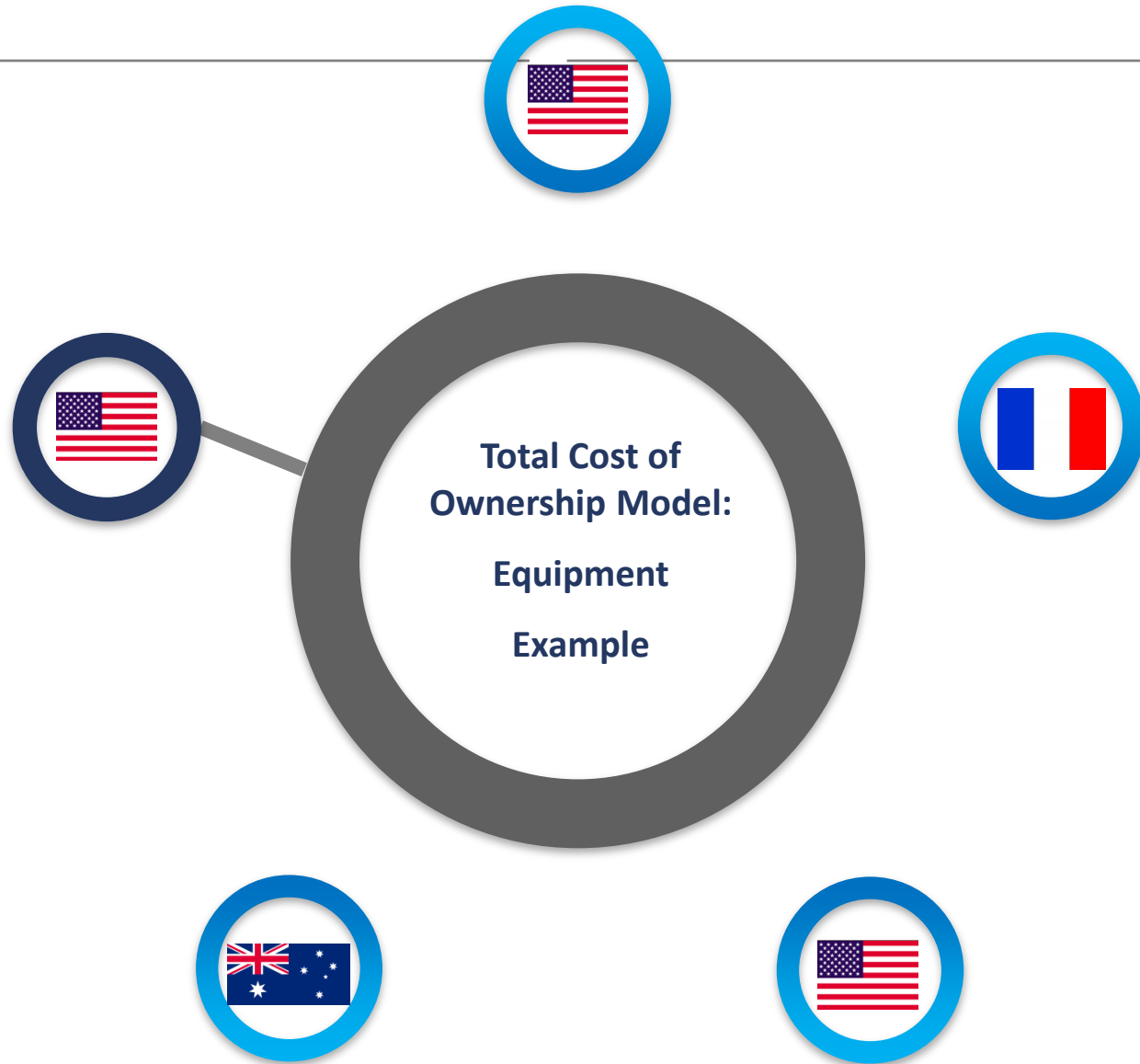


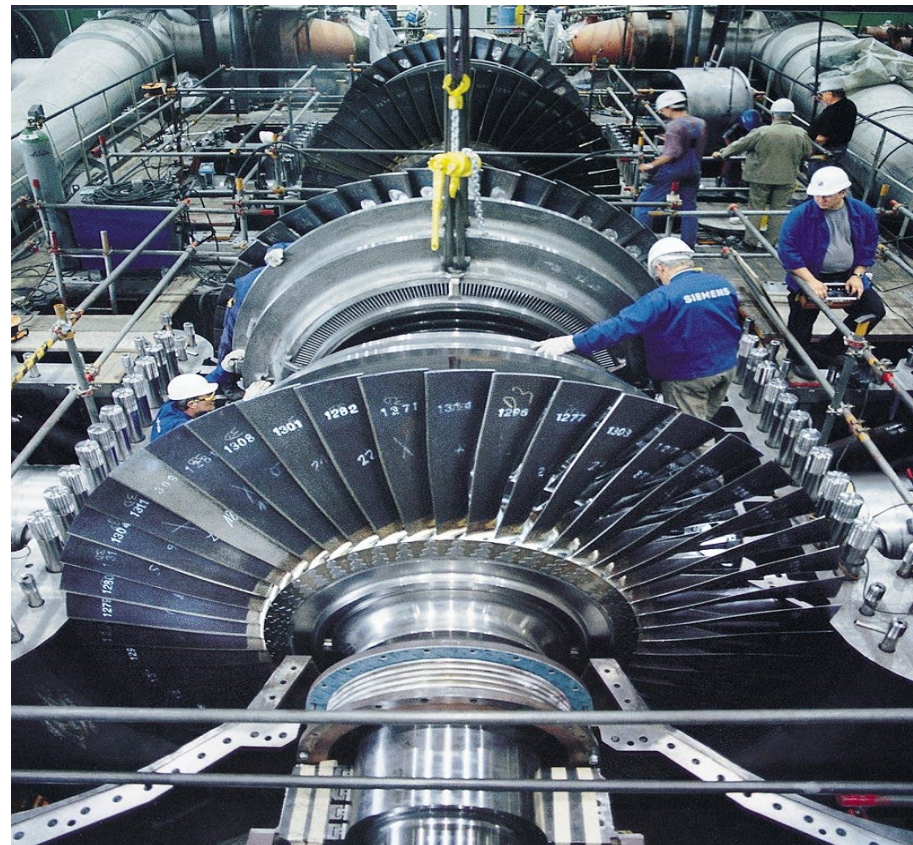
COST MODEL EXAMPLES



Scenario: Gas Turbine Example

A major Oil & Gas company is in the process of purchasing 3 new gas turbines. The supply manager would like to prepare a Total Cost of Ownership model. In order to do so she has gathered the following information:

- Lifecycle of the turbine: 5 years
- Company's cost of capital: 12%
- Rate of Inflation: 3%
- For other information see step 4



Building a Total Cost of Ownership Model

STEP 1 (PROCESS MAP):

- Construct a process map outlining the activities associated with acquiring, using and supporting the item over its useful life



STEP 2 (TCO CATEGORIES):

- Determine TCO Categories

- | |
|----------------------|
| 1. PURCHASE PRICE |
| 2. ACQUISITION COST |
| 3. USAGE COSTS |
| 4. END OF LIFE COSTS |



STEP 3 (COST ELEMENTS):

- List the cost elements under each category

PURCHASE PRICE:

- Direct Equipment Cost
- Upgrades (CAPEX)

+

ACQUISITION COST:

- Construction
- Installation
- Logistics

+

USAGE COSTS:

- PM Overhauls
- Corrective Maintenance
- Upgrades (OPEX)
- Fuel cost

+

END OF LIFE COST:

- Salvage value

Building a Total Cost of Ownership Model

STEP 4 (MEASUREMENT):

- Determine if each cost element is recurring (R) or one-time (O)
- Identify how each element is to be measured

