

6 LIFE CYCLE COSTING APPLICATION

This guide has focused on how to create LCC models of mobile equipment, the inputs required, the risks associated with those inputs, and common investment analysis techniques. These are fundamental principals that must be understood in order to get value out of the LCC methodology.

But what are the highest value applications of these models? This final section explains how to leverage the method to produce better forecasts, reduce costs and optimize performance of these critical fleet assets.

The most valuable applications of LCC models of mobile equipment are:

1. **Budgets** – LCC is a zero-based method that can be structured to support a vigorous budgeting process that identifies projected costs by asset, activity and period. The nature of mobile equipment is that costs are predictable but they occur both on a recurring basis and as distinct events – it is incorrect to simply build a budget based on historic run rates. For example, while it might be sensible to forecast fuel expense based on equipment usage, it is foolish to assume that maintenance costs will be the same from year to year since major component replacements do not occur annually.
2. **Resource Forecasts** – the LCC structure identifies materials and labour content that can be extrapolated to determine major component schedules, workforce estimates, shop requirements and machine availability. These forecasts provide a rational basis for business planning and determining the feasibility of new projects.
3. **Evaluate Maintenance Tactics** – LCC models offer a comprehensive framework with which to evaluate different maintenance tactics in terms of financial and productivity outcomes. For example, does it make sense to invest in a specific new condition monitoring technology? Where are the benefits likely to be realized and thus compared to the cost of enabling that technology? LCC models are structured to represent these elements right down to the specific task level, allowing managers not to just estimate costs and benefits associated with different tactics, but to connect the dots to specific activities that will change as a result of them.



To truly leverage an LCC model, that model must be constructed to a degree of detail that includes the following critical data at the task level:

- Hierarchical position
- Task description
- Estimated labour, materials and miscellaneous cost
- Interval
- Expected downtime

It can take considerable effort and knowledge to create these records, and they must be reasonably accurate, but once they are in place they provide exceptional value to the organization using them.

Below is a sample from a detailed LCC model based on the previous exercise in this guide. It expands the task records to the level of detail necessary to support budgeting and resource forecasts in particular:

