Technologies for Efficiency and Competitiveness

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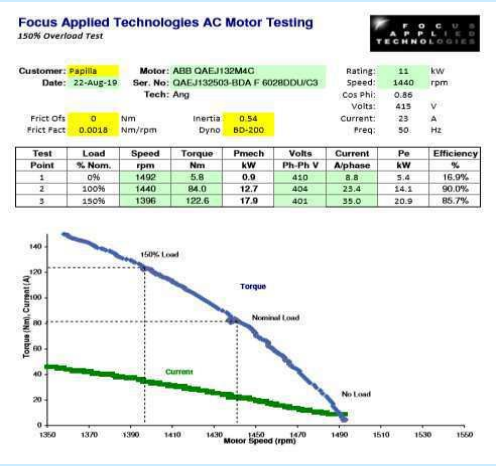
Where does all the money go?

(An overview)

Time = Money
Energy = Money
Materials = Energy + Money



Time is Money

ASEAN pay scales vary widely
Are your employees productive enough?
Is your business productive enough?
Are workers operating at their best “Value Add” level?

How do you measure this?

To make sure you are getting the most out of your team you have to track their performance.

How to do this depends on your industry.
Basically you need to track who is working on what, and how many man hours went into what.

I think of this as “Time Optimization” or “Human Resource Optimization”

Energy is Money

Small Businesses energy expenses are typically:
Electricity
Transportation Fuels
Other fuels (some times)

Again fuel costs wary widely.

Transportation costs are often overlooked, but are an integral part of your expenses, INCLUDING commuting back and forth to work or the job site.

Your energy efficiency plan needs to include commuting as well as your processes and building.

TARIF ASEAN JULI 2018
(cUSD/kWh)

USD Cents/kWh Jenis Pengguna	Indonesia	Malaysia	Thailand	Singapura	Philippines	Vietnam
House Rumah Tangga	11,00	10,00	12,41	19,97	18,67	10,59
Med. Biz Bisnis menengah-TR	11,00	13,58	11,00	14,30	12,23	13,44
Big Biz Bisnis besar-TM	8,36	9,60	11,00	14,02	11,98	12,36
Med Ind. Industri menengah-TM	8,36	8,29	8,36	13,05	11,69	7,81
Big Ind. Industri besar-TT	7,47	7,76	8,36	12,72	11,63	7,41

Some countries favor small businesses (Thailand) while others “fine” them (M'sia, VN) compared to houses

Big industries are better at lobbing for lower rates

Materials are Energy and Money!

