) and insurance - 2%
   C. Operation costs - per year
      1. Power Cost - $\frac{\text{BHP X .746}}{\text{motor eff.}}$ X hours per year running time X Rate/KWH
      2. Labor and supplies - about $400.00 per year.
   D. Maintenance - about $5.00/BHP/year.

II. Multiple cylinder engine - high speed:
   A. Initial Investment - $55.00 to $100.00/BHP, depending on size and quality.
   B. Investment cost per year
      1. Interest - 6% to 8%
      2. Depreciation - 20% to 40% depending on use factor and cost of engine.
      3. Taxes and Insurance - 2%
   C. Operation costs per year
      1. Fuel use is about 14 cubic feet of 1000 BTU/-c.f. gas per BHP hour - fuel use per BHP at 50% load is about 40% more than at full load. Engine should be operated at about 65% rated load.
      2. Labor and supplies - about $1000.00/year to to $2000.00/year per engine.
   D. Maintenance - $250.00/year to $400.00/year.

III. Single cylinder engine - low speed:
   A. Initial investment - $80.00 to $160.00/BHP, depending on size and quality.
   B. Investment costs per year
      1. Interest - 6% to 8%
      2. Depreciation - 5% to 15%, depending on use factor and cost of engine.
      3. Taxes and Insurance - 2%
   C. Operation costs per year
      1. Fuel - about 14 cubic feet gas/BHP hour
      2. Labor and supplies - $850.00/year to $1400.00-/year per engine.
   D. Maintenance - about $100.00/year to $200.00/year.

It is not in the scope of this study to evaluate the effect of corporate income tax on overhead, operation and maintenance costs, but this should be gone over with the accountants of any particular company. In general, however, those costs which are deductible before taxes do not affect profits nearly so much as those which are not.

Labor costs:

This cost is often underestimated and so deserves discussion here. Most of us realize that an employee costs more than the pay check shows, but we often do not realize how much more. The following costs, not shown on the pay check, should be considered:

1. Fringe benefits (vacation, sick leave, F.O.A.B. taxes, jury duty, insurance, pensions, etc.). This cost now averages about $1000.00/year per employee in industry and is rising every year.
2. Personnel and supervisory costs.
   This includes training, safety, supervision, etc. Each employee account must assume its proportionate share of this cost.
3. Housing - residence and/or office space.
   Office space costs about $5.00 per square foot

and residence about $10.00/square foot. These must be amortized on per year basis.

4. Transportation - if supplied.

About 10¢ per mile on an average of 15,000 miles per year or $1500.00 average.

Many cost engineers prefer to arrive at the cost per employee by multiplying the wage by a factor - about 1.5 if no housing, office space or transportation is required. For oil lease personnel, however, this factor is about 2.5. This means that a pumper who is paid $4000.00/year, and is furnished housing and transportation, will cost about $9000.00/year to keep on the payroll. If he cares for 10 wells, the labor done per well costs $900.00/year.

In order to illustrate the figures set forth in this text, the following three examples are given, purely for illustrative purposes. Electricity is calculated at 1.25¢/kwh, and gas at 15¢/mcf.

10 HP LOAD - 80% LOAD FACTOR

	Engine 1 Cylinder	Engine 2 Cylinder	Electric Motor
First Cost	$1600.00	$1000.00	$ 500.00
Investment Cost			
Interest	7% - $ 112.00	7% - $ 70.00	7% - $ 35.00
Depreciation	8% - 128.00	20% - 200.00	5% - 25.00
Insurance & Taxes	2% - 32.00	2% - 20.00	2% - 10.00
	$ 272.00	$ 290.00	$ 70.00
Operation Cost			
Electricity or Fuel	$ 147.00	$ 147.00	$ 816.00
Labor & Supplies	900.00	1000.00	400.00
	$1047.00	$1147.00	$1216.00
Maintenance Cost	$ 100.00	$ 250.00	$ 50.00
Total	$1419.00	$1687.00	$1336.00

25 HP LOAD - PUMP 8 HRS/DAY

	Engine Slow Speed	Engine High Speed	Electric Motor
First Cost	$2000.00	$1600.00	$ 800.00
Investment Cost			
Interest	7% - $ 140.00	7% - $ 112.00	7% - $ 56.00
Depreciation	5% - 100.00	16% - 256.00	4% - 32.00
Insurance & Taxes	2% - 40.00	2% - 32.00	2% - 16.00
	$ 280.00	$ 400.00	$ 104.00
Operation Cost			
Fuel or Electricity	$ 153.00	$ 153.00	$ 850.00
Labor & Supplies	1200.00	1600.00	300.00
	$1353.00	$1753.00	$1150.00
Maintenance Cost	$ 100.00	$ 200.00	$ 50.00
Total	$1733.00	$2353.00	$1304.00

25 HP LOAD - 80% LOAD FACTOR

	Engine Low Speed	Engine High Speed	Electric Motor
First Cost	$2000.00	$1600.00	$ 800.00
Investment Cost			
Interest	7% - $ 140.00	7% - $ 112.00	7% - $ 56.00
Depreciation	8% - 160.00	20% - 320.00	5% - 40.00
Insurance & Taxes	2% - 40.00	2% - 32.00	2% - 16.00
	$ 340.00	$ 464.00	$ 112.00
Operation Cost			
Fuel or Electricity	$ 368.00	$ 368.00	$2045.00
Labor & Supplies	1400.00	2000.00	400.00
	$1768.00	$2368.00	$2445.00
Maintenance Cost	$ 200.00	$ 400.00	$ 50.00
Total	$2308.00	$3232.00	$2607.00

Yet these examples do not tell the story completely. Some other things which may have strong influence on the right decision are:

Does this decision fit in with the ever increasing automation policy of progressive industry? The next best way now may be the best way in five years. Will this lease need to be an automatic lease?

What complexities of labor problems are to be encountered? Pumper labor is skilled, scarce and precious.

How will we want to operate this lease five years from now? 10 years from now?

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