

CASE STUDY ENERGY SAVINGS IN A MUD PUMP

ABSTRACT

This case study explores the installation of the starting and energy saving apparatus in a mud pump owned by a water authority.

Benefits include:

- Reduced voltage motor starting
- Energy savings
- Improved power quality

CLIENT PROFILE

The company is a water authority with various facilities in the country. SinuMEC was installed at a mud pumping facility.

BUSINESS REQUIREMENT

The ever increasing electricity prices and business demands for increased profitability led the company management to explore energy saving solutions.

Water authorities have enormous number of motors operating 24 hours a day (total of 8760 hours a year). The mud pump is used to elevate mud. Similarly to all mud and sludge pumps, they are loaded with partial loads.

As the amount of mud and its texture level changes the load of the motor changes. While the motor is designed to start fully loaded, the actual load is significantly less than the nominal. The average load of the motor was 31%. As in many similar locations, the motor runs most of the time with a partial load offering significant potential for energy savings.

SOLUTION

The factory implemented PowerSines' innovative SinuMEC (Sinusoidal Motor Efficiency Controller) system to provide harmonics-free motor starting as well as to induce energy savings. SinuMEC controlled the voltage supplied to the motor to allow reduced voltage startup; and while the motor was running the SinuMEC adjusted the voltage according to the

OVERVIEW

PRODUCT USED

SinuMEC – Sinusoidal Motor Efficiency Controller

CLIENT PROFILE

Water Authority

APPLICATION

Mud Pump

BUSINESS REQUIREMENT

Stable motor starting and cutting energy costs

SOLUTION AND BENEFITS

Installation of PowerSines' Sinusoidal Motor Efficiency Controller, designed to reduce motor voltage according to motor load, improved motor efficiency and lifetime.

load. Due to the structure of electric motors, reducing the supplied voltage while partially loaded increases its efficiency and lowers its internal losses.

SinuMEC is built around the patented RIGHTVoltage technology, which enables control of the voltage supplied to the AC motor. By utilizing proprietary methods for combining three-phase voltage vectors (VVC - Voltage Vector Combination), SinuMEC controls the voltage amplitude while maintaining a pure sinusoidal waveform. It does not generate harmonics and is EMI/RFI free.

While the pump's control voltage was kept unchanged, the power voltages supplied through SinuMEC were constantly measured for power demand and modified accordingly.

RESULTS

MOTOR STARTING

SinuMEC provided smooth motor starting with reduced voltage. The startup current did not exceed twice the nominal current.

ENERGY SAVING

An energy meter was installed on the line side of SinuMEC in order to measure the energy consumed by the system. The motor operated for 24 hours with SinuMEC's operational "Save Mode" and 24 hours in "internal bypass" mode. In order to compare the periods, the amount of pumped mud was measured. The following table shows the average values measured during each 24-hour period:

SinuMEC Mode	Save	Bypass	Saving
Volts, RMS	415.05	414.41	<0.5%
Currents, RMS	9.65	14.24	32%
Line Losses			54%
Active Power	4.36	4.67	7%
Reactive Power	5.39	9.08	41%
Total Power	6.93	10.21	32%
Power Factor	0.62	0.45	38%

In order to provide a better comparison of the two time periods, taking into account the changing characteristics of the load, the peak values were also compared, in the table below:

SinuMEC Mode	Save	Bypass	Saving
Volts, RMS	423.9	422.3	<0.5%
Currents, RMS	12	16.5	27%
Line Losses			47%
Active Power	6.29	7.02	10%
Reactive Power	7.13	10.03	29%
Total Power	9.51	12.24	22%
Power Factor	0.74	0.59	25%

POWER QUALITY

SinuMEC does not generate any side effects and does not require any filters. In addition, it improves the power quality of the facility by filtering harmonics and improving the power factor.

The table below compares the average power quality parameters during the two 24-hour periods:

SinuMEC Mode	Save	Bypass	Improvement
Volts, THD	1.51	1.53	1%
Currents, THD	2.70	3.83	30%
Currents, TDD	1.73	3.6	52%
Power Factor	0.62	0.45	38%

SUMMARY

The installation of SinuMEC provides significant benefits, from motor starting, energy saving and improvement of power quality. SinuMEC increases the facilities reliability, efficiency and profitability.

Similar benefits were measured in other SinuMEC installations in low or variable load motors, such as vacuum pumps, hydraulic pumps and more.

