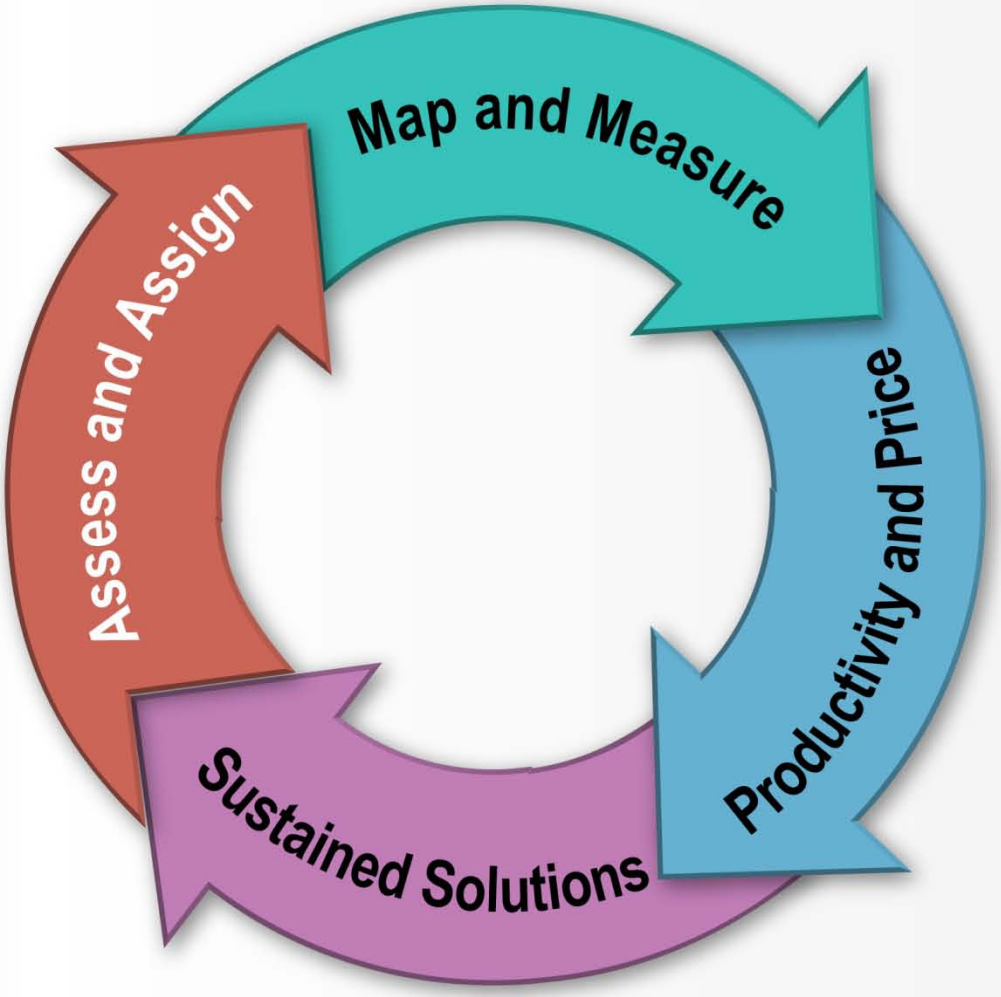
AMPS

Reducing Wasteful Consumption Through Voluntary Constraint

Short Overview

John Berilla
LSS MBB

A.M.P.S. Road Map



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Introduction to AMPS:
An Energy Consumption Reduction Method

Assess and Assign
Map and Measure
Productivity and Price
Sustained Solutions

- **Characteristics:**
  - **Data focused**
  - **Work flow centered**
  - **Operator & team driven**
  - **Highly adaptable**
- **Fundamentals:**
  - **Making drivers of energy consumption and cost visible**
  - **Quantifying it relative to output**
  - **Allow the operator to solve their own problem**
- **Solutions:**
  - **Little capital investment**
  - **Minimal impact on current work**
  - **Seek 100% effectiveness**

Energy Consumption Behavior Model: An AMPS Perspective

Drivers

- What is measured and rewarded
- Behavior and expectations of peers
- Momentum of past behavior (habits)
- Theory of Knowledge (TOK)

Inhibitors

- Invisibility
- Lack of scarcity
- System Design

Step 1 – Assess and Assign

General Facility Information
- Condition and Type of Use
- Size, Age, Orientation
- Occupancy
- Metering & Data availability

Inventory Existing Systems
- Equipment Loads
- Proper sizing
- Hours of operation
- % Machine Uptime

