

Forward looking innovative solution provider

Intelligent Power Saver- iMLS

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AGENDA

- iMLS Technology Overview
- iMLS Installation and Performance
- Example of Energy Saving ROI Assessment





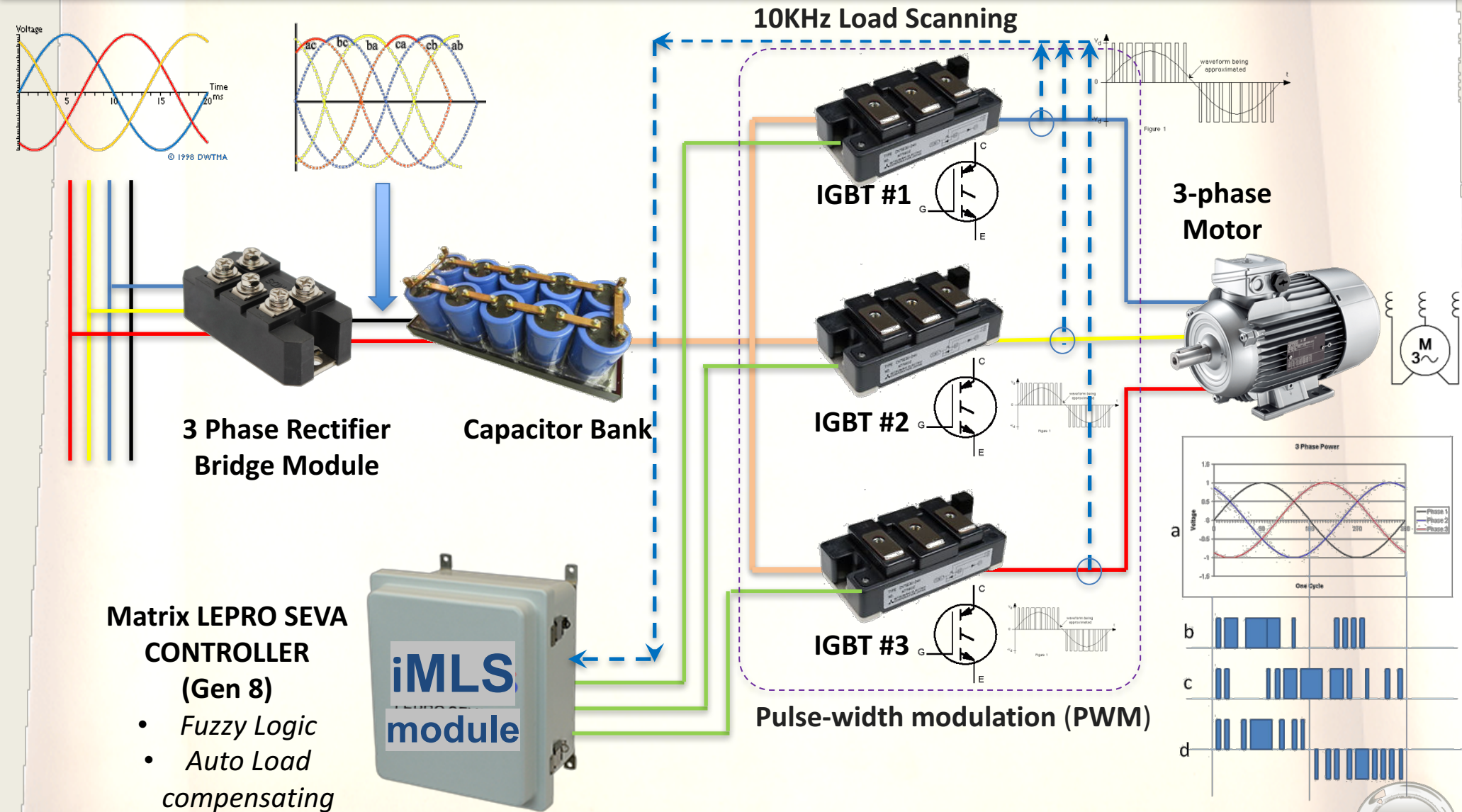
IMLS TECHNOLOGY OVERVIEW

iMLS TECHNOLOGY

- Adopts Automatic Load Compensations control technology
- Self Proprietary Software:
 - Base on Computer Control Fuzzy Control Theory
 - Load Scanning at 10000 Hz
 - Real Time Optimal Control
- High Performance Energy Saving
 - Close loop monitoring to enable Fast response to load variations.
 - Ensure motor operate in most energy economic state.
- Reduced Operating Temperature & Noise of Pump hence, prolong lifespan.



iMLS TECHNOLOGY



The diagram illustrates the Glycol Cooling System, which includes two main tanks: WARM CHILLED GLYCOL TANK and COLD CHILLED GLYCOL TANK. The system is controlled by two PICs (PIC503 and PIC509) and features several pumps (P-1A, P-1B, P-2A, P-2B, P-3A, P-3B, P-3C) and compressors (XX-1, XX-2). The flow is monitored by various sensors (PI, FI, FIC, TI, PD, L) and the system is equipped with a PSA NITROGEN source. The diagram highlights the installation of iMLS on pumps P2A and P2B, which are highlighted in red. The system is designed to provide cooling for the MPP and SYN/STE processes.