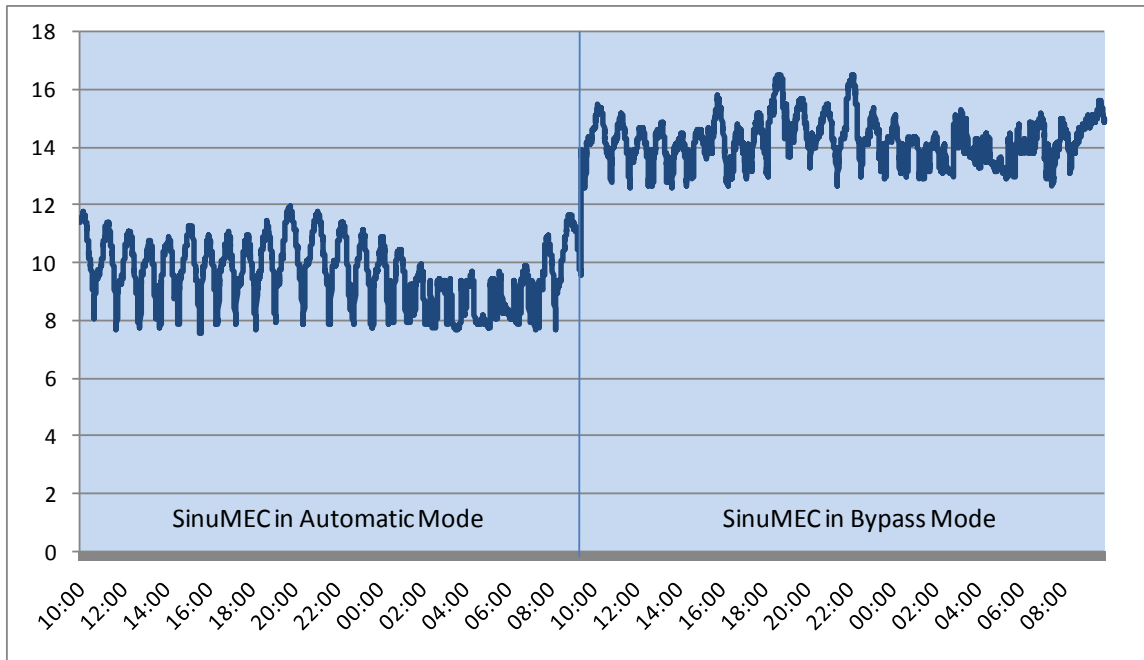
Results in all cases show that with SinuMEC, companies can focus on the productivity of their operation while SinuMEC handles the reliability of their motors.



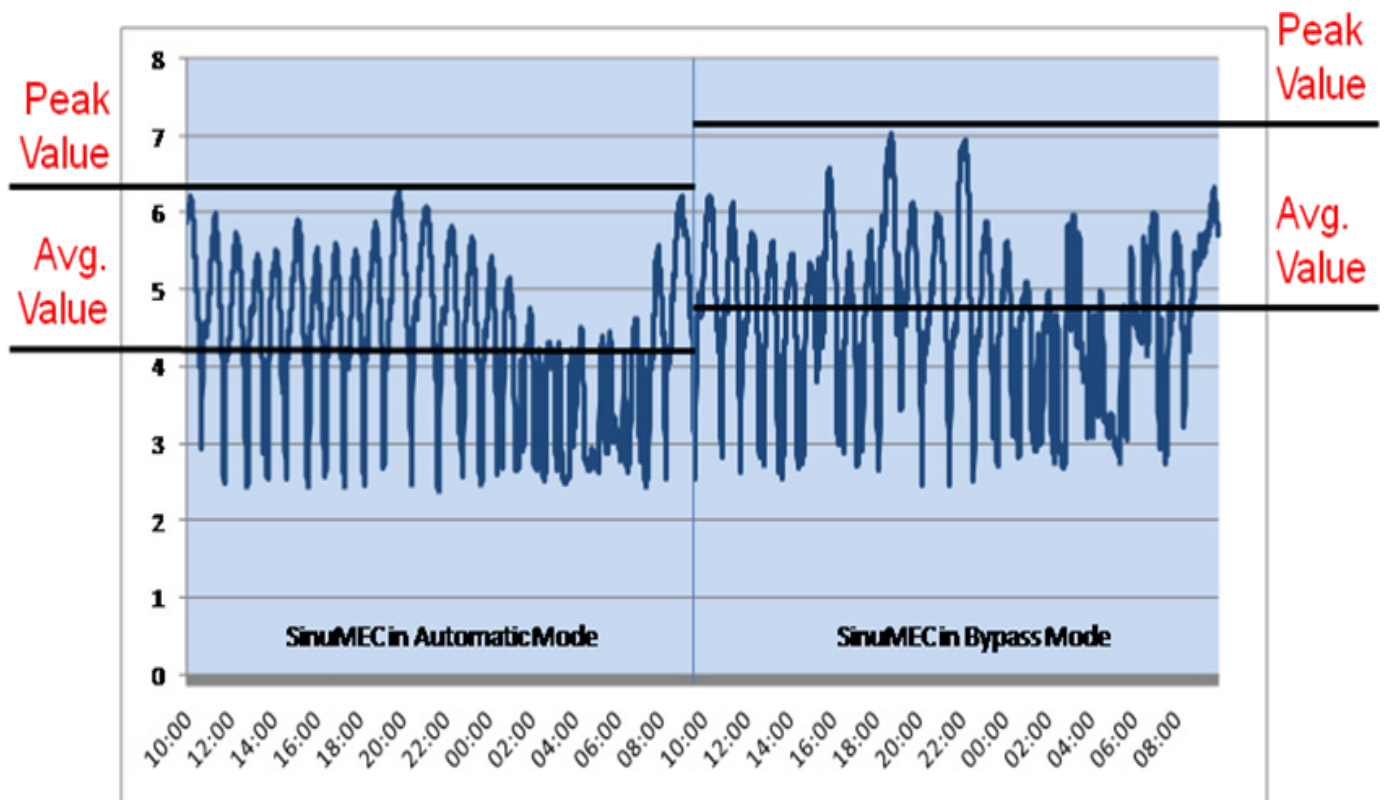
SinuMEC – Sinusoidal Motor Efficiency Controller

