Sweet Leveraging DOE's Integrated Tool Suite & Resources

Tools Nissan Has Used from DOE to Save Energy

Brett Rasmussen, PE, CEM, CEAM

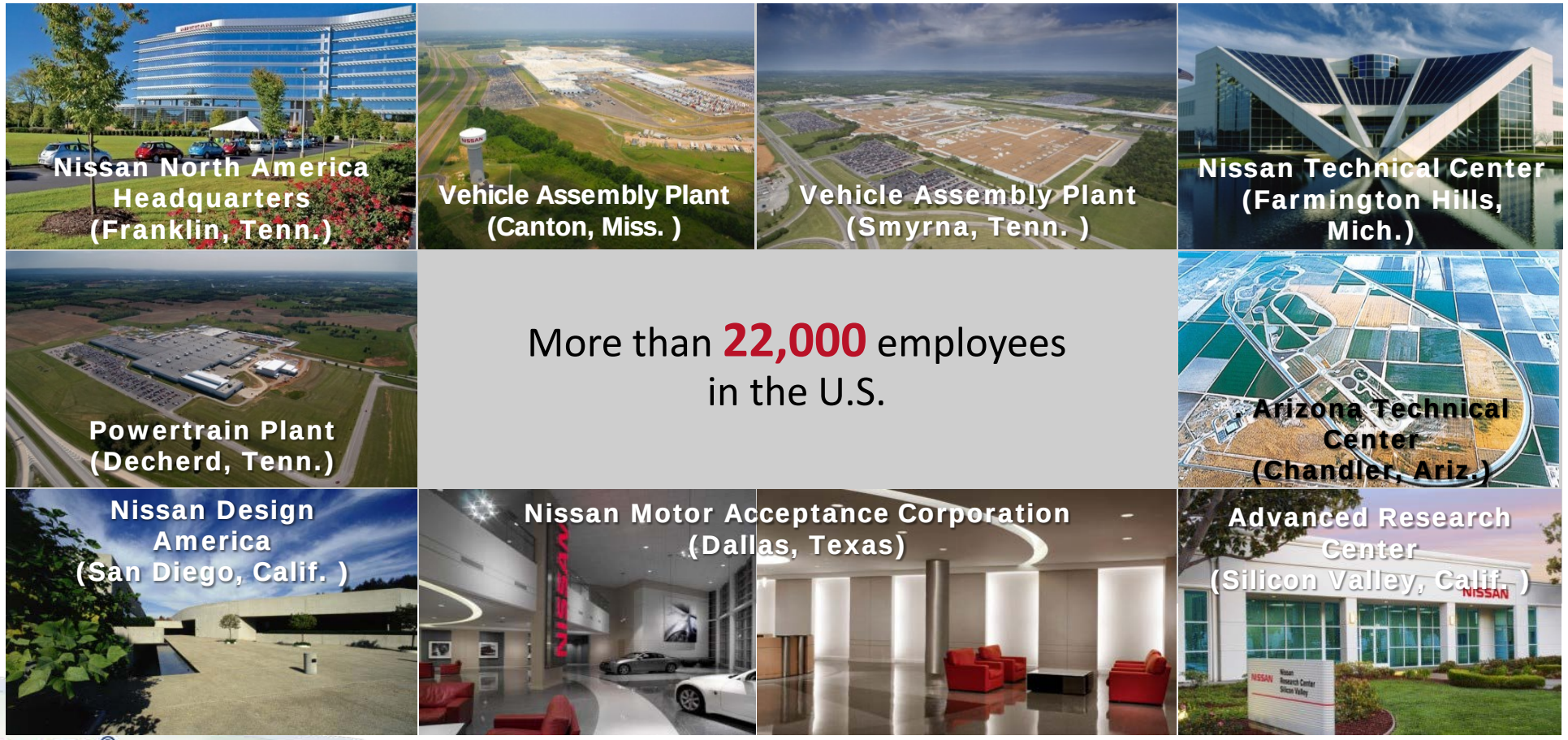
2018 WEEC World Energy Engineering Congress

Tools Nissan Has Used From DOE to Save Energy

- Agenda
  - Information about Nissan
  - Information about NNA-Canton
  - DOE Compressed Air Audit
  - Questions