ELEMENT	R/O	MEASURE
PURCHASE PRICE:		
➤ Direct Equipment Cost	O	Supplier quote (\$2,575,000 per Turbine)
➤ Upgrades (CAPEX)	O	Supplier quote (\$320,000 per Turbine)
ACQUISITION COST:		
➤ Construction	O	Supplier quote (\$500,000 per Turbine)
➤ Installation	O	Supplier quote (\$240,000 per Turbine)
➤ Logistics	O	Supplier quote (\$110,000 per Turbine)
USAGE COSTS:		
➤ Delivery Opportunity Cost	O	\$10,500,000
➤ Preventive Maintenance	R	\$106,667/Turbine per year
➤ Corrective Maintenance	R	\$646,000/Turbine per year
➤ Fuel cost	R	\$3,000,000/Turbine per year
END OF LIFE COSTS:		
➤ Salvage value	O	\$600,000/Turbine

Building a Total Cost of Ownership Model

ELEMENT	Present	Year 1	Year 2	Year 3	Year 4	Year 5
PURCHASE PRICE:						
➤ Direct Equipment Cost	\$7,725,000					
➤ Upgrades (CAPEX)	\$960,000					
ACQUISITION COST:						
➤ Construction	\$1,500,000					
➤ Installation	\$720,000					
➤ Logistics	\$330,000					
USAGE COSTS:						
➤ Delivery Opportunity Cost	\$10,500,000					
➤ Preventive Maintenance		320,001	329,601	339,489	349,674	360,164
➤ Corrective Maintenance		1,938,000	1,996,140	2,056,024	2,117,705	2,181,236
➤ Fuel cost		9,000,000	9,270,000	9,548,100	9,834,543	1,012,9579
END OF LIFE COSTS:						
➤ Salvage value						(1,800,000)
TOTAL:	\$21,735,000	\$11,258,001	\$11,595,741	\$11,943,613	\$12,301,922	\$10,870,979