Assess Current Commitment Level
- Assigned Site Leader w/ Champion
- Policy and plan formalized & endorsed
- Budgeting and reporting
- Data-driven goals, targets, action plans

Base-line Cost and Consumption
- Data collection - plan & execute
- Time Series Analysis
- Comparative Analysis
- Degree Day Analysis

- **Do we have the level of commitment needed to be successful ?**
- **Do we have what we need when we need it to accomplish the mission?**
- **Are we getting better? Worse? How do we know?**
- **How do our usage habits impact how we are billed?**

Visibility
TOK
System
Design

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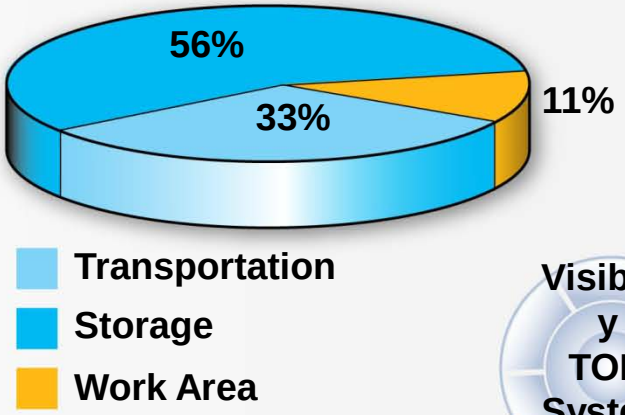
Step 1 – Assess and Assign

Make visible the cause and effect relationships between what the operator produces and the resources used to produce it:

- Devices to work flow
- Space to:
  - Work Flow
  - Type of Use

	Device A	Device B	Device C
Work Flow 1	X		
Work Flow 2	X	X	
Work Flow 3	X	X	X

Space Utilization: Work Flow 3



- Where is capacity a concern?
- How much of our work space is used to create value?
- Which work flows are using which devices?

Visibility TOK System Design

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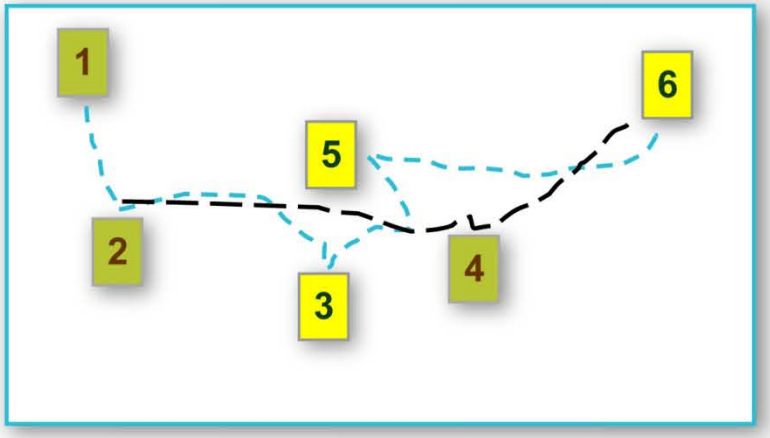
Step 2 - Map and Measure

Mapping the physical layout of consumption devices to their respective work flows reveals spatial opportunities, layout constraints, and scope of effort.

Target a given work flow for improvement effort based on:

- **Strategic Importance**
- **Magnitude of Savings**
- **Ease Implementation**



- **Is the equipment arranged to minimize transportation and mobility?**
- **Does the facility design promote suboptimal consumption habits?**
- **Is the chosen scope appropriate?**

TOK System Design

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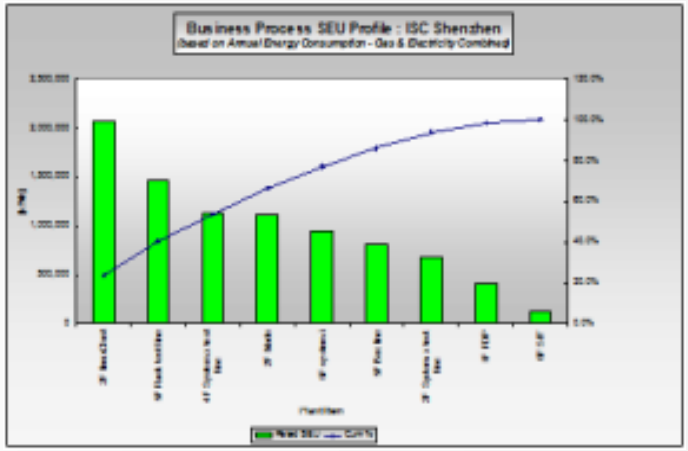
Step 2 - Map and Measure: Focusing on Leading Indicators

Device	Month	Usage (kWh) (000)	Rate ($)	Monthly Cost ($) (000)
1	Jan	200	.11	22
2	Jan	330	.11	36.3
3	Jan	350	.11	38.5
4	Jan	420	.11	46.2
5	Jan	160	.11	17.6



- Which work flow is consuming the greatest amount of energy?
- Which device in a given work flow is the greatest cost driver?
- How do consumption costs/rates rise and fall with output?