Installed iMLS on P2A & P2B Pumps

- Energy Saving > 40%

- ## Installed iMLS on P2A & P2B Pumps
- Energy Saving > 40%
 - Running Temp reduced from 62C to 40C



INSTALLATION & PERFORMANCES

INSTALLATIONS



Resort World Manila



Up Techno Hub



GSK Singapore



Merck Singapore



St Luke Hospital



MacQueen Mall



Harbor Point



Green Belt

INSTALLATIONS



vertex-one



MarketMarket



Districtimus



Glorietta



FairviewTerraces

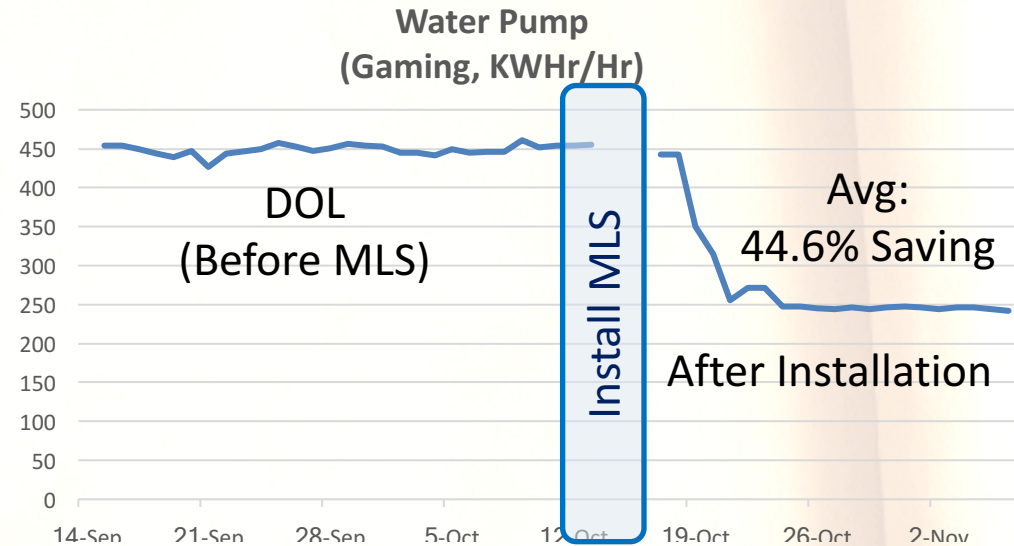
INSTALLATION AND PERFORMANCE EXTRACTS

- iMLS has been installed in various locations and industries. It has proven track records of helping customers saved significant amount of energy.
- Over 500 sets installed in Philippines with multi-million dollars annual power saving. The largest client attained >USD 2millions saving per year.
- This presentation put forward 3 installation success stories in difference industries and 1 Competitive Case Study:
 - Entertainment Sector: Gaming Center
 - Hospitality Sector: Hotel
 - Manufacturing Sector: Pharmacy Plant,
 - Competitive Experiments: Parallel Water Pump Case Study