STEP 5 (TIME LINE):

- Develop a cost timeline over the expected life of the item and place each cost in the appropriate time period
- Calculate totals for each period

Building a Total Cost of Ownership Model

STEP 6 (CALCULATE TCO):

- Determine Present Value Interest Factors (PVIF) for each year, using your firm's Cost of Capital (12%)
- Calculate present values of totals in each year
- Sum present values to get Total Cost of Ownership (TCO)

Time	Present	Year 1	Year 2	Year 3	Year 4	Year 5
TOTAL	\$21,735,000	\$11,258,001	\$11,595,741	\$11,943,613	\$12,301,921	\$10,870,978

X	X	X	X	X	X
1	.893	.797	0.712	0.636	0.567

Present Value Interest Factor Table for One Dollar Discounted at k Percent for n Periods:

$$PVIF = \frac{1}{(1+k)^n}$$

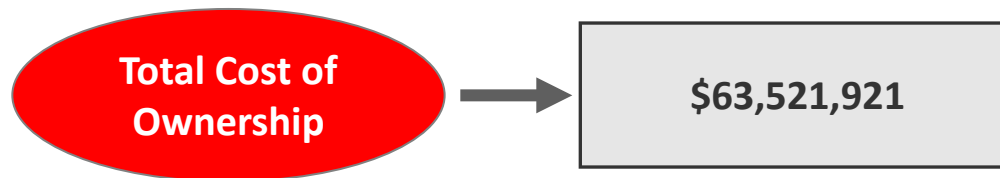
Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	0.901	0.893	0.885	0.877
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826	0.812	0.797	0.783	0.769
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751	0.731	0.712	0.693	0.675
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683	0.659	0.636	0.613	0.592
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621	0.593	0.567	0.543	0.519
6	0.942	0.888	0.837	0.790	0.746	0.705	0.666	0.630	0.596	0.564	0.535	0.507	0.480	0.456
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513	0.482	0.452	0.425	0.400

Building a Total Cost of Ownership Model

STEP 6 (CALCULATE TCO):

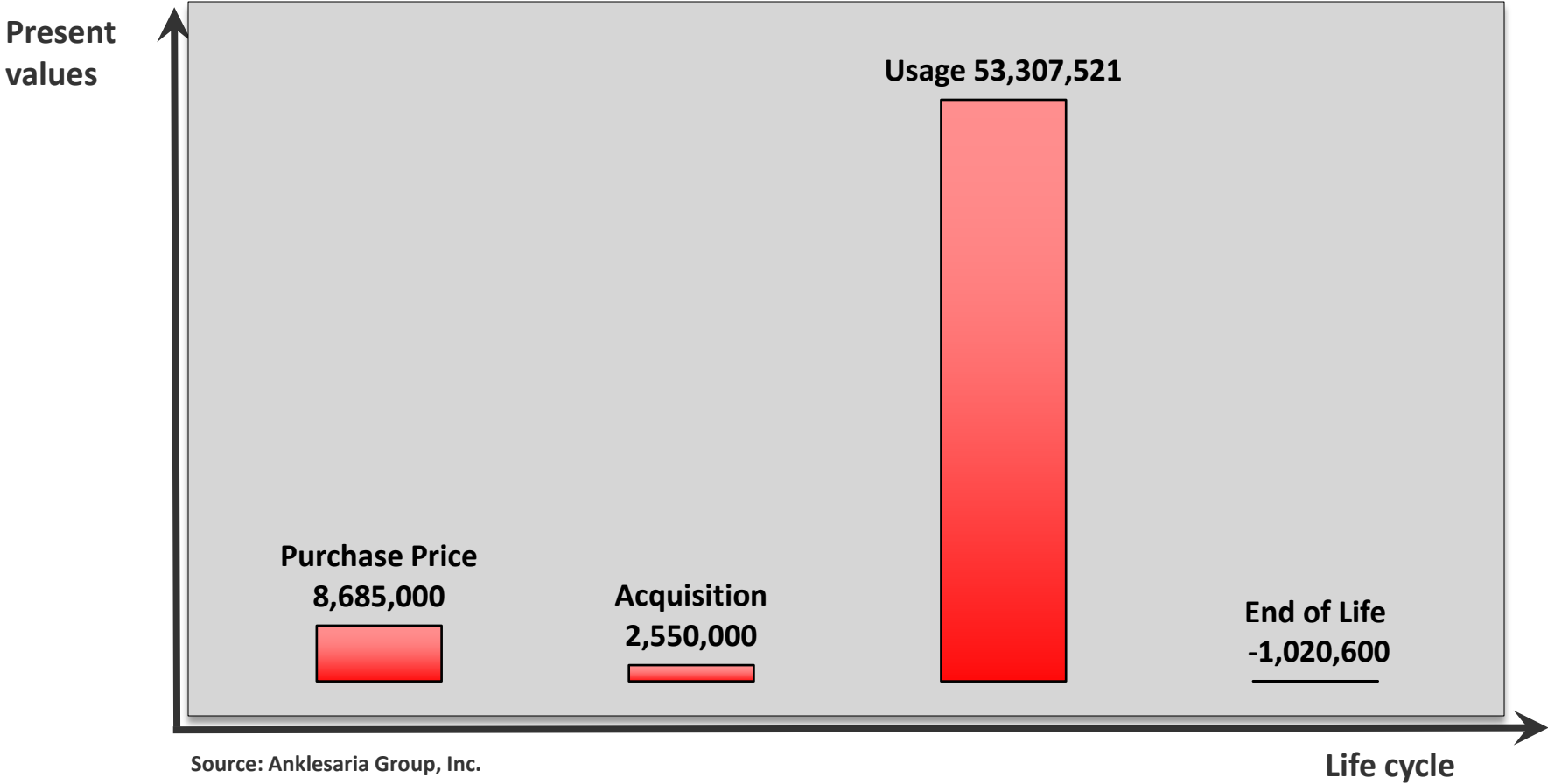
- Determine Present Value Interest Factors (PVIF) for each year, using your firm's Cost of Capital (12%)
- Calculate present values of totals in each year
- Sum present values to get Total Cost of Ownership (TCO)

