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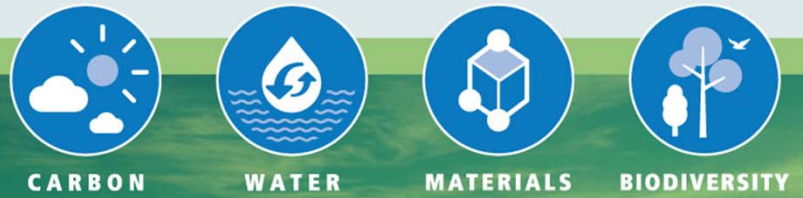
LET'S MAKE **A BETTER PLANET**

Continuous Improvement

Toyota Motor Manufacturing, IN



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TMMI Information

- 2 Assembly plants under 1 roof

West Plant (1998)
- Sequoia
- Highlander
- Hybrid Highlander

East Plant (2003)
- Sienna
- Highlander

- 2,000,000 square feet under roof
- >4,700 team members
- ISO14001
- ISO9001

TOYOTA ENVIRONMENTAL CHALLENGE 2050

To go beyond zero environmental impact and achieve a net positive impact, Toyota has set itself six challenges. All these challenges, whether in climate change or resource and water recycling, are beset with difficulties, however we are committed to continuing toward the year 2050 with steady initiatives in order to realize sustainable development together with society.