Table 19: Detailed LCC Sample

Component	INSTALLED PRICE	ADJUSTED PRICE	BENCHMARK SMU	0 7,000	7,000 13,800	13,800 20,500	20,500 27,200	27,200 33,800
Engine								
Engine Changeout	\$500,000	\$525,000	20000	\$0	\$0	\$557,134	\$0	\$0
Parts	\$450,000	\$472,500	20000	\$0	\$0	\$501,421	\$0	\$0
Labour	\$25,000	\$26,250	20000	\$0	\$0	\$27,857	\$0	\$0
Miscellaneous	\$25,000	\$26,250	20000	\$0	\$0	\$27,857	\$0	\$0
Duration (Hours in Shop)	100.00	100.00	20000	-	-	100.00	-	-
Midlife	\$150,000	\$150,000	10000	\$0	\$156,060	\$0	\$0	\$165,612
Parts	\$105,000	\$105,000	10000	\$0	\$109,242	\$0	\$0	\$115,928
Labour	\$30,000	\$30,000	10000	\$0	\$31,212	\$0	\$0	\$33,122
Miscellaneous	\$15,000	\$15,000	10000	\$0	\$15,606	\$0	\$0	\$16,561
Duration (Hours in Shop)	100.00	100.00	10000	-	100.00	-	-	100.00
ENGINE TOTAL				\$0	\$156,060	\$557,134	\$0	\$165,612
Parts				\$0	\$109,242	\$501,421	\$0	\$115,928
Labour				\$0	\$31,212	\$27,857	\$0	\$33,122
Miscellaneous				\$0	\$15,606	\$27,857	\$0	\$16,561
Duration (Hours in Shop)				-	100.00	100.00	-	100.00
Driveline	\$0	\$0	0					
Alternator	\$75,000	\$78,750	22000	\$0	\$0	\$0	\$85,242	\$0
Parts	\$60,000	\$63,000	22000	\$0	\$0	\$0	\$68,193	\$0
Labour	\$11,250	\$11,813	22000	\$0	\$0	\$0	\$12,786	\$0
Miscellaneous	\$3,750	\$3,938	22000	\$0	\$0	\$0	\$4,262	\$0
Duration (Hours in Shop)	30.00	30.00	22000	-	-	-	30.00	-
Wheel Group 1st Overhaul	\$200,000	\$210,000	25000	\$0	\$0	\$0	\$227,311	\$0
Parts	\$160,000	\$168,000	25000	\$0	\$0	\$0	\$181,849	\$0
Labour	\$30,000	\$31,500	25000	\$0	\$0	\$0	\$34,097	\$0
Miscellaneous	\$10,000	\$10,500	25000	\$0	\$0	\$0	\$11,366	\$0
Duration (Hours in Shop)	20.00	20.00	25000	-	-	-	20.00	-
Wheel Group 2nd Overhaul	\$300,000	\$315,000	50000	\$0	\$0	\$0	\$0	\$0
Parts	\$240,000	\$252,000	50000	\$0	\$0	\$0	\$0	\$0
Labour	\$45,000	\$47,250	50000	\$0	\$0	\$0	\$0	\$0
Miscellaneous	\$15,000	\$15,750	50000	\$0	\$0	\$0	\$0	\$0
Duration (Hours in Shop)	20.00	20.00	50000	-	-	-	-	-
Control Group	\$300,000	\$315,000	35000	\$0	\$0	\$0	\$0	\$0
Parts	\$240,000	\$252,000	35000	\$0	\$0	\$0	\$0	\$0
Labour	\$45,000	\$47,250	35000	\$0	\$0	\$0	\$0	\$0
Miscellaneous	\$15,000	\$15,750	35000	\$0	\$0	\$0	\$0	\$0
Duration (Hours in Shop)	30.00	30.00	35000	-	-	-	-	-
Brakes Front	\$60,000	\$63,000	7000	\$64,260	\$0	\$66,856	\$68,193	\$69,557
Parts	\$48,000	\$50,400	7000	\$51,408	\$0	\$53,485	\$54,555	\$55,646
Labour	\$9,000	\$9,450	7000	\$9,639	\$0	\$10,028	\$10,229	\$10,434
Miscellaneous	\$3,000	\$3,150	7000	\$3,213	\$0	\$3,343	\$3,410	\$3,478
Duration (Hours in Shop)	30.00	30.00	7000	30.00	-	30.00	30.00	30.00
Brakes Rear	\$80,000	\$84,000	11000	\$0	\$87,394	\$0	\$90,924	\$92,743
Parts	\$64,000	\$67,200	11000	\$0	\$69,915	\$0	\$72,739	\$74,194
Labour	\$12,000	\$12,600	11000	\$0	\$13,109	\$0	\$13,639	\$13,911
Miscellaneous	\$4,000	\$4,200	11000	\$0	\$4,370	\$0	\$4,546	\$4,637
Duration (Hours in Shop)	30.00	30.00	11000	-	30.00	-	30.00	30.00
DRIVELINE TOTAL				\$64,260	\$87,394	\$66,856	\$471,670	\$162,300
Parts				\$51,408	\$69,915	\$53,485	\$377,336	\$129,840
Labour				\$9,639	\$13,109	\$10,028	\$70,750	\$24,345
Miscellaneous				\$3,213	\$4,370	\$3,343	\$23,583	\$8,115
Duration (Hours in Shop)				30.00	30.00	30.00	110.00	60.00

This model will support subsequent examples in this section. It is included in the PDF portfolio as **LCC Application.xls**.



6.1 BUDGETS

Consider the LCC model structure, referenced to time, activity and cost. Opportunities for this structure to support budgeting include:

- The fleet can be modeled by aggregating individual machine LCC baselines, and machines can be added with different start dates or points in their life cycle
- Add operating overheads, management salaries and other maintenance department costs, by extrapolating labour as the driver of these expenses
- The budget for a specific period is easily defined because the LCC model is time-based, with cash flows delineated by type and period
- Adjust the budget by altering specific input costs or maintenance intervals
- Map all costs to company cost codes and expense elements
- Report expense types by period
- Update with actual maintenance costs to measure budget performance
- Upload to incorporate the budgeting system

In addition to supporting budget development, LCC models provide an audit trail for assessing existing budgets that were derived from LCC models. They also offer flexibility in developing multiple budget scenarios according to various fleet compositions and operating conditions.