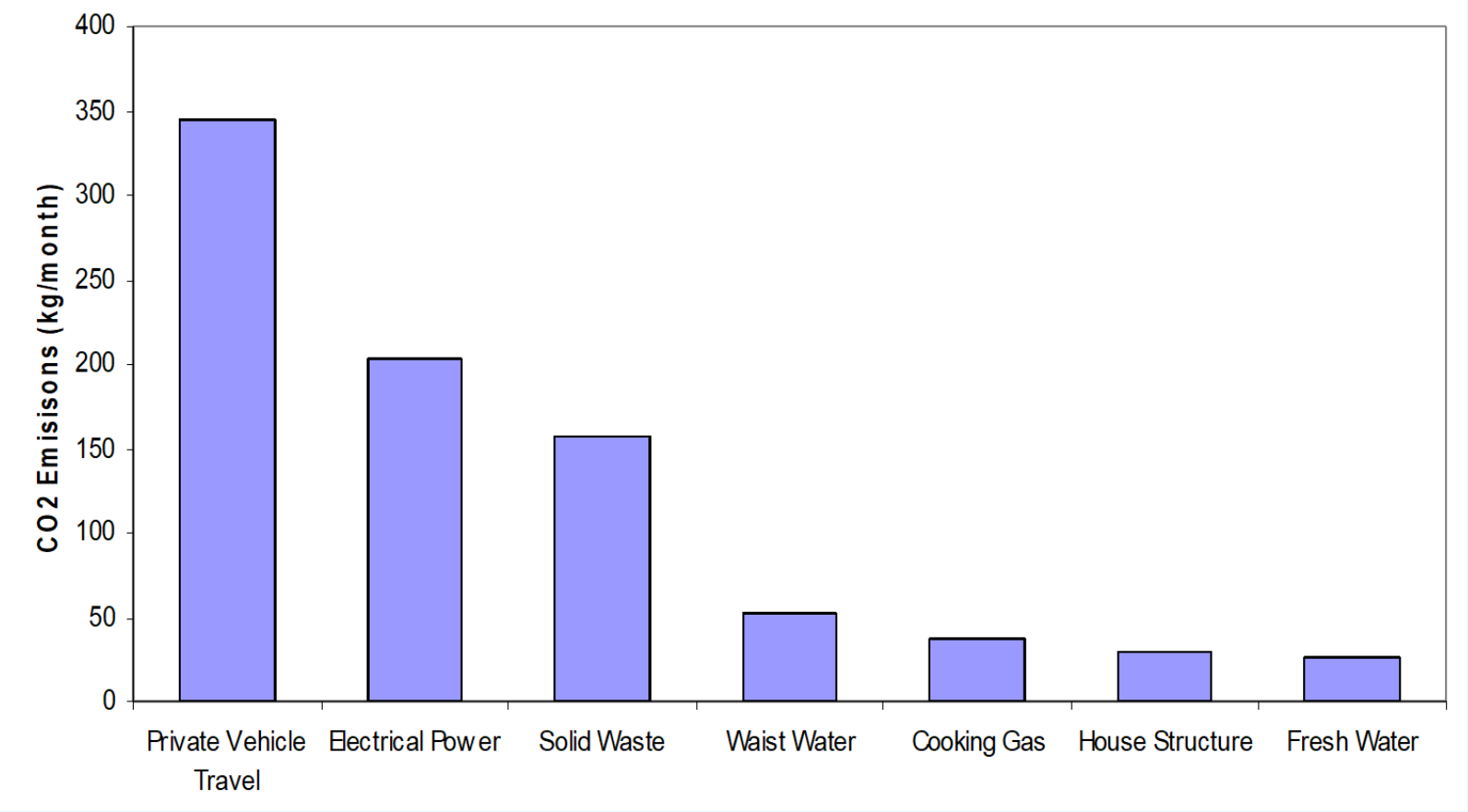
Materials used in your product, or consumed by your business represent both money and energy.

Proper optimization requires tracking materials consumption, utilization and scrap.

Good planning reduces scrap, reducing cost and environmental impact.

Proper recycling can also help both.

Household Emissions Analysis for WWF:



This analysis indicates that Transport, Electrical power and Waste are the biggest emissions categories for residences. Micro-scale businesses will be fairly similar.

Electrical power reduction: Building

Building Efficiency Technologies

Energy Audit – Financial plan
Check for Incentives (grants, tax breaks)
Know your electrical rate!
Lighting: LED, Diffused from outside
Heating/Cooling: INSULATE
Automatic lights/AC Shutoff

Aircon ~60% of small businesses, can be reduced by about half
Insulation and ventilation at roof
Tinting at windows, Double Pane Windows, Awnings
Ventilate heat out of building
Use more efficient inverter and 3 Phase ACs

Preform a cost/benefit analysis. Even if you are renting, it may make sense to “upgrade” the premise, and there may be incentives to do so

Model Household Electrical Usage:

Electrical Appliance	Avg Power (W)	Hours/Day
Air conditioning	500	2 x 12
Electric Water Kettles	2000	0.5
Electric stoves and Ovens	2000	1
Cooking appliances (Blender, …)	250	0.5
Fans	75	3 x 10
Refrigerators	80	24
Lighting	20	6 x 8
TV	50	6
Stereo/Radio	50	8
Computers	100	6
Water pumping (in rural homes)	100	2

Based on our survey we get household monthly electrical bills of from 9 to 100 rm/pax per month (Average of ~125RM for 5 pax family)
Air conditioning adds about 50-100RM per month