CHALLENGE : 1 | CHALLENGE : 2 | CHALLENGE : 3 | CHALLENGE : 4 | CHALLENGE : 5 | CHALLENGE : 6

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Plan to Meet Goal

Three Tiered Approach

New Technology

+

Renewable Energy

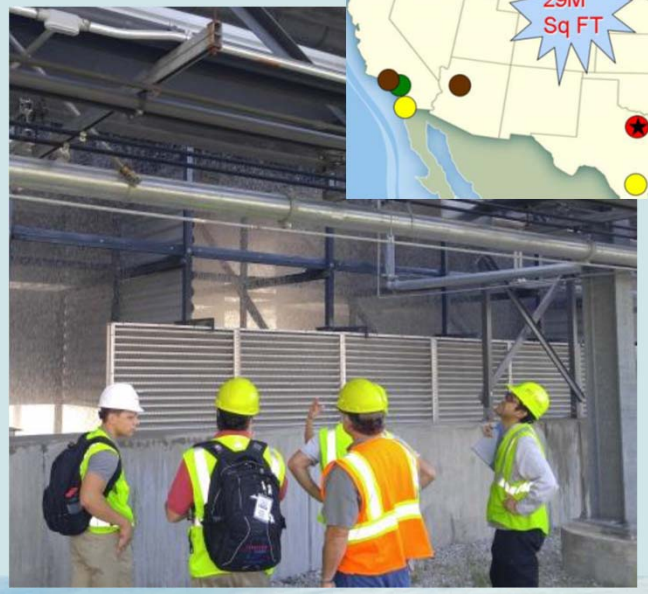
+

Kaizen Activities

=

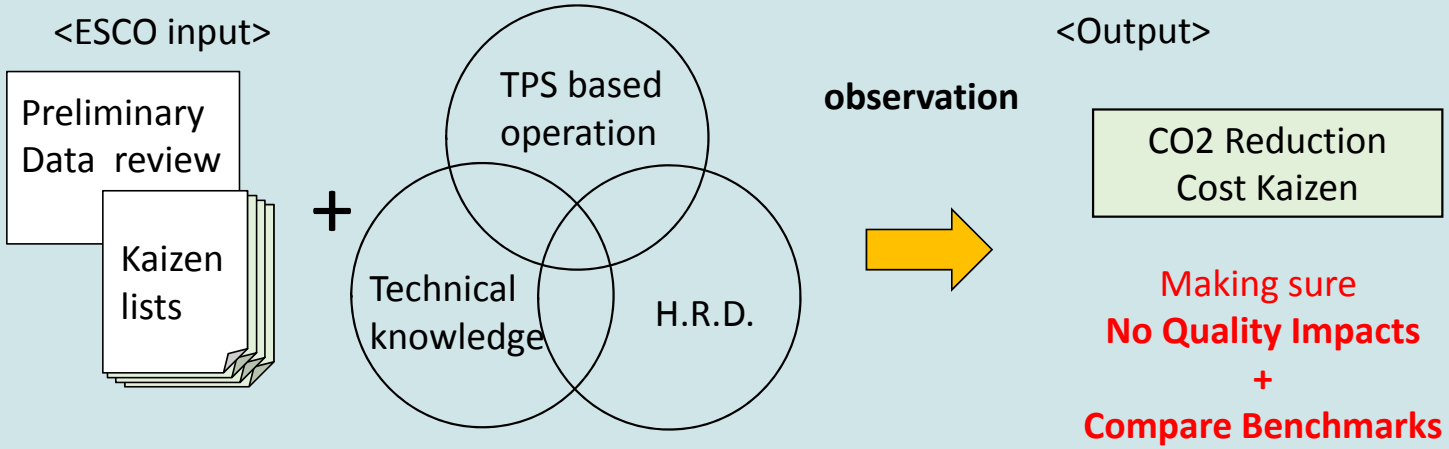
ESCO

- **E**nergy **S**avings **Co**-Operative (Group Effort)
  - Host Plant
  - Additional Plant Participation
    - Bring Expertise/Experience
    - Take ideas back
    - Provide training for other Plants
- NOT A TREASURE HUNT
  - Focus is energy, not $$
  - Document ALL ideas



ESCO Overall Plan

Concept



Toyota Production System (TPS)
A production system which is steeped in the philosophy of "the complete elimination of all waste" imbuing all aspects of production in pursuit of the most efficient methods.

ESCO Outline

Step 1	**Preliminary Data Review** - Review old Kaizen List - Data analysis with process configuration - Benchmark with similar process @ other facilities
Step 2	**Detailed Investigation** - Measure energy data - Find out energy loss during non-production - Confirm efficiency & control methods
Step 3	**Kaizen Proposal** - Make the Kaizen list (include countermeasures)
Step 4	**Kaizen Implementation**
Step 5	**Confirmation of Kaizen result**

ESCO on site

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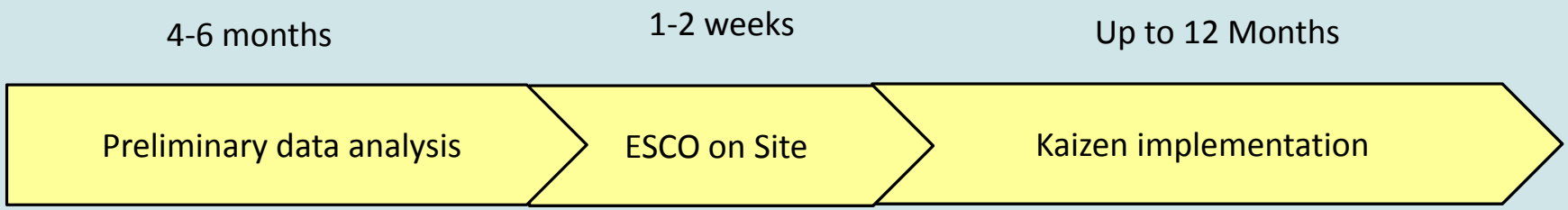
ESCO Timeline

Process



Data visualization

- Find Kaizen points
- Benchmarking

Genchi Genbutsu

- Go and See processes, investigate kaizen opportunities
- Include Non-Production Time