CASE 1: (GAMING) RW, MANILA

- The Gaming Center installed
 - 1X Water Pumps.
- EDM Meter was installed and daily recording of meter readings collected at 1pm everyday.
- KWHr data of 1 month before and 1 month after installation were tabled.
- Results:
 - Water Pump: AVG 44.6% Saving
 - Chiller : AVG 8.7% Saving
- Water Pump Power saving Exceeded expectation.



CASE 2 : (HOTEL) MANILA

- The Hotel installed iMLS on Chiller System:
 - 2X Primary Pump (30KW)
 - 2X Secondary Pump (55KW)
 - 2X Condenser Pump (15KW)
- Customer Performed Measurement to collect before and after installation performance.
- Results:
 - Pump Power Save: 34%~38%
- Chiller Temperature Performance maintained within allowable limit.

Pump Power Consumption

AVG (L1, L2, L3 Ampere)	Without MLS	With MLS	Reduction %
Primary Pump 1	31.33	19.97	36.3%
Primary Pump 2	32.87	21.53	34.5%
Secondary Pump 1	62.17	41.30	33.6%
Secondary Pump 3	61.57	37.60	38.9%
Condenser Pump 1	103.47	66.03	36.2%
Condenser Pump 3	106.13	67.20	36.7%

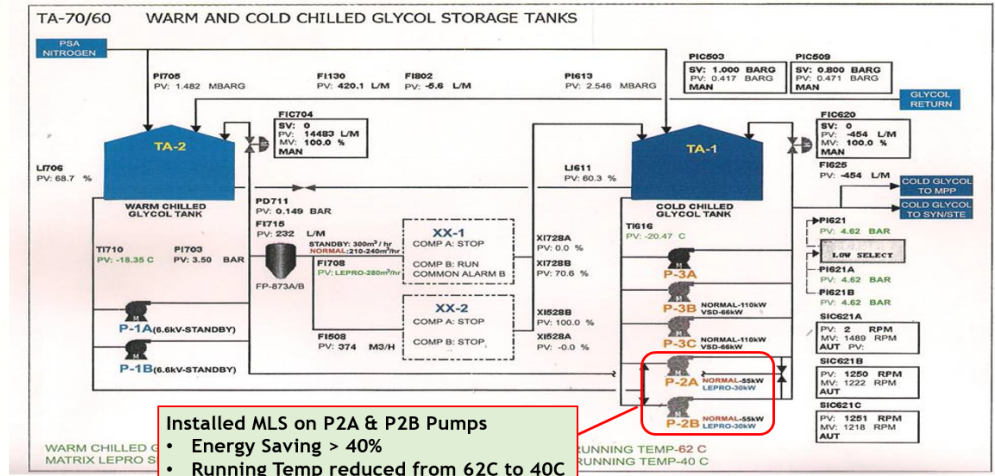
Chiller Performance

	Without MLS	With MLS
CHILLED WATER IN, °F	50.4	49.7
CHILLER WATER OUT, °F	43.8	44
CONDENSER WATER TEMP-IN, °F	84.6	83.3
CONDENSER WATER - OUT, °F	91.3	90.9