Air conditioning is available in 80% of the surveyed houses

On average it consumes 62% of the residential electric power

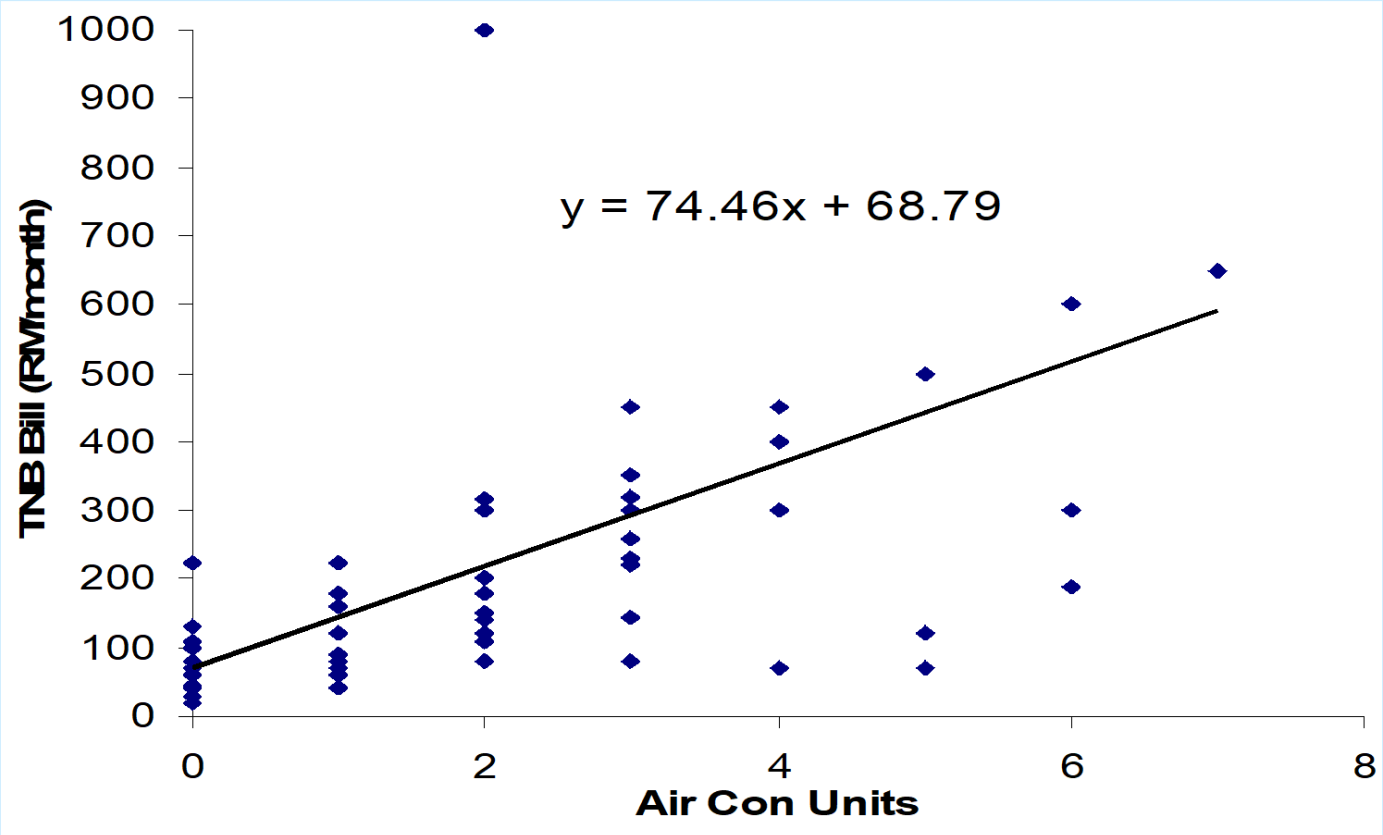
Sample data from Survey:

"Baseline" bill is: ~20$

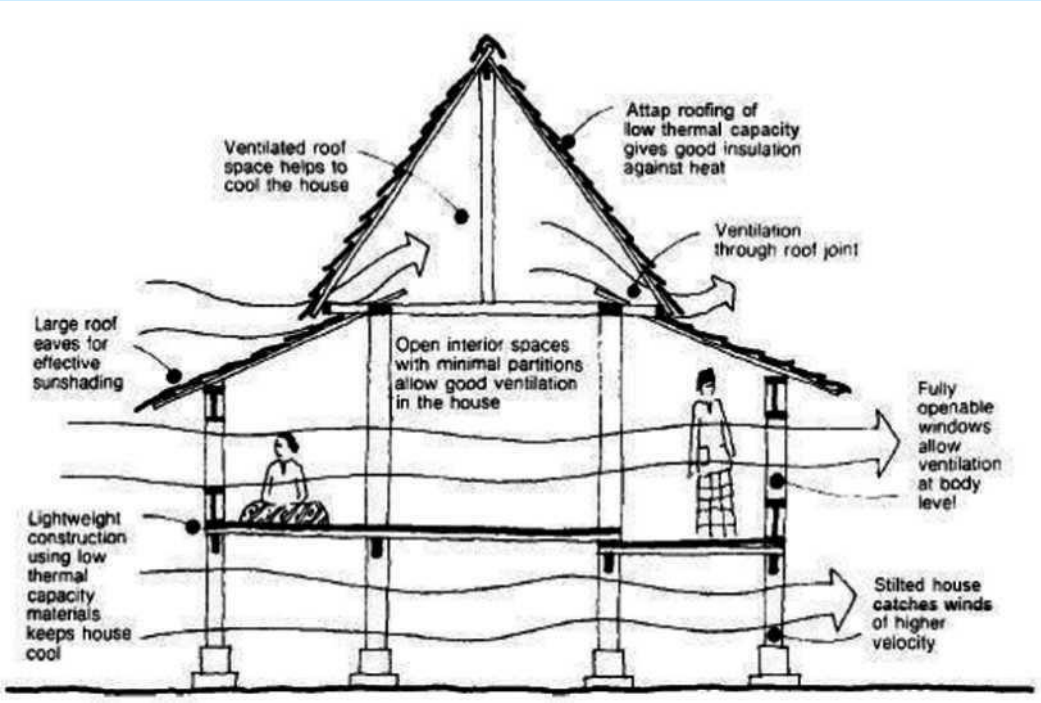
Additional cost per aircon: 15$

Average AC units: 2.6, or about 50$/month

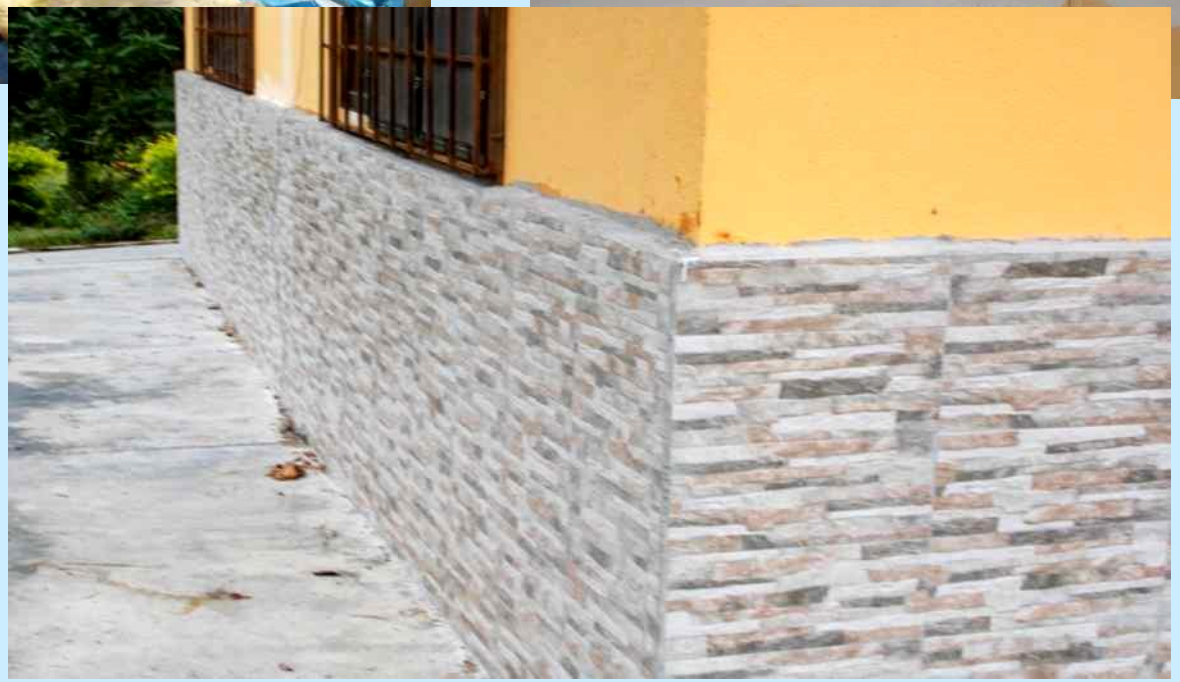
62% of our electrical bills goes to aircon!



