

A Case For:

Lean, Green Supply Chains

AN ENERGY CONSUMPTION CALCULATOR FOR MATERIAL HANDLING SYSTEMS

In this era of lean and green supply chains, distribution experts focus on cost savings and sustainable behavior, respectively. More than ever, engineers and business leaders are taking an extended view of the energy requirements of planned material handling systems and including those results in their cost justification and net carbon footprint.

HK Systems, in conjunction with business partners and clients, has developed a simple yet innovative tool to calculate the expected energy requirements of a material handling system design. This Excel-based calculator allows the user to select among a wide variety of equipment, environment and building elements to approximate the expected annual utilization in kWh as well as dollars. The tool also facilitates the comparison of two different designs so the user can contrast the annual costs and uncover projected inefficiencies. Tool usage requires only a basic understanding of the system(s) to be reviewed and includes an instruction page to better outline the dynamics of this exciting tool. There are 4 steps to complete this analysis:

Step 1 – Become familiar with the systems or system(s) to be tested. For an existing system, start with drawings of all the equipment. Determine what equipment will be tested, size of the equipment, horsepower, etc. In general, if something runs on electricity, you will need to include it in this tool.

Step 2 - Open the Excel spreadsheet calculator and read the instruction sheet. In the "Instruction" tab in this tool, a step by step process walks a user through all of the steps necessary to operate this tool. It also details each input parameter and explains what the output files will look like.

Step 3 - Select the "Input" tab and enter data. This tab allows you to select the quantity of equipment and the associated utilization. The calculator computes the energy required, as well as gives a cost estimate for up to two different scenarios for comparison purposes. This page lists most automated as well as manual material handling equipment. Equipment is categorized into the following areas:

Storage – This includes Automated Storage and Retrieval Systems, Carousels, Vertical Lift Machines (VLM), etc.

Pallet Conveyor – The user can enter various size motors, transfers, and turntables.

Case Conveyor – This includes various size motors, singulators, spiral conveyors, conveyor extenders, etc.

Sortation – Sliding shoe sorter, gantry crane, shuttle car, tilt tray systems, and bombay sorter are just a few of different types of sorters that can be entered.

Automated Guided Vehicles – If the system uses AGVs or monorail then these line items should be included.

Manual Vehicles – This area allows for manual operations like fork trucks, walkie riders, and very narrow aisle (VNA) vehicles.

Picking/Palletizing – Some of the options in this area include palletizers, pick-to-light, pallet collector/dispensers, robots, over-head crane, depalletizers, etc.

Lifts – Whether large or small, reciprocating or continuous this area will handle it.

Building Services – There are options here for various lighting, HVAC, compressed air, and refrigeration.

Operational Data - Scenario #1	
3 Shift - Automated	Scenario Name
24	Hours of operation per day
5	Days of operation per week
50	Weeks of operation per year
6000	Hours of operation per year
0.9	Power Factor
\$0.06	Cost per Kilowatt Hour

Qty	Unit of Measure	Utilization	Device	Detail/Model	Amp/Unit	KW	Utilized KW	KWHR/yr
100	Motor	25%	Case Conveyor	5 hp	1.1	82.3	20.57	123,448
8	Motor	25%	Case Conveyor	75 hp	1.6	9.6	2.39	14,365
40	Motor	25%	Case Conveyor	1 hp	2.1	62.6	15.71	94,269
3	Motor	25%	Case Conveyor	1.5 hp	3.0	6.7	1.68	10,100
7	Motor	25%	Case Conveyor	2 hp	3.4	17.8	4.45	26,710
22	Motor	25%	Case Conveyor	3 hp	4.6	79.0	19.75	118,510

The above illustration displays a portion of the tool's input data sheet. The items in white are user defined input values while the items in blue are either calculated from the input values and energy formulas or are constant values.

