How is your Application Performing?

Since this evaluation is installation specific, a review of the configuration of the site or machine is required. Producing a custom analysis of your operation requires a review of your application by a Yaskawa Representative.

How much money can you save with Yaskawa on this or future projects?

Let us conduct a LCC Analysis of your application:

- Schedule a meeting with your Yaskawa sales representative.
- Review your existing or planned VFD Application.
- Complete a questionnaire profiling your VFD application from an operating cost and reliability perspective.
- Data will be input to the same Reliasoft™ programs used in the preceding examples.
- A custom report will be provided back to you with anticipated $avings when using Yaskawa VFDs.

YASKAWA
The Drive for Quality™

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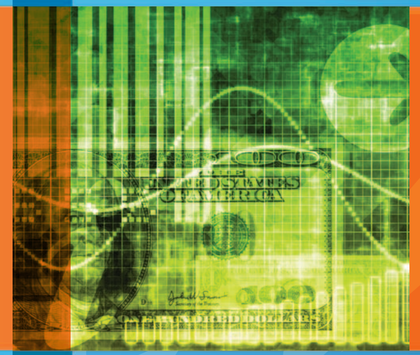
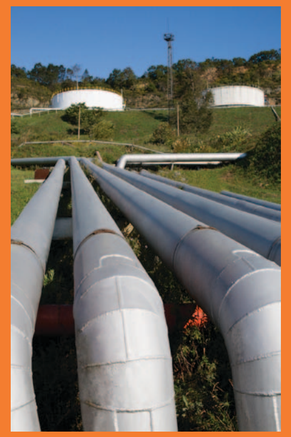
Document BL.LCC.01 04/01/10

Driving down the cost.

LifeCycle Cost Analysis



YASKAWA
The Drive for Quality™



Oil Field Example
Comparison based on:

- 17 Wells
- 14 barrels per hour each
- $60.00/bbl
- 8 year lifespan
- 24/7/365 operation

Textile Example
Comparison based on:

- 1 extruder feeding 18 sections, each section with 2 spin pump, 1 godet and 4 winder drives
- Line production rate - $1,600 per hour
- 20 year lifespan
- 24/7/365 operation

Yaskawa's Variable Frequency Drive (VFD) products have features and functions that are unmatched in the industry, providing the highest levels of performance.

Everyone in the Variable Frequency Drive Business Talks Features and Functions.

Your machine, your pump, your process line - whatever your VFD Application - the bottom line is: Drives are money.

- Your VFD Applications produce money.
- Operating your VFD Applications costs money.
- Maximizing the return means minimizing the cost.
- Optimizing the Life Cycle Cost (LCC) of a VFD Application is critical to maximizing the return.

Life Cycle Cost (LCC), Total Cost of Operations (TCO), and Lowest Cost of Product Ownership are phrases being rejuvenated in today's cost conscious world. LCC and lowest cost of ownership are not new to Yaskawa - the concepts are integral to the Yaskawa Design and Quality system - The Yaskawa Quality Experience.

Every new generation of Yaskawa VFDs builds on the successes of the past and takes advantage of new component technologies for improved size, cost, and reliability.

These are qualitative statements - and Yaskawa can show you how to quantify them. A simple LCC analysis of specific VFD Applications yields dramatic results. The following examples compare LCC, measured in lost production and corrective maintenance cost, in real world applications.

Example: Oil field - 17 wells, progressive cavity pumps (PCP).

From customer maintenance records, existing drive related LCC over 8 years = $1,237,324

If using Yaskawa, drive related LCC over 8 years = $91,857

Saving with Yaskawa = $1,145,468

Example: Textile producer - spinning line, 18 sections of 7 drives each + extruder.

From customer's existing failure rate, drive related LCC over 20 years = $741,141

If using Yaskawa, drive related LCC over 20 years = $31,005

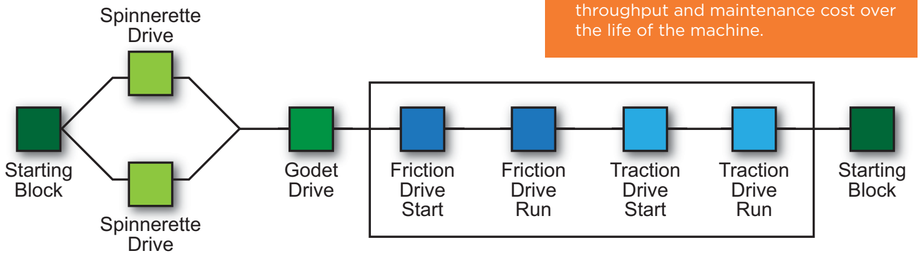
Saving with Yaskawa = $710,136

The Output.

Example of Reliability Block Diagram (RBD)

RBD of individual machine sections, Spinnerette through Winder. Winder is comprised of friction and traction drives, 2 each per machine section..

Spinning Line Analysis



Sample of BlockSim™ Output from the analysis of the Textile Example Presented on Page 2.

BlockSim™ Analysis		Yaskawa	Existing
System Overview			
General			
Mean Availability (All Events):		0.99997	0.99936
Expected Number of Failures:		0.36	8.68
MTTFF:		478,270.04	19,559.73
System Uptime/Downtime			
Uptime (Hours):		175,195.3	175,087.2
Corrective Maintenance (CM) Downtime:		4.7	112.8
Total Downtime (Hours):		4.7	112.8
Number of CMs:		0.36	8.68
Total Costs:		$12,830	$306,221
Throughput			
Total Throughput (Hours):		175,188.6	174,928.2
Max possible throughput 20 yrs @ 8760 hrs/yr		175,200.0	175,200.0
Years	20		
Hours/Year	8760.0		
Lost Hours (total downtime)		11.4	271.8
Lost Production, at $/hr	$1,600	**$18,175**	**$434,920**
LCC - Total Costs + Lost Production		$31,005	$741,141
Savings with Yaskawa:			**$710,136**

System Configuration and LCC

The customer supplied data is used to create a Reliability Block Diagram (RBD) using Reliasoft Corporation's BlockSim™ software.

- Each block represents a drive.
- Each block is populated with MTBF and maintenance data.
- The RBD defines how the drives are interconnected from a reliability perspective.
- Multiple simulations calculate statistical throughput and maintenance cost over the life of the machine.

Mean Time Between Failures (MTBF) and System Configurations.

Customer maintenance records can be used to calculate the existing drive's Mean Time Between Failure (MTBF), or that number can be assigned, based on historical experience.

The Yaskawa MTBF used for comparison is the result of a five year study of installed drives at Ford Motor Company. The study comprised 490 drives in a wide variety of applications and more than 11 Million hours combined operation. It yielded an MTBF of 472,000 hours.

System Configuration

For analysis, it is necessary to define how the drives are interconnected, reliability-wise.

- In the Oil Field example, the drives are independent. Any drive can shut down without affecting the others
- The Spinning Line example is more complex. If the Extruder shuts down, the entire line shuts down. If any other drive shuts down, only the production of its Section is affected.
- Finally, the production rate (in $ of product/hour) and maintenance costs of the system must be defined.
- Once the system configuration is known and maintenance costs are defined, a LCC comparison can be made.

MTBF

A two parameter exponential failure distribution is considered appropriate for electronics. It ignores infantile failures and calculates MTBF over the useful life of the product. This study utilizes a single parameter exponential distribution. It includes infantile failures for two reasons:

- Infantile failures are still field failures. The customer in the field doesn't care when the product fails, he only cares that it failed.
- With Yaskawa's Quality Control/Quality Assurance (QC/QA) processes, infantile failures are virtually non-existent!