Where did we go wrong?



How to make it right?



New HQ: 10x bigger, same electric bill as old!

Electrical power: Motors

Manufacturing businesses spend a lot on electricity for motors

Track Energy Usage: Know your tariff category
Don't Oversize: check you motors efficiency
Consider use of “Premium Efficiency” motors
Shut Down when not in use: automated systems are best
Reduce Peak Power:
- **VFD/Soft Start/ Power Correction Caps**
- **Stagger Starting of big motors or major processes**

Rewinding motors *can* reduce their efficiency
Make sure your re-wind house can confirm the efficiency

Electrical power: Monitoring

Process Monitors are a good way to track your energy usage

Electrical power: Motors

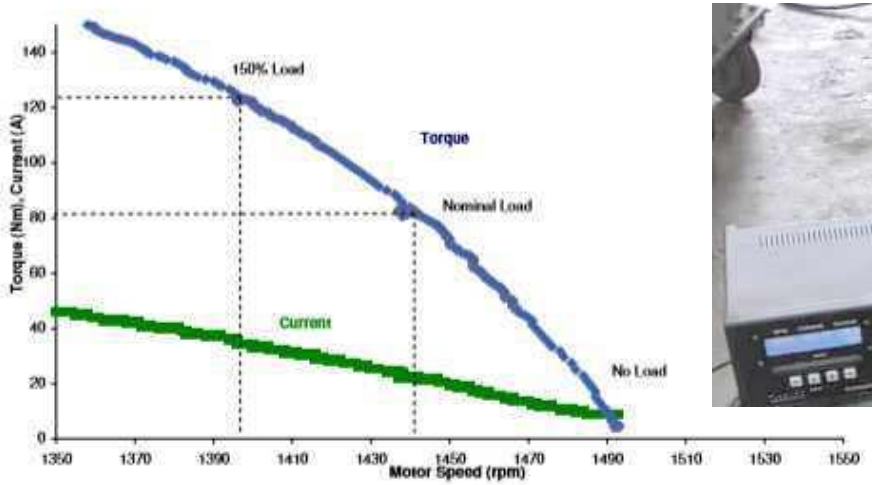
We produce equipment for measuring the efficiency of Electric motors, vehicles and engines.

Focus Applied Technologies AC Motor Testing

150% Overload Test

Customer:	Papilla	Motor:	ABB QAEJ132M4C	Rating:	11	kW
Date:	22-Aug-19	Ser. No:	QAEJ132503-BDA F 6028DDU/C3	Speed:	1440	rpm
		Tech:	Ang	Cos Phi:	0.86	
				Volts:	415	V
Frict Ofs	0	Nm	Inertia	0.54	Current:	23	A
Frict Fact	0.0018	Nm/rpm	Dyno	BD-200	Freq:	50	Hz

Test Point	Load % Nom.	Speed rpm	Torque Nm	Pmech kW	Volts Ph-Ph V	Current A/phase	Pe kW	Efficiency %
1	0%	1492	5.8	0.9	410	8.8	5.4	16.9%
2	100%	1440	84.0	12.7	404	23.4	14.1	90.0%
3	150%	1396	122.6	17.9	401	35.0	20.9	85.7%



Electrical power: Motor Efficiency

Underloading is the most common efficiency loss
Overloading can also reduce efficiency
Bad rewinds, “scratched” rotors & stators can too

Reducing the NEED for Transportation

Business location siting:

Locate your home, business, employees and customers as close together as possible

Avoid travel with Online Technologies:

Scheduling

Invoicing, Billing, Payments electronically

Customer Service remotely to replace travel

- Skype for conferencing
- Foto, data, documents in real time
- On-Line Trouble Shooting

When choosing a vehicle, consider the long-term cost of fuels, and total cost of ownership. Better efficiency vehicles may cost more in the short run, but save you in the long run.