TOK and Scarcity

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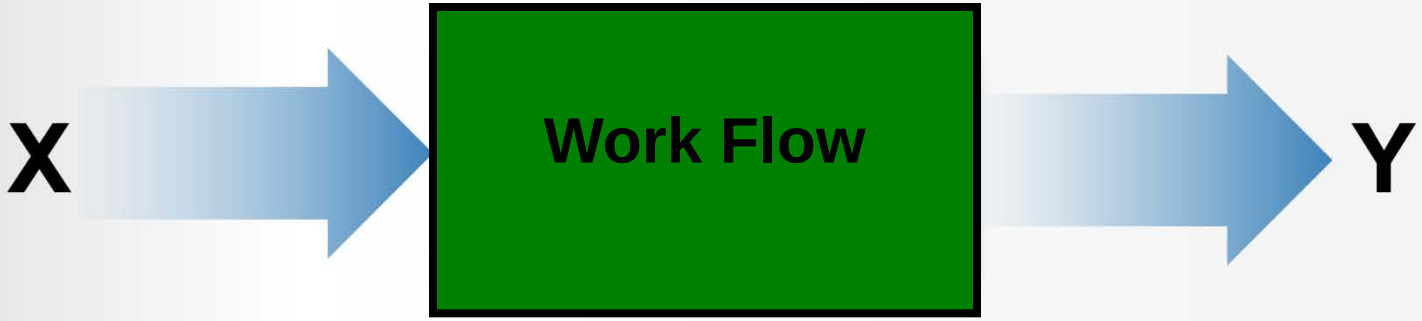
Step 3 – Productivity and Price

PRODUCTIVITY

Balances Efficiency (x) with Effectiveness (Y)…Addresses both types of problems…Speaks both languages…Shapes desired behavior…Output / kWh



- **Are we doing the right things?**
- **Are we doing them the right way?**
- **How well is the process accomplishing its intended purpose?**

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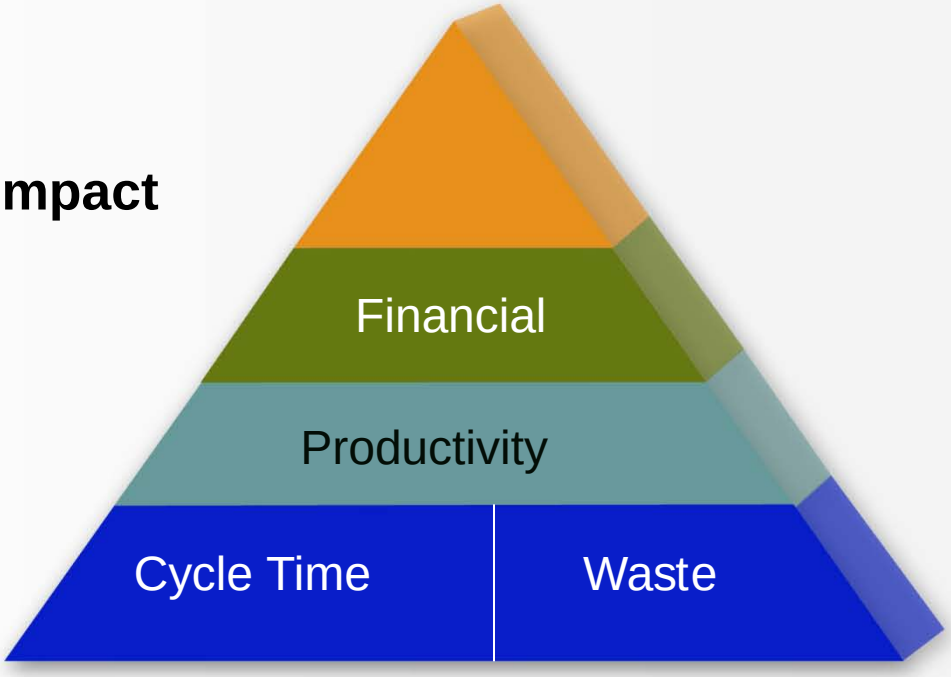
Step 3 – Productivity and Price

PRICE

Makes visible the hierarchal relationship between financial impact and operational performance

Output / kWh * Rate

Reveals drivers of utility rate



- **Does when we do the work effect costs?**
- **Does how we do the work effect costs?**