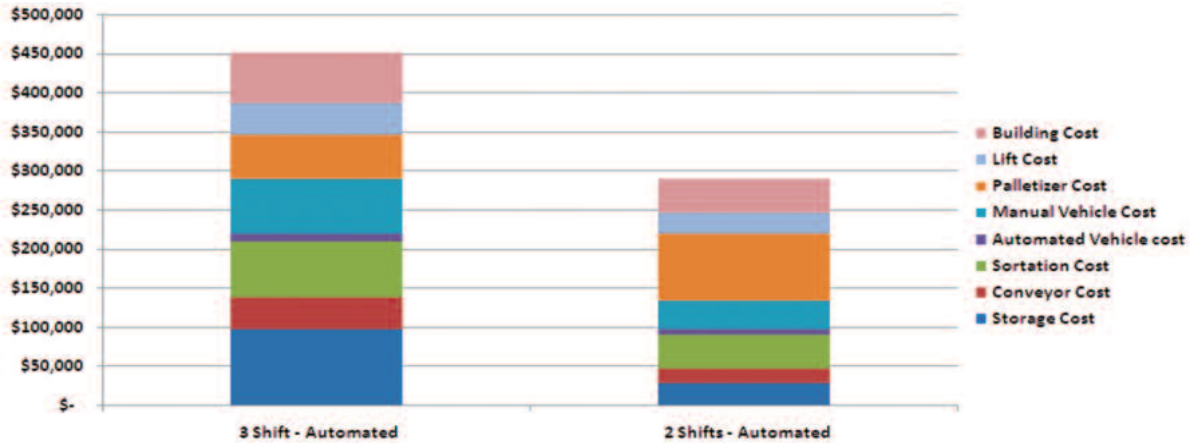
Step 4 - Review the results in terms of Kilowatts or dollars by each area. The results provide a side by side comparison of up to two options. An example may be comparison of a manual system to an automated system or a 2 shift operation to a 3 shift operation. The tables and charts below demonstrate the output capabilities.

ENERGY COSTS

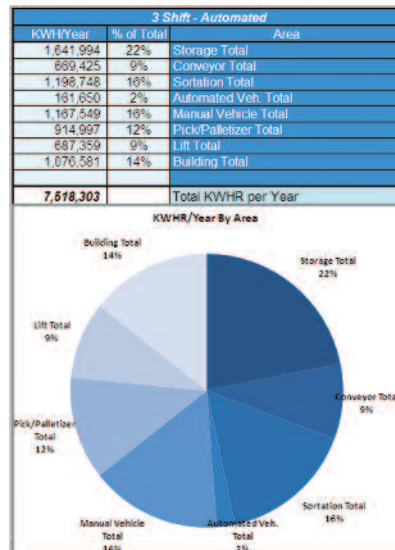
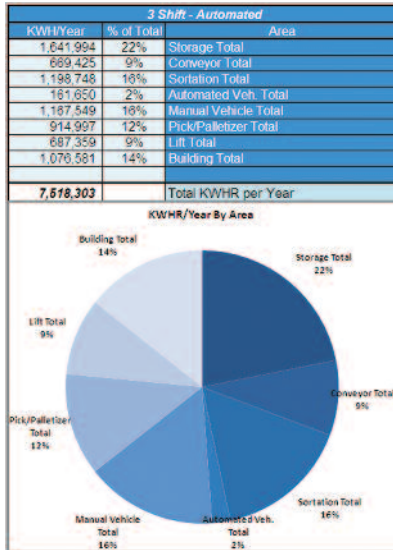
3 Shift - Automated	
Results - All Areas	
\$ 98,520	Storage Total
\$ 40,166	Conveyor Total
\$ 71,925	Sortation Total
\$ 9,699	Automated Veh. Total
\$ 70,053	Manual Vehicle Total
\$ 54,900	Pick/Palletizer Total
\$ 41,242	Lift Total
\$ 64,595	Building Total
\$451,098 Cost Per year	

2 Shifts - Automated	
Results - All Areas	
\$ 29,804	Storage Total
\$ 18,023	Conveyor Total
\$ 43,012	Sortation Total
\$ 7,048	Automated Veh. Total
\$ 36,230	Manual Vehicle Total
\$ 85,081	Pick/Palletizer Total
\$ 27,494	Lift Total
\$ 43,063	Building Total
\$ 289,756 Cost Per year	
\$ 161,343 Difference between scenarios	

ENERGY COSTS BY FUNCTION



ENERGY COSTS IN KWHS



Download this energy consumption tool at www.hksystems.com/calculators. Call 1-800-HKSYSTEMS (457-9783) with feedback or questions!

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