Example:

Open LCC Application.xls and review the setting. It is a model of the 12-year life of an 8-truck fleet of 240 Ton electric drive vehicles, per:

Fleet	8	240T Electric Drive	
Delivery:			
Year 1	4 Trucks		
Year 2	2 Trucks		
Year 3	2 Trucks		
Life (SMU)	65000		
Application	Baseline		
Location	United States		
Estimated Production	360	TPH	



After reviewing the model structure, open the O&M tab. There you'll find parts, labour and miscellaneous items for every task summed for all 8 trucks. Tires, Fuel and Operator are similarly summed:

Table 20: O&M Tab

	Period												Haul Fleet Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Maintenance:													
Parts	\$543,872	\$1,783,039	\$4,778,364	\$5,122,072	\$5,457,603	\$7,015,631	\$5,314,416	\$6,830,982	\$4,368,028	\$6,668,484	\$2,886,658	\$2,077,349	\$52,846,498
Event Labour	\$114,660	\$404,024	\$757,861	\$961,619	\$1,027,370	\$1,191,314	\$996,110	\$1,274,668	\$988,458	\$1,043,750	\$447,452	\$237,252	\$9,444,539
Wrench Time	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%
Labour Actual	\$191,100	\$673,373	\$1,263,102	\$1,602,699	\$1,712,283	\$1,985,523	\$1,660,183	\$2,124,446	\$1,647,431	\$1,739,584	\$745,754	\$395,420	\$15,740,898
Miscellaneous	\$21,308	\$130,430	\$282,987	\$325,258	\$359,113	\$431,537	\$339,242	\$444,502	\$284,306	\$401,056	\$164,018	\$115,629	\$3,299,386
Sub-total	\$756,280	\$2,586,842	\$6,324,453	\$7,050,029	\$7,528,998	\$9,432,691	\$7,313,842	\$9,399,930	\$6,299,765	\$8,809,124	\$3,796,430	\$2,588,397	\$71,886,781
Operations:													
Tires	\$856,800	\$2,184,840	\$2,228,537	\$3,182,351	\$2,318,570	\$2,364,941	\$2,894,688	\$2,460,485	\$3,513,572	\$2,559,888	\$1,566,652	\$532,662	\$26,663,984
Fuel	\$4,284,000	\$6,429,672	\$8,659,457	\$8,735,228	\$8,810,565	\$8,952,991	\$9,028,669	\$9,174,093	\$9,321,722	\$9,142,458	\$4,662,654	\$2,282,835	\$89,484,344
Operator	\$1,428,000	\$2,143,224	\$2,886,486	\$2,911,743	\$2,936,855	\$2,984,330	\$3,009,556	\$3,058,031	\$3,107,241	\$3,047,486	\$1,554,218	\$760,945	\$29,828,115
Sub-total	\$6,568,800	\$10,757,736	\$13,774,480	\$14,829,321	\$14,065,989	\$14,302,263	\$14,932,914	\$14,692,609	\$15,942,535	\$14,749,832	\$7,783,523	\$3,576,442	\$145,976,443
O&M Total	\$7,325,080	\$13,344,578	\$20,098,933	\$21,879,350	\$21,594,988	\$23,734,954	\$22,246,755	\$24,092,538	\$22,242,300	\$23,558,957	\$11,579,954	\$6,164,839	\$217,863,225

Note that this model represents labour in dollar terms (this assumes a labour cost per hour) and that it is adjusted for “wrench time”, or a labour efficiency factor that allows for non-productive labour such as clean-up, training, service reports, etc. Most companies assume a labour efficiency factor of 50% to 60%.



Next, open the Overheads tab. This worksheet uses labour hours (determined by dividing the actual labour expense by the assumed rate, in this case \$60 per hour), to drive the entire group of overhead expenses such as supervision, facilities, tools, vehicles and IT. These resources are estimated in gross terms (for example 0.5 of a leadman's time is required for the first two years, rising to a full time leadman once the crew reaches a certain size).