Scarcity
TOK
Transparency

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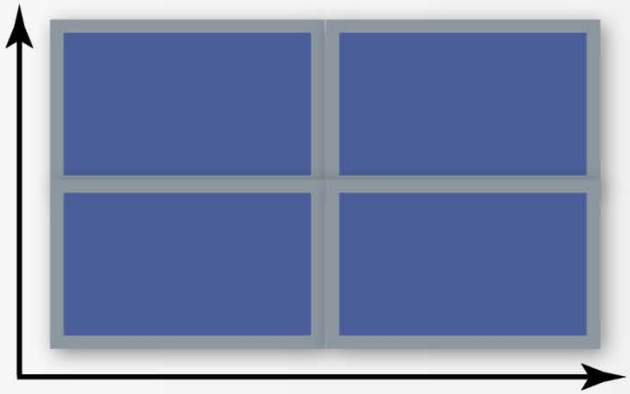
Step 4 – Sustained Solutions

- **Brainstorm / Benchmark solutions**
  - **Insist on simplicity and little capital investment**
  - **Provide feedback that is direct, visual, immediate**
  - **Prioritize on (1) Benefits (2) Ease of Implementation**
- **Implement and validate effects**
- **Standardize and sustain the gain**
- **Communicate and compare**

B&E Matrix



- **Does the solution make it easy to do the right thing?**
- **Does the solution make it impossible to do the wrong thing?**
- **How are we doing?**
  - **Historically? Peers? Industry?**

Transparency
Peer Awareness
Habits

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AMPS Deployment Example

- **The Garrison Commander at Fort Andrews, NY contacted the Director of Public Works to discuss how they could become "greener" in terms of energy consumption.**

- **They wanted a practical approach that would deliver rapid, tangible results with little capital expenditure. An AMPS Event seem to fit the bill.**

- **They decided to focus on the Brigade Combat Team One (BCT01) and their four (4) Tactical Equipment Maintenance Facilities (aka motor pools).**

- **The Division Commander would sponsor the event with a small cross-functional team leading the 5 day effort with the improvement goal:**

  - **To reduce energy consumption (kWh) at one specific TEMF by 15% within the next 30 days with a maximum budget of $3500.**

Step 1 – Assess and Assign

- **Facility Alpha was chosen out of the four TEMFs due to greater occupancy, longer operational hours, greater square footage and availability of metered data.**
- **Building - 2 years old @ 20,000 sq ft (heated)**
  - **36 full time soldiers / contractors working one (1) ten (10) hr shift**
  - **1 smart sub-meter (electric) – Data available - CY 2008 to present**
  - **Annual Consumption for 2009: 2.1M kWh**
  - **Annual Consumption Cost: $231,000**
  - **Inspect and refit on average 1,660 vehicles / year**

So how is this actionable?

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Step 1 – Assess and Assign

Work Flow \ Device	1	2	3	4	5	6	7	8	9	10	Vehicles
A	X	X	X					X	X	X	900
B	X			X	X			X	X	X	400
C	X					X	X	X	X	X	260