CASE 3 : (MANUFACTURING) SINGAPORE

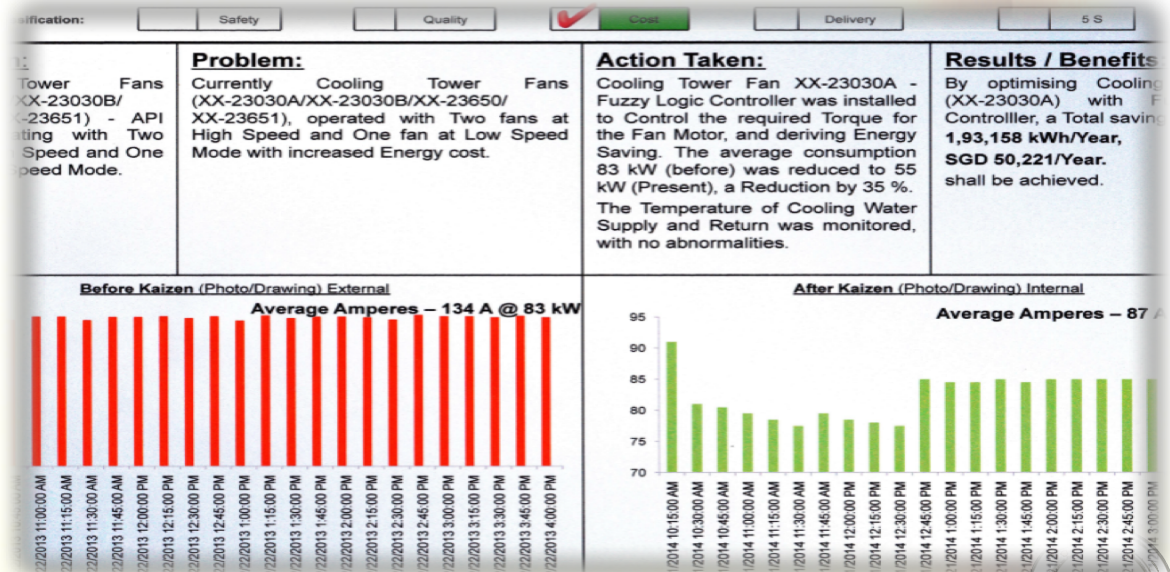
- The manufacturing plant installed iMLS on
 - 2X Warm Chilled Glycol Pumps (55KW)
 - 3X Cooling Tower Fans
- Customer Performed Measurement to collect before and after installation performance.

Glycol Pumps Power Saving > 40%



Cooling Tower Fans Saving won Energy Treasure Hunt Awards

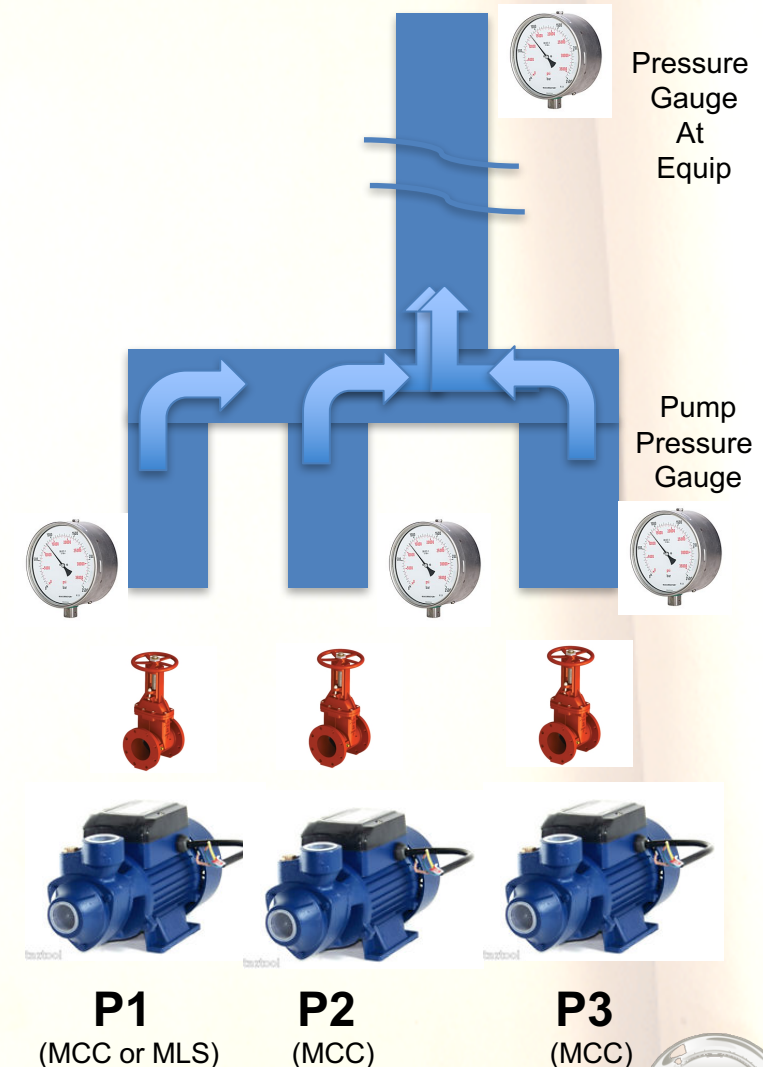
- Results:
 - Glycol Pump Power Save > 40%
 - Pump Operating Temperature reduced from 62 degC to ~40degC.
 - Cooling Tower Fans achieved 35% Saving.
 - System Performance stays within limit.