OJT for Others

- Kaizen viewpoint
- Technical analysis

- Planning
- Budgeting
- Implementation

ESCO Daily Schedule Example

Time	Action	Attendance
Morning Meeting (7:30 - 8:00)	- Confirmation of day's activity - Share relevant information - Issues & Request	All
Onsite Investigation (8:00 ~ 16:00)	- Individual group site investigation - Measurement - Analysis "WHY?" - Kaizen propsal documentation	Break into Groups
Afternoon Meeting (16:00 ~ 16:30)	- Share day's results - Confirmation of next day's plan - Request to 2nd shift or Maintenance	All

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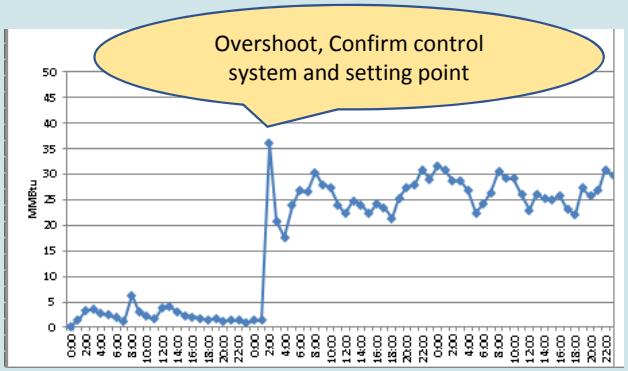
ESCO Pre-Event Data Collection

- Electric, Natural Gas, Water, CA, Steam and Chilled Water Usage



- Shop Energy Usage
- Meter locations
- Machine Energy use

Facility Equipment Setpoints and Energy Use

6 Approaches to Energy Kaizen

- Eliminate – Remove Unnecessary Usage
- Stop - Turn Off Usage When Not Needed
- Repair – Repair Equipment Waste
- Reduce – Lower Usage at End Point
- Change – Switch to More Efficient Source
- Recover – Reuse Wasted Energy

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TMMI ESCO Event

- 7 day event, including both a Saturday and Sunday
- 17 Participants (over 1,000 manhours)
- 60 Kaizens proposed
- 20,000 Mtons of CO2 Reduction Identified
- 159,00 MMBtu Reduction Identified
- $1.8 Million Savings Identified
- 1.1yr Average Payback

Sample of Kaizens Identified

Background/Description- There are 12 opportunities to install VFDs. Currently, motors are running at 100% while valves are partially closed. Motors run at a higher frequency than needed to achieve optimum flow.

Before

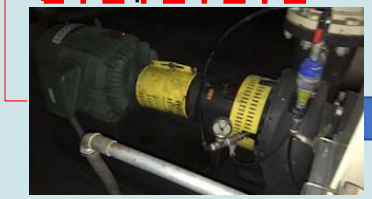
Pump at 60Hz

50% closed

After

VFD

Pump at 40Hz



100% open

Energy Savings (MMBTU)	12,000 MMBTU
Cost	$350K
Cost Savings ($)	$232K

CO2 Savings
2,200 MTon

Simple Payback
1.5

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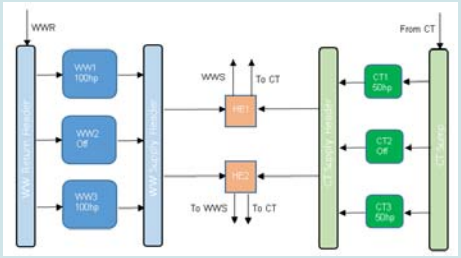
Sample of Kaizens Identified

Background/Description – Weld Water, ED pumps oversized and run at full power. Weld Water has 2 out of 3 pumps on each loop running at any one time. ED/Filter pumps regulate pressure by closing valves. Add VFD's to all pumps to regulate systems.