Device 1 – Electrical Bay Doors

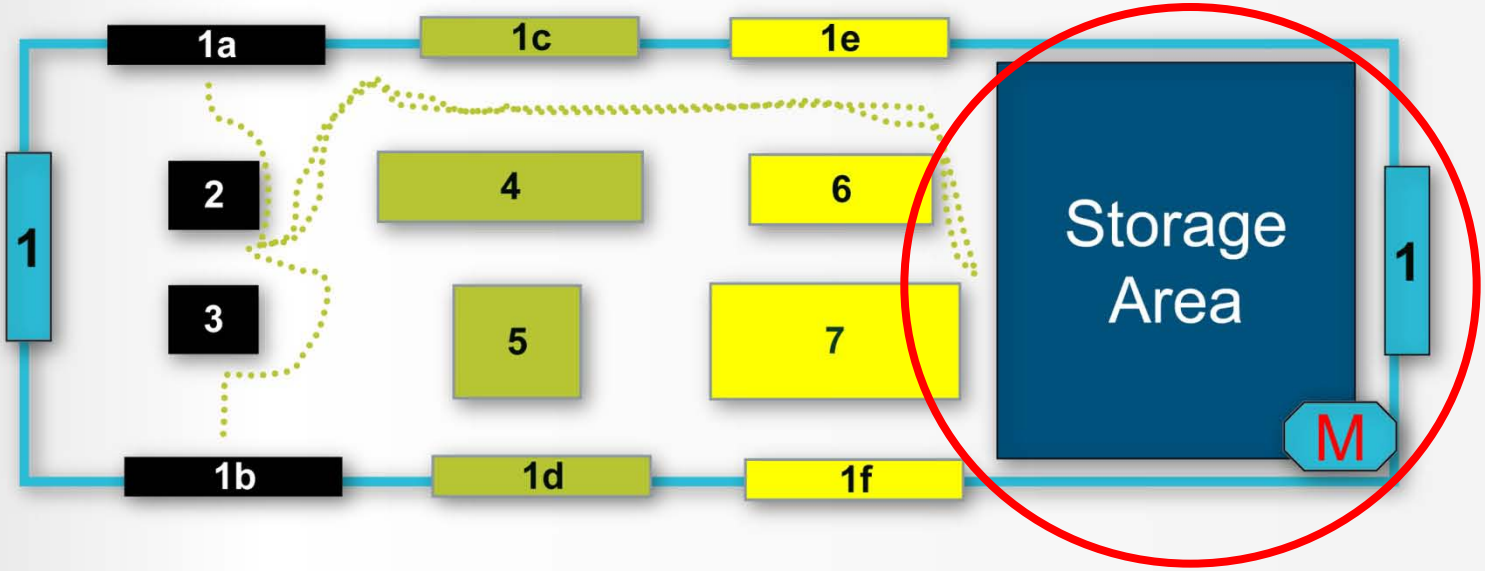
Device 8 – Heating / Cooling

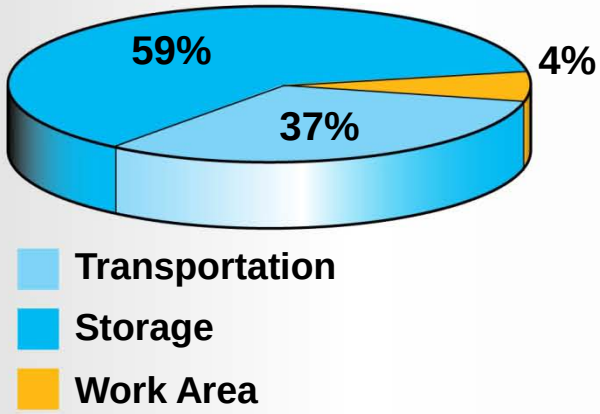
Device 9 – Emergency Lighting

Device 10 – Heated Flooring

Team initially focuses on Devices 1, 8, 9, 10

Step 2 - Map and Measure





Device 1 – Electrical Bay Doors

Device 8 – Heating / Cooling

Device 9 – Emergency Lighting

Device 10 – Heated Floor

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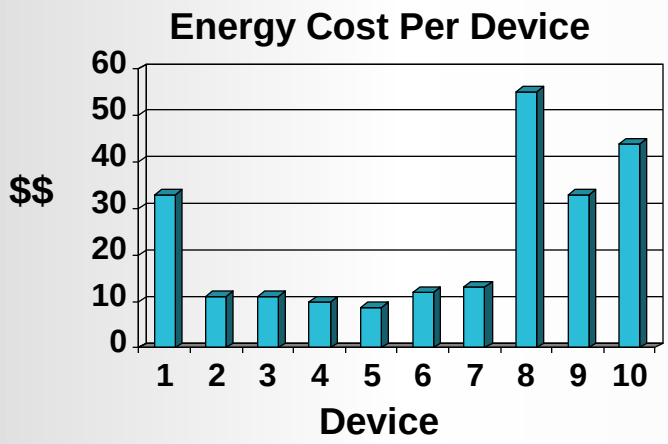
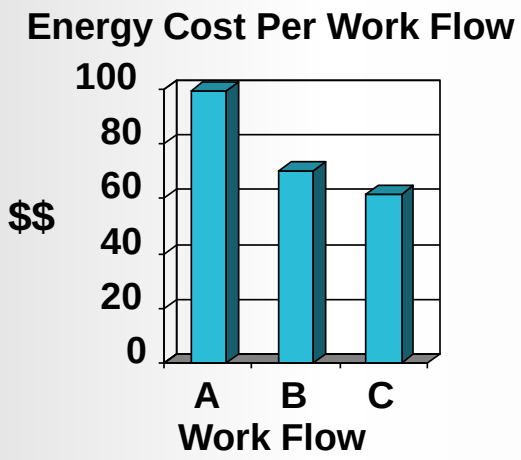
Step 2 - Map and Measure:

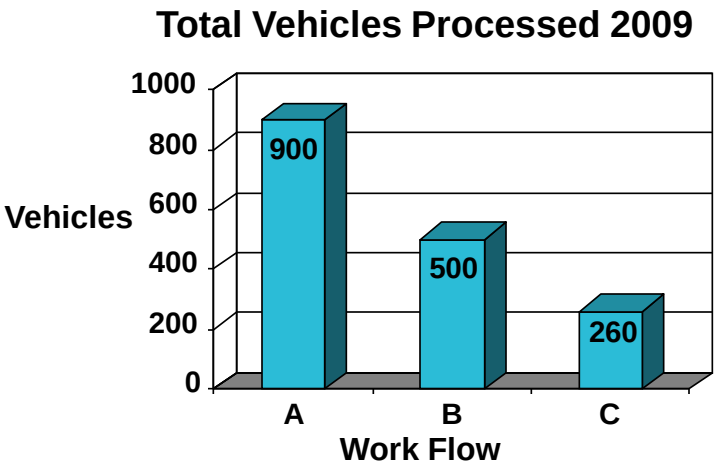
Leading Indicators for Facility Alpha (2009)

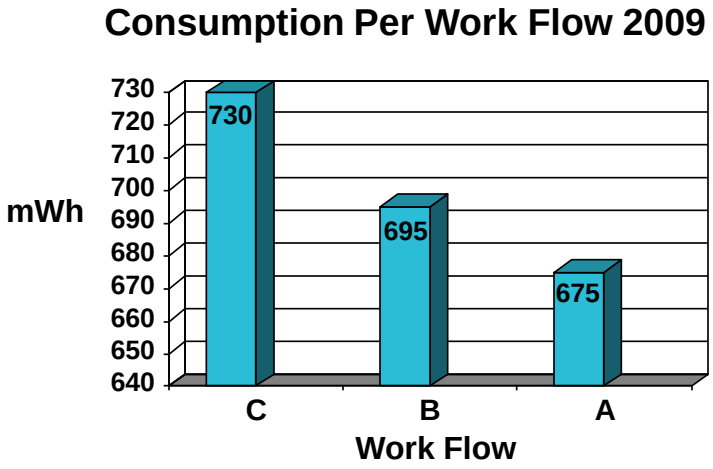


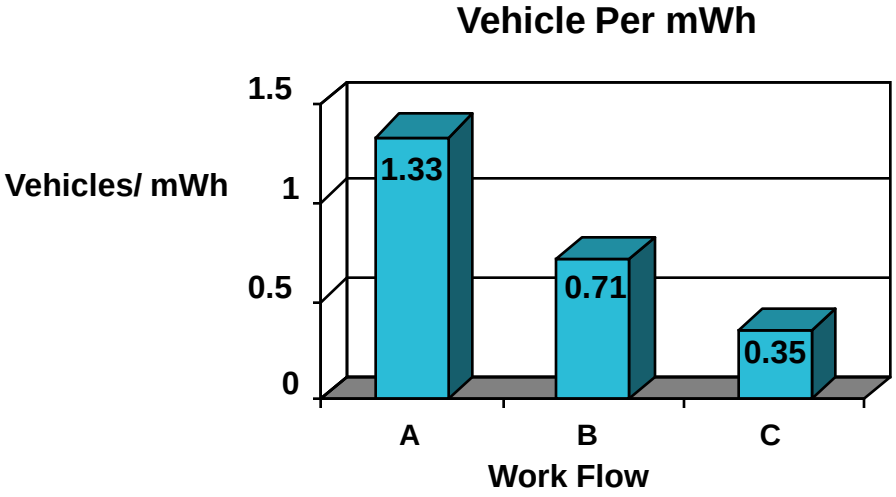


Device	Usage kWh (000)	Rate ($)	Cost (000)
1	300	.11	33
2	100	.11	11
3	100	.11	11
4	90	.11	9.9
5	80	.11	8.8
6	110	.11	12.1
7	120	.11	13.2
8	500	.11	55.0
9	300	.11	33
10	400	.11	44