DETAILED GRAPHS OF THE CASE STUDY RESULTS

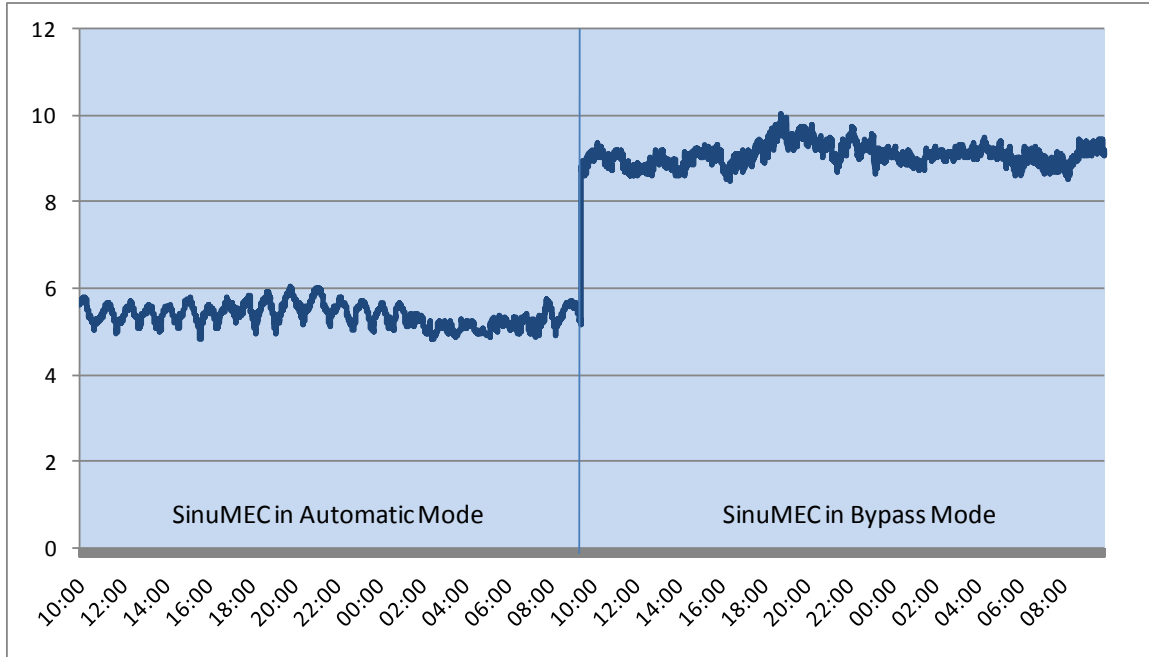
Current



Active Power



Reactive Power



Current Harmonics