COMPETITIVE STUDY: MULTI-PUMP SYSTEM

- Objective: To determine Power Saving performance of iMLS system against MCC mode.
- Desired Operating Pressure at Equipment Input: 5 to 6 Bar.
- MLS Power Saver was connected to Pump 1 with switchable options of running either MCC or iMLS Mode.
- More than 50 experiments were performed with customers. **iMLS attained 29% ~44% Energy Saving.**

Group	Date	Ap Cooling Press(bar)	Pump 1 Mode	Pump Pressure (bar)	Pump 1	Pump 2	Pump 3	Measured Power (kW)	Pump 101-1	Pump 101-2	Power Saving
5	27-Mar-18	4.98	Mcc	9.2	9			65.50	68.80		Baseline
5	27-Mar-18	5	Matrix	7	9			46.60	63.50		29%
6	27-Mar-18	5.02	Mcc	9.5	9			66.00	69.00		Baseline
6	27-Mar-18	5	Matrix	7.1	9			46.87	68.90		29%
7	27-Mar-18	5.02	Mcc	9.5	9			65.50	68.80		Baseline
7	27-Mar-18	5.03	Matrix	7.1	9			46.70	69.00		29%
9	11-Apr-18	5	Mcc	7	8.9			87.14	72.06		Baseline
9	11-Apr-18	5	Matrix	6	8.9			49.00	72.10		44%
9	11-Apr-18	5.04	Matrix	5.9	8.9			49.50	71.20		43%



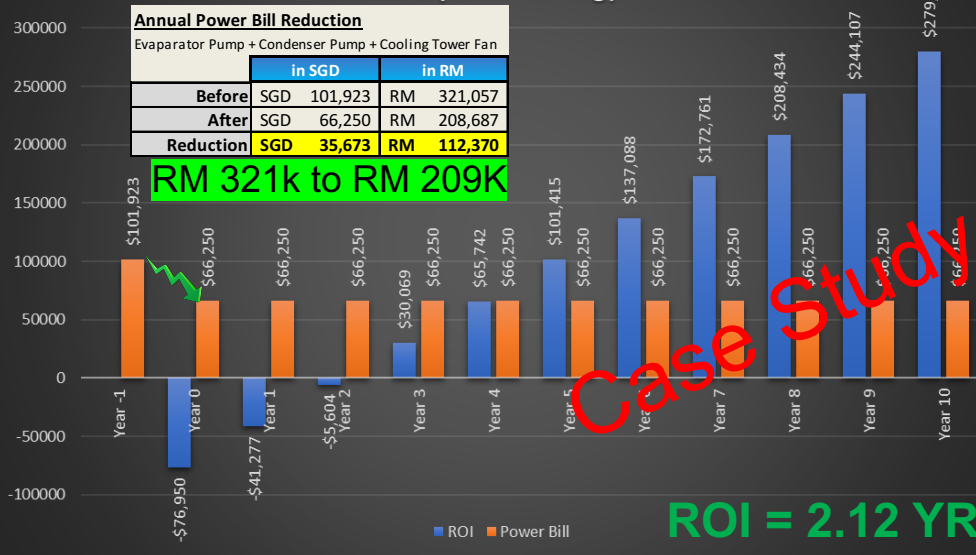
EXAMPLE: PROJECTED POWER BILL SAVING & ROI ANALYSIS

iMLS ROI (35% and 40%)