Step 3 – Productivity and Price

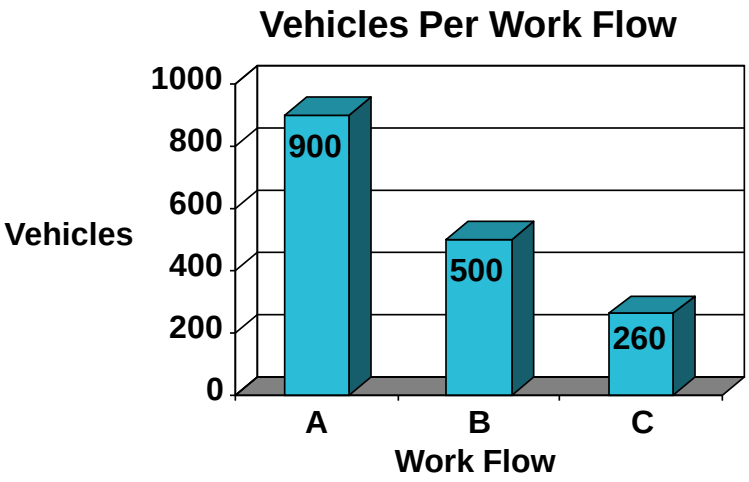


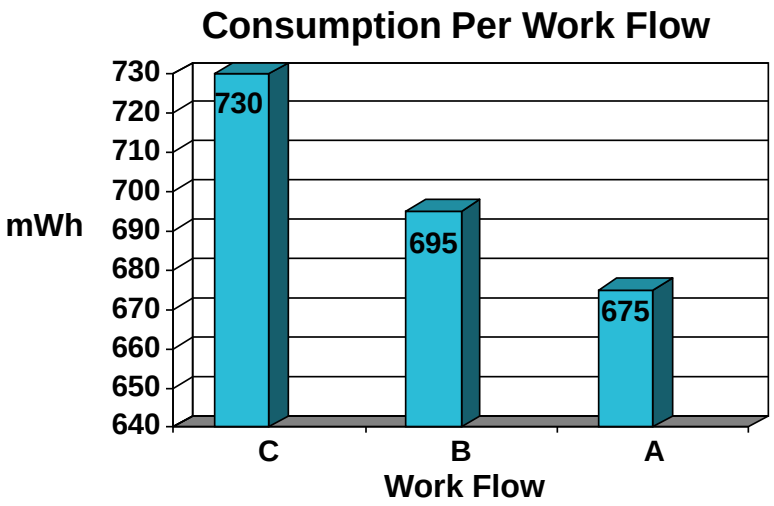


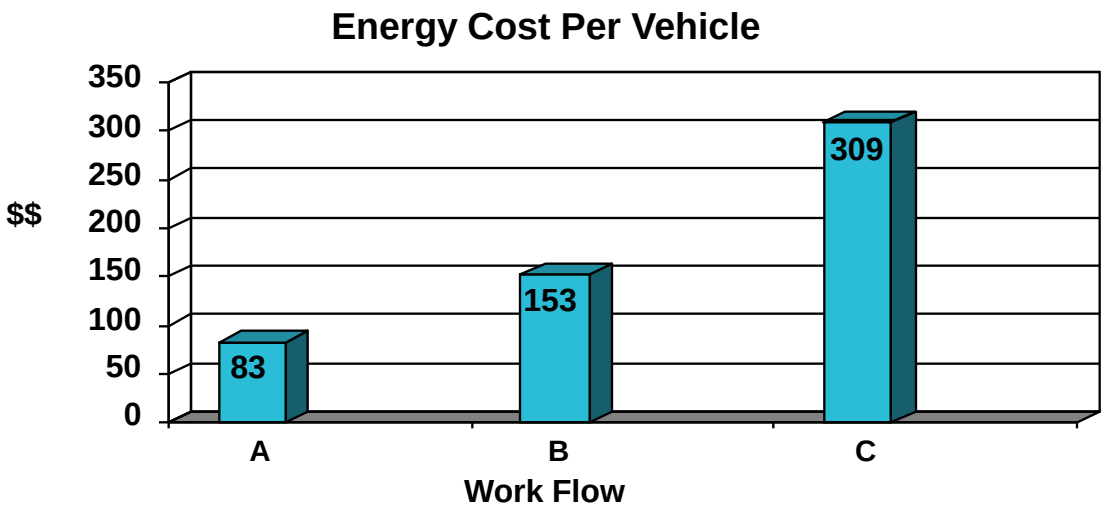


.8 vehicles per mWh

Step 3 – Productivity and Price







Step 4 – Sustained Solutions

Ease of Effort

- Train 100% of employees on importance of conserving energy

X

- Lower HVAC night set back from 65 to 60
- Lower Floor Heat from 68 to 60
- Do morning PT outside or in the PM
- De-lampstorage area
- Increase Bay Door Speed
- Install Strip Curtains on Bay Doors
- Re-locate thermostat
- Install commercial energy monitor
- Publish monthly utility bills for each TEMF

- Install UV window film in offices Permanently seal windows

X

- Install Air Curtains Work Flow A
- Install utility drops for canopy lighting directly over points of work
- Adjust regulation to permit minimal emergency interior and exterior lighting
- Re-key select exterior doors