When “Green” buildings aren't Green

KPI Chasing, Marketing Value

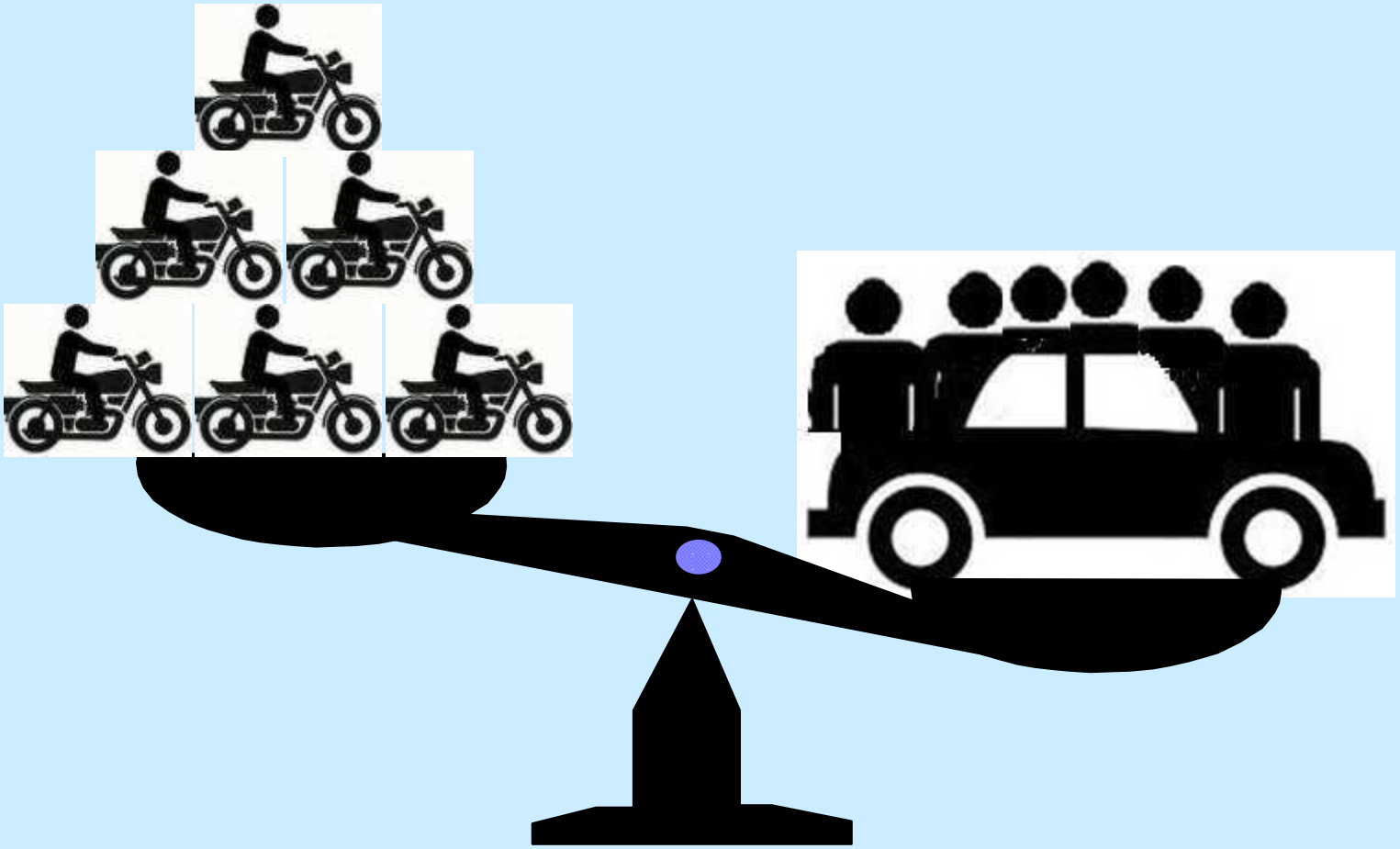
“The LEED-certified buildings, collectively, showed no savings compared to non-LEED buildings. LEED Silver and Certified office buildings underperformed other office buildings...” (Xie 2017)

Researchers have blamed careless work by builders, overly complicated energy-saving technology, or the bad behaviors of the eventual occupants of a building and inept energy modeling, prompting the title *“Are Modelers Literate?”* (Conniff)

In the case of some “Green” buildings (A new “showcase” corporate HQ in California USA) the building saves ~15% over the old HQ but people are forced to travel over twice as far to get to it, resulting in a total of ***50% INCREASE in emissions*** over the old building+Commute!