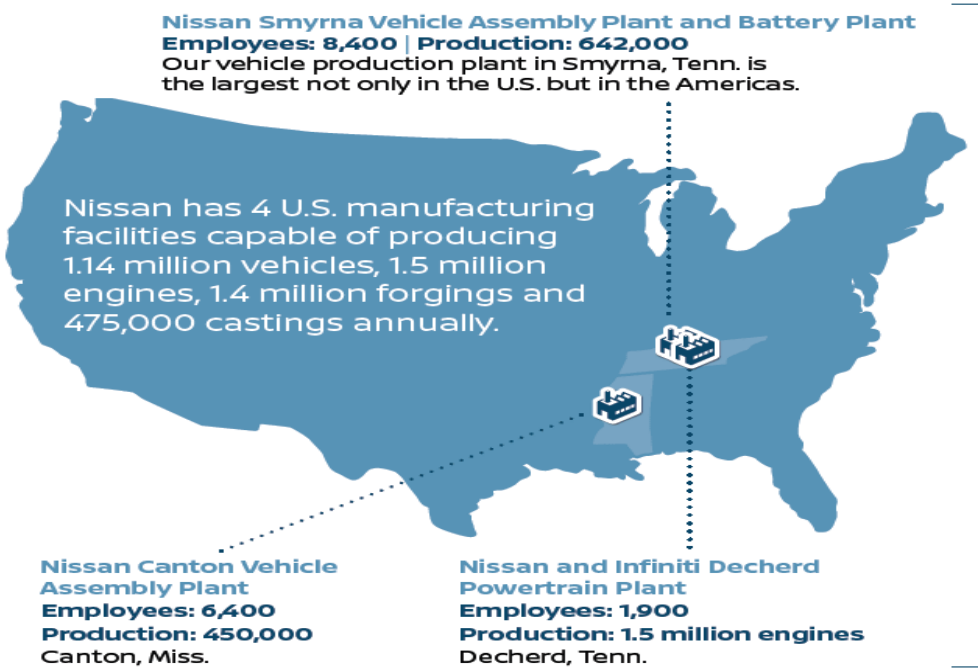
Association of Energy Engineers

U.S. FOOTPRINT



Association of Energy Engineers

U.S. MANUFACTURING & INVESTMENT FOOTPRINT



More than
22,000 U.S. employees
including 16,000 manufacturing jobs

15 million vehicles proudly manufactured in the U.S. since 1983

10 million engines proudly manufactured in the U.S. since 1997

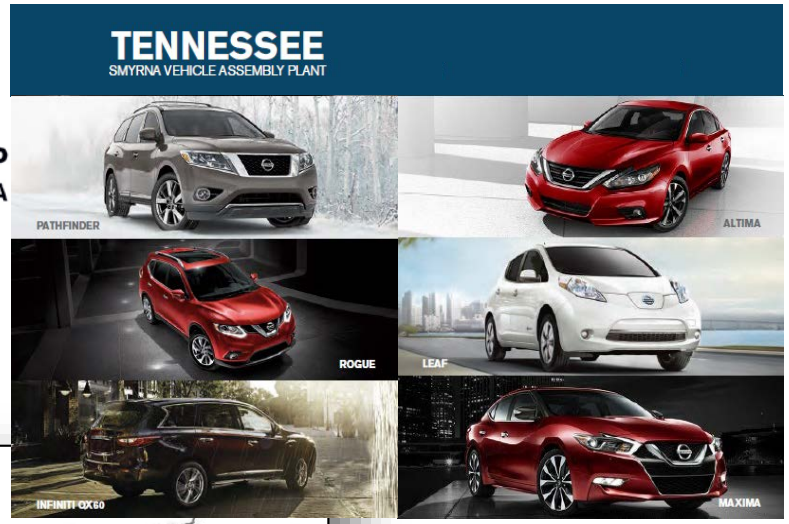
$14 billion spent with **300** suppliers in 30 states in U.S. in 2016

$11 billion investment in manufacturing in the U.S. since 1981

Association of Energy Engineers

U.S. MANUFACTURING

NISSAN GROUP
OF NORTH AMERICA



Association of Energy Engineers

ENERGY STAR WITH CEO 2016

- Canton is a Certified ENERGY STAR Plant by EPA
- Are only 10 Certified Plants in the USA
- Of the 10 Plants Only two build truck
- Canton Has Been Certified 12 years

Association of Energy Engineers

DOE Recognizes Canton for ISO 50001

Association of Energy Engineers

DOE Recognizes Canton for ISO 50001

Superior Energy Performance®
U.S. DEPARTMENT OF ENERGY

PLATINUM
2017-20

Canton Vehicle Plant

Nissan North America Inc.

Recognized by the U.S. Department of Energy for implementing ISO 50001 and Superior Energy Performance program standards, and improving energy performance by 20.9% over 3 years.

Association of Energy Engineers

4,000,000 VEHICLES

Association of Energy Engineers

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

In-Plant Training

Compressed Air Assessment Basics

April 18th 2017

Frank Moskowitz
Draw Professional Services

What is an In-Plant Training?