Level of Benefits

Step 4 – Sustained Solutions

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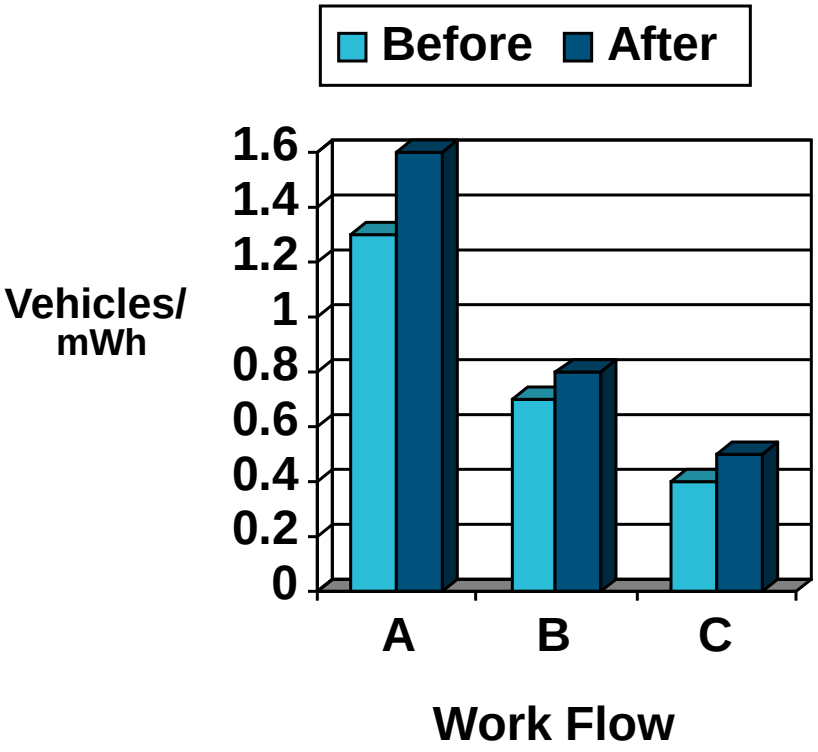
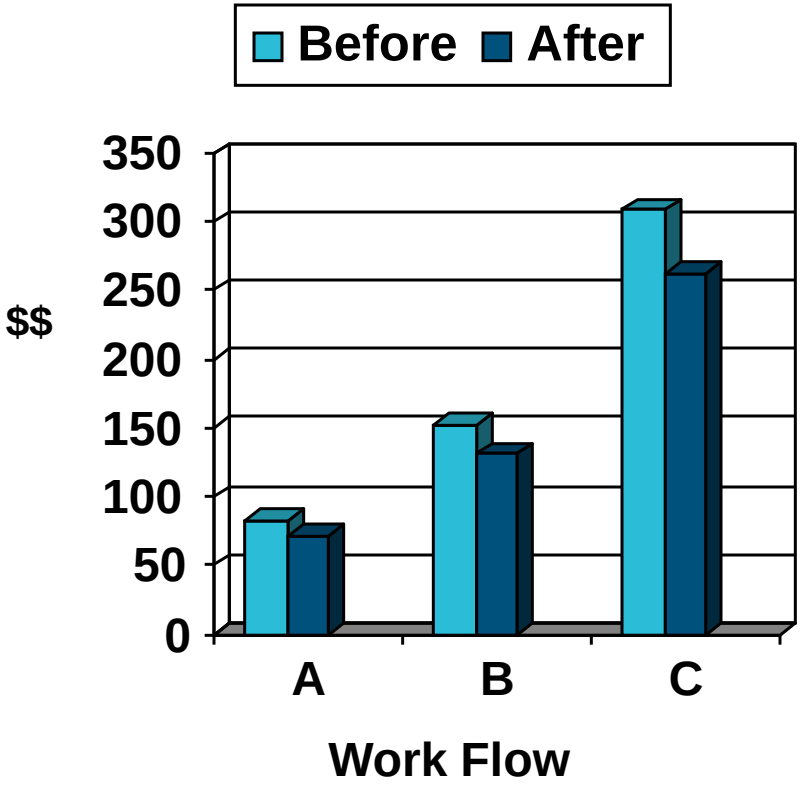
Level of Benefits

Vehicle Per mWh



Energy Cost Per Vehicle



Guidelines for Change

- Forget changing habits. Change the process.
- Embrace the short attention span.
- First understand the behavior. Then remove its trigger.
- Let the metric do the work.
- Those that do the work must help design it
- Fix the one thing that makes you better right now.
- Improved productivity requires a physical process change.
- Make it easy to do the right thing
- Compare the right thing to everything.
- Transparency in everything

Monica Painter
Partner
203-912-9579

Carlton McArthur
Associate Partner
301-520-8754

John Berilla
Strategy Consultant
208-724-6181