Electric 2-W Efficiency Comparison

6 guys on 6 e-motors are more efficient than 6 guys in one car!



Grab Food, GoJEK, Food Panda... all run on 2-wheels!

Project Management:

TRANSPERENCY in finances, procurement to catch “leakage”
Just like anything else, you need the data to make the best decisions. Make sure you keep track of expenses, and revenue
Get a finance person you can trust, and over-watch

Estimate project time conservatively to avoid going over time
A short delivery time might sound good at first, but if you are quote unreasonably the costs can kill your profit margin in the end

PROCURMENT: Know Customs duties (and loop holes)
Often times you can have imported parts classified in lower cost categories depending on how they are used in the final product. In some countries this can be quite significant

Generic Technologies:

GOOGLE IT!
When faced with a need or problem, go online for more info.
Check prices and make sure your not being “gouged”

CYBER SECUTITY: Backup!
You never know when the Russians will strike

Use Free/Open Source Software
Linux, Open Office
PCB Layout, Schematics, Ardurino, etc all have free versions

Consider newer technologies like Wide-band cellcom router
We saved 2000$ on land line installation with a broad band router
Unlimited office hours bandwidth + 60GB for 50$/month

Tools are an investment. Chose wisely.

Develop an “investment plan” for new tools and consider their “life time” efficiency

Good tools vs. cheap tools
Constantly replacing cheap tools may cost more than buying quality tools that will last

Rapid Prototype until volume makes sense to make a mold

Outsource vs. In source: focus on your competency

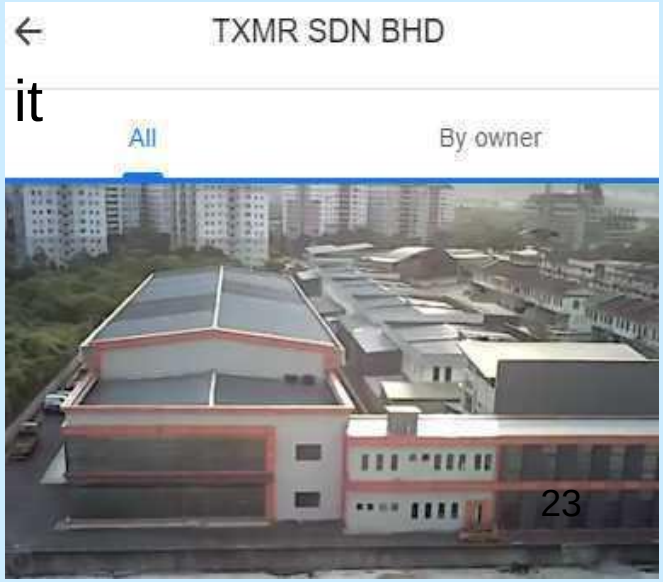
Don't Reinvent the wheel: it costs more to make something from scratch. Leverage off of existing products, tools and industries as much as possible.

TXMR: A case study

TXMR, a "partner" company of ours in Kuala Lumpur were having financial problems so we investigated.

They were suffering losses from:
Over purchasing (buying 3 components when needed only 1)
Over Paying (paying up to 3x the actual cost)
We looked further and found this was from
Employee "cost skimming"

Overtime pay
Workers prefer OT, so worked slow to get it
Late Delivery of projects, causing
Extensive travel and expenses to finishing up at customer site



CONCLUSIONS: DATA, DATA, DATA!

1) Track resource utilization:

- **Human resources**
- **Travel**
- **Materials**
- **Energy**

Without the data, you are just another opinion.

2) Minimize the need for travel, *including commuting*

Logistics Analysis Tool

3) Minimize Energy consumption via efficient buildings, motors and automation

Building and Motor Guidelines

4) Minimize scrap, & unnecessary utilization of resources

Materials “accounting”

CONCLUSIONS

5) Know the customs rules, electrical tarrifs and look for incentives

Industrial Assessment Team

6) Get the data and calculate the ROI of various efficiency improvements

Take data before/after to generate case studies

7) Keep your self informed of the latest trends and technologies

Public on-line easy to understand database with case studies

Inefficiency is like corruption: it is a parasitic drag on you and your business, so don't tolerate it at any level!

CONTACT: Let us know if you need more!

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