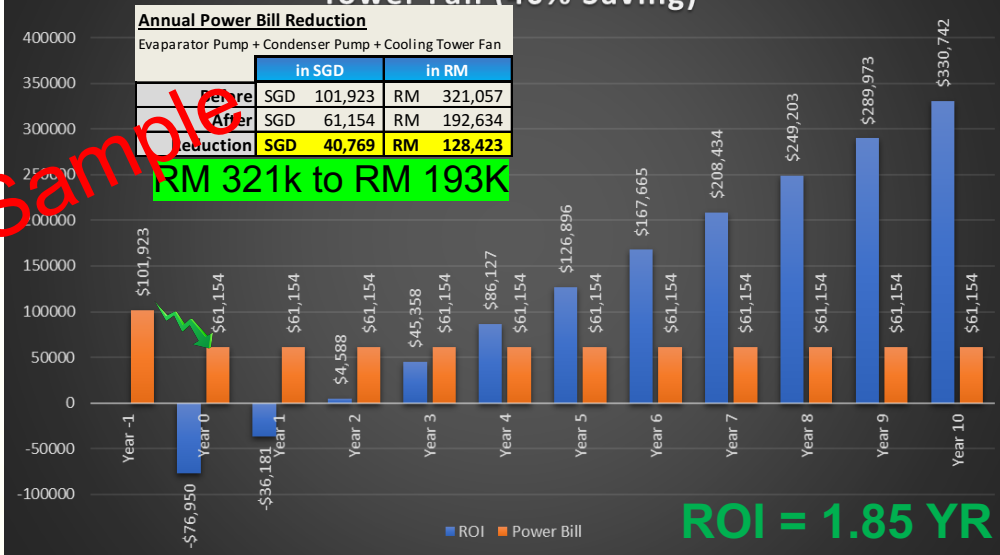
Innoforte will work with customers to assess potential power saving projects. With the saving projection, energy saving dollars and investment ROI can be derived.

Previous Installations attained 30% to 50% saving with confident.

Evaporator Pump + Condenser Pump + Cooling Tower Fan (35% Saving)



Evaporator Pump + Condenser Pump + Cooling Tower Fan (40% Saving)