Before

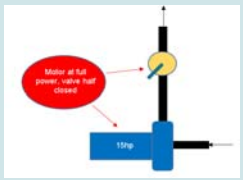
Weld Water System

-Pump motors running at full power
-2 out of three pumps on each loop running at any one time



ED/Filtration Pumps

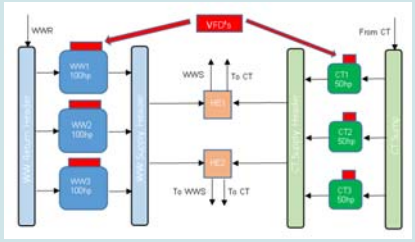
-Pumps running at full power
-System pressure regulated at valve



After

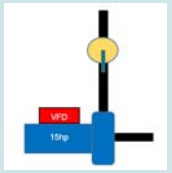
Weld Water System

-VFD's added to pumps
-All pumps running at reduced power



ED/Filtration Pumps

-VFD added to pumps
-Valves completely open
-Pressure regulated by VFD



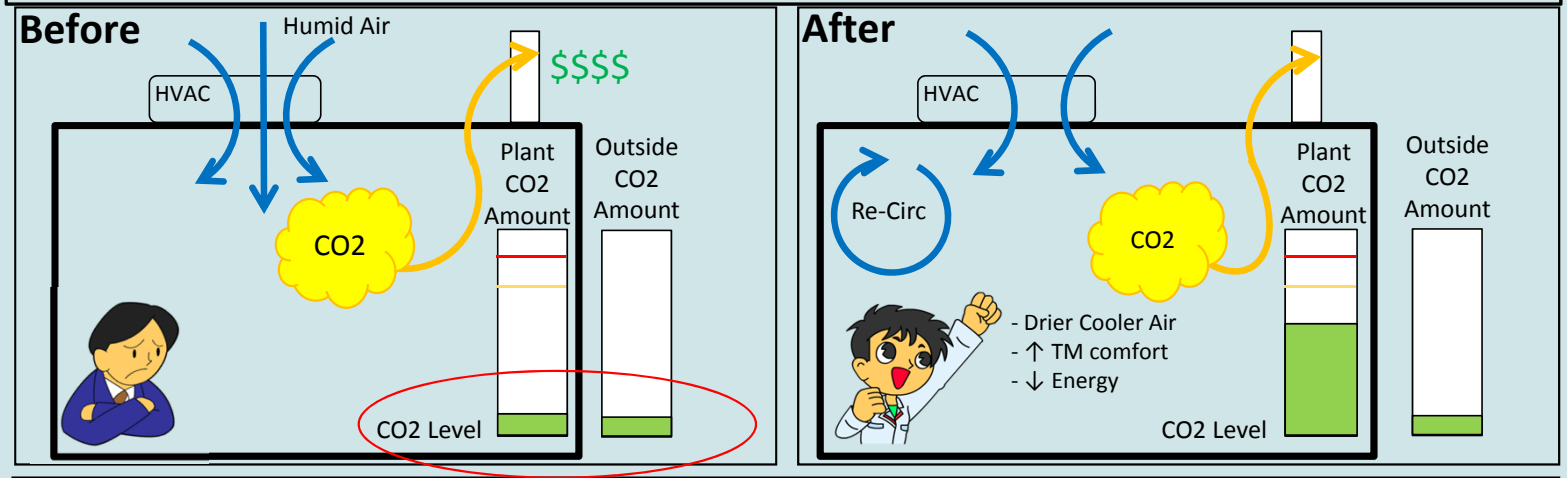
Energy Savings (mmBtu)	4,700
Cost	$114K
Cost Savings ($)	$87k

CO2 Savings
1400 MTon

Simple Payback
1.3 Years

Sample of Kaizens Identified

HVACs run to provide fresh air to replace CO2. Using sensors, run HVACs less while still maintaining safe CO2 levels in shops, increased TM comfort, increased energy savings



Energy Savings (MMBTU)	22,805
Cost	$400,000
Cost Savings ($)	$211,713

CO2 Savings: 2,431 MTon

Simple Payback: 1.89yr

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Sample of Kaizens Identified

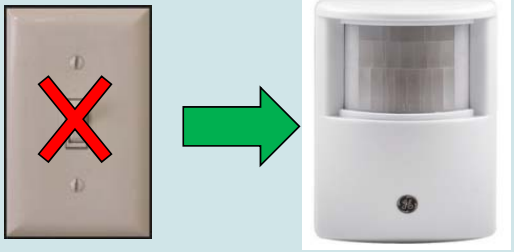
Background/Description – Assembly underground conveyor pits have 26 2-bulb fluorescent light switches operated by 3 standard wall light switches. Typically these light are left on.