Overhead costs are then determined by multiplying the quantity of each resource by its unit consumption rate:

Table 21: Overheads Tab

		Period												Haul Fleet Total
		1	2	3	4	5	6	7	8	9	10	11	12	
Event Labour		\$114,660	\$404,024	\$757,861	\$961,619	\$1,027,370	\$1,191,314	\$996,110	\$1,274,668	\$988,458	\$1,043,750	\$447,452	\$237,252	\$9,444,539
Wrench Time		60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%
Labour Actual		\$191,100	\$673,373	\$1,263,102	\$1,602,699	\$1,712,283	\$1,985,523	\$1,660,183	\$2,124,446	\$1,647,431	\$1,739,584	\$745,754	\$395,420	\$15,740,898
Labor Rate	\$ 60	\$ 61.20	\$ 62.42	\$ 63.67	\$ 64.95	\$ 66.24	\$ 67.57	\$ 68.92	\$ 70.30	\$ 71.71	\$ 73.14	\$ 74.60	\$ 76.09	
Mechanics @2000/FTE		1.56	5.39	9.92	12.34	12.92	14.69	12.04	15.11	11.49	11.89	5.00	2.60	
Overheads: Resources and Rates														
Foreman	\$ 100,000	0	0	1	1	1	1	1	1	1	1	0	0	
Leadman	\$ 80,000	0.5	0.5	1	1	1	1	1	1	1	1	0.5	0.5	
Planner	\$ 60,000	0.5	0.5	0.5	1	1	1	1	1	1	1	0.5	0.5	
Administrator	\$ 40,000	0	0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0	
Building - Depreciation	5000 sq ft Bay	0.25	0.5	1	2	2	2	2	2	2	2	1	0.5	
Building - Maintenance	5000 sq ft Bay	0.25	0.5	1	2	2	2	2	2	2	2	1	0.5	
Building - Utilities	5000 sq ft Bay	0.25	0.5	1	2	2	2	2	2	2	2	1	0.5	
Light Vehicles	\$ 7,500	1	1	1	1	1	1	1	1	1	1	1	1	
Tools	\$500/mech \$ 500													
IT	\$1500/admin \$ 1,500													
Overheads: Costs														
Foreman		\$ -	\$ -	\$ 100,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ -	\$ -	
Leadman		\$ 40,000	\$ 40,000	\$ 80,000	\$ 80,000	\$ 80,000	\$ 80,000	\$ 80,000	\$ 80,000	\$ 80,000	\$ 80,000	\$ 40,000	\$ 40,000	
Planner		\$ 30,000	\$ 30,000	\$ 30,000	\$ 60,000	\$ 60,000	\$ 60,000	\$ 60,000	\$ 60,000	\$ 60,000	\$ 60,000	\$ 30,000	\$ 30,000	
Administrator		\$ -	\$ -	\$ 20,000	\$ 20,000	\$ 20,000	\$ 20,000	\$ 20,000	\$ 20,000	\$ 20,000	\$ 20,000	\$ 20,000	\$ -	
Building - Depreciation	5000	\$ 10	\$ 12,500	\$ 25,000	\$ 50,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ 50,000	\$ 25,000	
Building - Maintenance		\$ 5	\$ 6,250	\$ 12,500	\$ 25,000	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,000	\$ 25,000	\$ 12,500	
Building - Utilities		\$ 10	\$ 12,500	\$ 25,000	\$ 50,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ 50,000	\$ 25,000	
Light Vehicles		\$ 7,500	\$ 7,500	\$ 7,500	\$ 7,500	\$ 7,500	\$ 7,500	\$ 7,500	\$ 7,500	\$ 7,500	\$ 7,500	\$ 7,500	\$ 7,500	
Tools	\$500/mech	\$ 500	\$ 781	\$ 2,697	\$ 4,959	\$ 6,169	\$ 6,462	\$ 7,346	\$ 6,022	\$ 7,555	\$ 5,744	\$ 5,946	\$ 2,499	\$ 1,299
IT	\$1500/admin	\$ 1,500	\$ 1,500	\$ 1,500	\$ 4,500	\$ 5,250	\$ 5,250	\$ 5,250	\$ 5,250	\$ 5,250	\$ 5,250	\$ 5,250	\$ 2,250	\$ 1,500



Finally, open the Department Budget tab, where the O&M and Overheads are combined to create the projected budget required to operate and maintain this fleet for its 12-year life:

Table 22: Department Budget

	Period												Haul Fleet Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Maintenance:													
Parts	\$543,872	\$1,783,039	\$4,778,364	\$5,122,072	\$5,457,603	\$7,015,631	\$5,314,416	\$6,830,982	\$4,368,028	\$6,668,484	\$2,886,658	\$2,077,349	\$52,846,498
Labour Gross	\$114,660	\$404,024	\$757,861	\$961,619	\$1,027,370	\$1,191,314	\$996,110	\$1,274,668	\$988,458	\$1,043,750	\$447,452	\$237,252	\$9,444,539
Wrench Time	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%
Labour Actual	\$191,100	\$673,373	\$1,263,102	\$1,602,699	\$1,712,283	\$1,985,523	\$1,660,183	\$2,124,446	\$1,647,431	\$1,739,584	\$745,754	\$395,420	\$15,740,898
Miscellaneous	\$21,308	\$130,430	\$282,987	\$325,258	\$359,113	\$431,537	\$339,242	\$444,502	\$284,306	\$401,056	\$164,018	\$115,629	\$3,299,386
Sub-total	\$756,280	\$2,586,842	\$6,324,453	\$7,050,029	\$7,528,998	\$9,432,691	\$7,313,842	\$9,399,930	\$6,299,765	\$8,809,124	\$3,796,430	\$2,588,397	\$71,886,781
Operations:													
Tires	\$856,800	\$2,184,840	\$2,228,537	\$3,182,351	\$2,318,570	\$2,364,941	\$2,894,688	\$2,460,485	\$3,513,572	\$2,559,888	\$1,566,652	\$532,662	\$26,663,984
Fuel	\$4,284,000	\$6,429,672	\$8,659,457	\$8,735,228	\$8,810,565	\$8,952,991	\$9,028,669	\$9,174,093	\$9,321,722	\$9,142,458	\$4,662,654	\$2,282,835	\$89,484,344
Operator	\$1,428,000	\$2,143,224	\$2,886,486	\$2,911,743	\$2,936,855	\$2,984,330	\$3,009,556	\$3,058,031	\$3,107,241	\$3,047,486	\$1,554,218	\$760,945	\$29,828,115
Sub-total	\$6,568,800	\$10,757,736	\$13,774,480	\$14,829,321	\$14,065,989	\$14,302,263	\$14,932,914	\$14,692,609	\$15,942,535	\$14,749,832	\$7,783,523	\$3,576,442	\$145,976,443
O&M Total	\$7,325,080	\$13,344,578	\$20,098,933	\$21,879,350	\$21,594,988	\$23,734,954	\$22,246,755	\$24,092,538	\$22,242,300	\$23,558,957	\$11,579,954	\$6,164,839	\$217,863,225
Overheads: Costs													
Admin Salaries & Benefits	\$ 70,000	\$ 70,000	\$ 230,000	\$ 260,000	\$ 260,000	\$ 260,000	\$ 260,000	\$ 260,000	\$ 260,000	\$ 260,000	\$ 90,000	\$ 70,000	\$2,350,000
Occupancy	\$ 31,250	\$ 62,500	\$ 125,000	\$ 250,000	\$ 250,000	\$ 250,000	\$ 250,000	\$ 250,000	\$ 250,000	\$ 250,000	\$ 125,000	\$ 62,500	\$2,156,250
Vehicles	\$ 7,500	\$ 7,500	\$ 7,500	\$ 7,500	\$ 7,500	\$ 7,500	\$ 7,500	\$ 7,500	\$ 7,500	\$ 7,500	\$ 7,500	\$ 7,500	\$90,000
Tools	\$ 781	\$ 2,697	\$ 4,959	\$ 6,169	\$ 6,462	\$ 7,346	\$ 6,022	\$ 7,555	\$ 5,744	\$ 5,946	\$ 2,499	\$ 1,299	\$57,479
IT Equip & Support	\$ 1,500	\$ 1,500	\$ 4,500	\$ 5,250	\$ 5,250	\$ 5,250	\$ 5,250	\$ 5,250	\$ 5,250	\$ 5,250	\$ 2,250	\$ 1,500	\$48,000
Overheads Total	\$ 111,031	\$ 144,197	\$ 371,959	\$ 528,919	\$ 529,212	\$ 530,096	\$ 528,772	\$ 530,305	\$ 528,494	\$ 528,696	\$ 227,249	\$ 142,799	\$ 4,701,729
Total Haulage Budget	\$7,436,111	\$13,488,775	\$20,470,892	\$22,408,269	\$22,124,200	\$24,265,050	\$22,775,527	\$24,622,843	\$22,770,793	\$24,087,653	\$11,807,203	\$6,307,638	\$222,564,954

Every item in this budget was calculated from zero-based principals using life cycle cost models of the trucks in the fleet.



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