CASE STUDY

Power Saving Derivation & Implementation

Per our meeting, we agreed to start phase 1 project with CT Pump 1&2

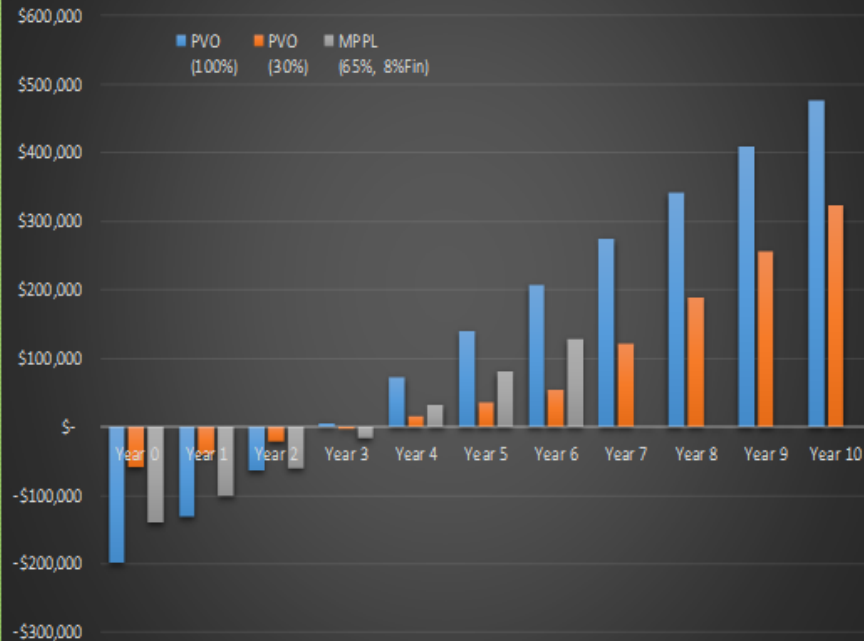
										S\$ to RM	2.95			Saving/Year
Operating										Pwr/Year (KW)	Pwr Price		Pwr Bill/Year (S\$)	35%
	Tag	KW	RPM	Volt	Amp	pf	Power	Hrs/wk	Operation	P/KW(RM)	P/KW(S\$)		S\$	S\$
Phase 1	CT Pump 2	110	1500	415	136	0.9	87979	168	768582	0.39	0.13	\$	101,609	\$ 35,563
	CT Pump 1	110	1500	415	122	0.9	78922	168	689463	0.39	0.13	\$	91,149	\$ 31,902
Phase 2	CT Pump C	75	1500	415	118	0.9	76334	168	666858	0.39	0.13	\$	88,161	\$ 30,856
	CT Pump D	75	1500	415	117	0.9	75688	168	661206	0.39	0.13	\$	87,414	\$ 30,595
Phase 3	Pallet Mill 1	220	990	415	280	0.9	181133	140	1318645	0.39	0.13	\$	174,329	\$ 61,015
Phase 4	Pallet Mill 2	220	990	415	280	0.9	181133	140	1318645	0.39	0.13	\$	174,329	\$ 61,015
	Pallet Mill 3	220	990	415	280	0.9	181133	140	1318645	0.39	0.13	\$	174,329	\$ 61,015
	Pellet Mill 4	250	990	415	300	0.9	194071	168	1695401	0.39	0.13	\$	224,138	\$ 78,448
													\$ 1,115,459	\$ 390,411
													RM3,290,603	RM1,151,711



CASE STUDY

CT Pump 1 & 2 (ROI Analysis, 6 Yr Co-Invest)

ROI CT Pump 1 & 2



CT Pump 1 & 2 110KW		Option 1 (Purchase)	Co-Invest Option Co-share Investment/Saving 6 Yrs Contract					
	Saving (Annual)	PVO (100%)	PVO (30%)	PVO Saving Share (Annual)		MPPL (70%, 8%Fin)		MPPL Share (Annual)
Year 0		-\$ 198,000	-\$59,400			-\$138,600		
Year 1	67465	-\$ 130,535	-\$ 40,510	28%	\$ 18,890	-\$ 101,113	72%	\$ 48,575
Year 2	67465	-\$ 63,069	-\$ 21,619	28%	\$ 18,890	-\$ 60,627	72%	\$ 48,575
Year 3	67465	\$ 4,396	-\$ 2,729	28%	\$ 18,890	-\$ 16,902	72%	\$ 48,575
Year 4	67465	\$ 71,862	\$ 16,161	28%	\$ 18,890	\$ 31,673	72%	\$ 48,575
Year 5	67465	\$ 139,327	\$ 35,052	28%	\$ 18,890	\$ 80,248	72%	\$ 48,575
Year 6	67465	\$ 206,793	\$ 53,942	28%	\$ 18,890	\$ 128,824	72%	\$ 48,575
Year 7	67465	\$ 274,258	\$ 121,407	100%	\$ 67,465	\$ 0	0	0
Year 8	67465	\$ 341,724	\$ 188,873	100%	\$ 67,465	\$ 0	0	0
Year 9	67465	\$ 409,189	\$ 256,338	100%	\$ 67,465	\$ 0	0	0
Year 10	67465	\$ 476,655	\$ 323,804	100%	\$ 67,465	\$ 0	0	0

Thank You

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