Time	Present	Year 1	Year 2	Year 3	Year 4	Year 5
TOTAL	\$21,735,000	\$11,258,001	\$11,595,741	\$11,943,613	\$12,301,921	\$10,870,978
	X	X	X	X	X	X
	1.000	0.893	0.797	0.712	0.636	0.567
	↓	↓	↓	↓	↓	↓
	\$21,735,000	\$10,053,394	\$9,241,805	\$8,503,852	\$7,824,021	\$6,163,845



Total Cost of Ownership Model Example

TCO for Gas Turbines



Analyzing TCO:

Use cost modeling skills beyond purchase price

Identify the main cost categories within TCO (e.g. Usage costs)

1

Identify main cost element(s) within chosen category
(e.g. Corrective Maintenance)

2

Build cost model(s) for chosen element(s)

3

Test for reasonableness

4

Use in negotiations as necessary

5

Analyzing TCO: Corrective Maintenance Example

Present value of corrective maintenance over 5 years = \$7,369,068

Maintenance Support Quote for 1st Year

3 turbines @ \$646,000/turbine = \$1,938,000 / year

Test for reasonableness

1. Estimate maintenance time

Number of Corrective Maintenance Hours/Turbine/person = 80

Crew Size = 44

For 3 turbines

TOTAL MAN HOURS REQUIRED / YR = 10,560 hrs

(80 maintenance hrs / turbine/person) * (44 people) * (3 turbines)

Analyzing TCO: Corrective Maintenance Example

2. Calculate \$ / yr for maintenance team from proposal

*Title	Salary	Rate/hr**	# hours billed/person	# of People	Direct Labor Cost
Mechanical Engineer	\$ 104,302.00	\$ 57.95	240	7	\$ 97,349
Electrical Engineer	\$ 112,441.00	\$ 62.47	240	7	\$ 104,945
Mechanic	\$ 48,792.00	\$ 27.11	240	15	\$ 97,584
Electrician	\$ 58,996.00	\$ 32.78	240	15	\$ 117,992
					\$ 417,869
*Source: Economic Research Institute (US Average)					
**Rate/hr is based on 1,800 billable hours/person/yr out of a maximum 2080 hours possible					

Number of hours billed per person for 3 turbines = $80 \times 3 = 240$ hours

Direct Labor cost = Rate/hour * # of Hours/person * # of persons/year

Analyzing TCO: Corrective Maintenance Example

3. What should the rate be for the corrective maintenance (per year)?

BASIC SHOULD COST	U.S. Should Cost	
Cost Element	%	\$ / year
Direct Labor	24.0%	\$417,869
Service Overhead	43.7%	
<i>Cost of Sales</i>	<i>67.7%</i>	
GSA & Other Expenses	13.6%	
Profit Before Tax	18.7%	
PRICE	100%	\$1,741,121

Sources: U.S. Economic Census, ERI.com; Company Financials; utilization used = 1800 hrs per year

Analyzing TCO: Corrective Maintenance Example

4. Compare

	Proposed	Should Cost
Price per year	\$1,938,000 / yr	\$1,741,121 / yr
Present Value over Lifecycle	\$7,369,068	\$6,620,461