Before

Estimated on time 12 hours/day (50%)

After

Replace 3 standard wall light switches with motion activated switches eliminating non-needed light power consumption



Electric Savings (kWh)	3,869
Cost	$90
Cost Savings ($)	$270.83

CO2 Savings: 2.4 Mtons

Simple Payback: .33 Yrs

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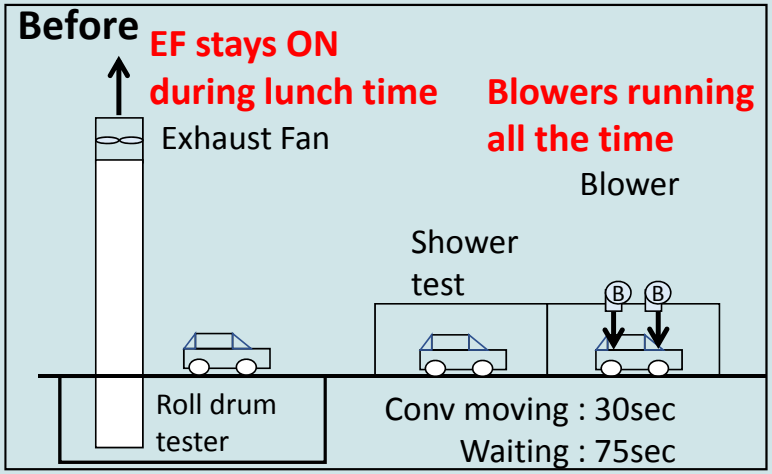
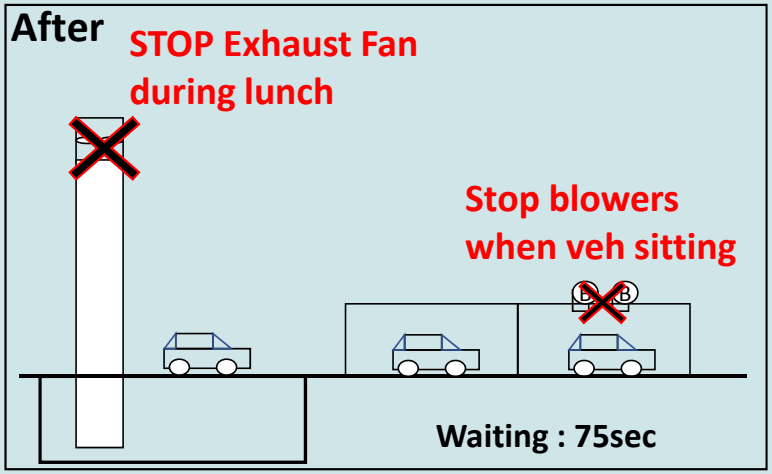
Sample of Kaizens Identified

Background/Description – Exhaust fans running during non-production time and shower test blowers left on all the time





Energy Savings (MMBTU)	1457
Cost	$7,500
Cost Savings ($)	$26,500

CO2 Savings: 1.22 Mtons

Simple Payback: .3 Yrs

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Toyota North American Environmental Report

Learn more about Toyota Environmental Challenge 2050
https://www.toyota-global.com/sustainability/environment/challenge2050/

Toyota North American Environmental Report
https://www.toyota.com/usa/environmentreport/

Materials Video

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CARBON WATER MATERIALS BIODIVERSITY

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ENVIRONMENTAL CHALLENGE 2050