- In-Plant Trainings (INPLTs) are system-specific workshops led by Better Plants experts that train participants on how to identify, implement, and replicate energy-saving projects.
- Better Plant partners host an on-site, three-day training at one of their facilities, and invite others to attend.
- The training traditionally focus around a topic such as:
  - Compressed air
  - Fans
  - Motor-driven systems.
  - Steam
  - Process heating
  - Pumps
  - Energy Management/ISO 50001

Nissan's In-Plant Training on Compressed Air

Savings Opportunities

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Nissan, Canton MS Plant, April 18-20, 2017

Summary of Study

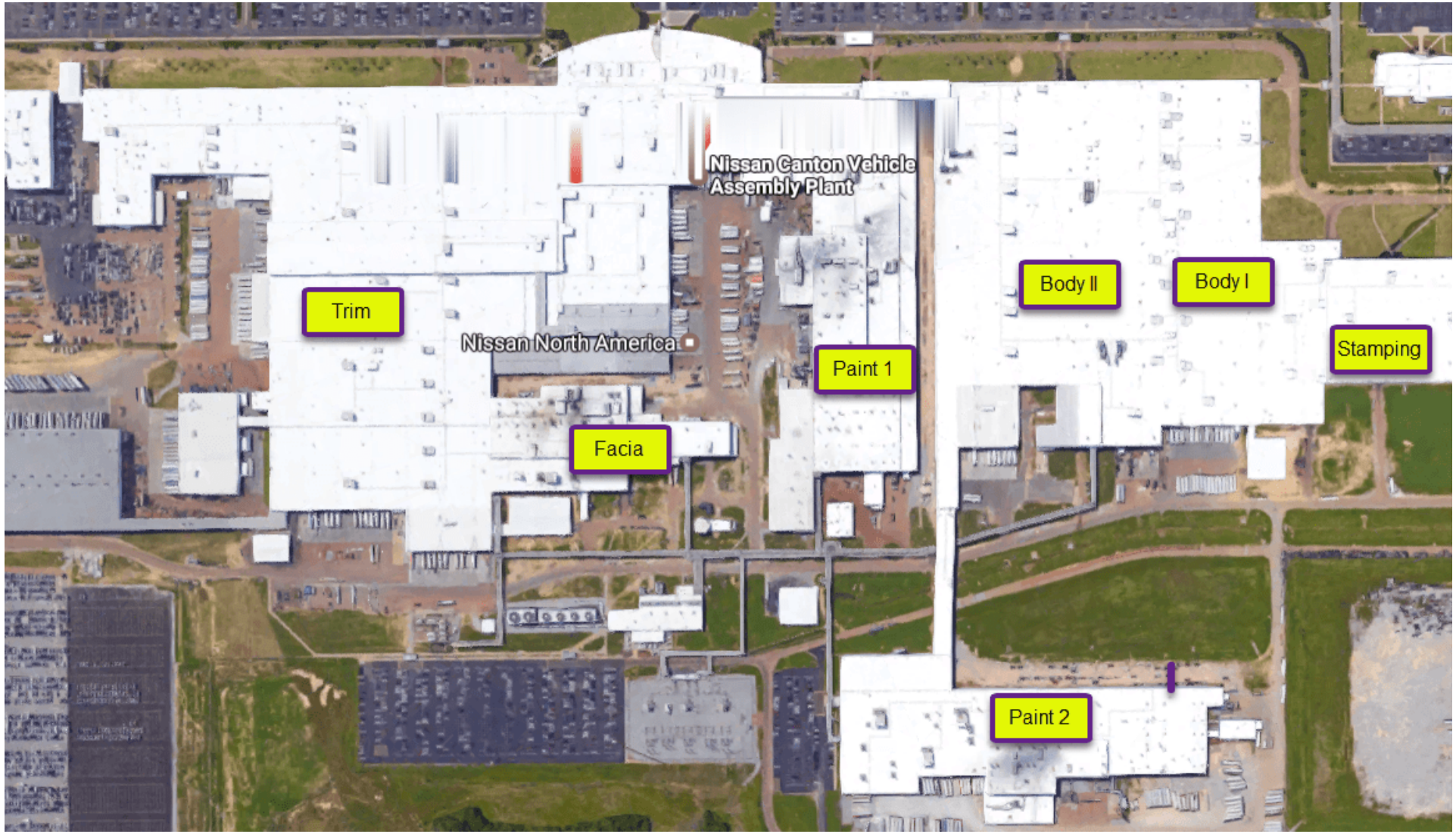
Primary objectives:

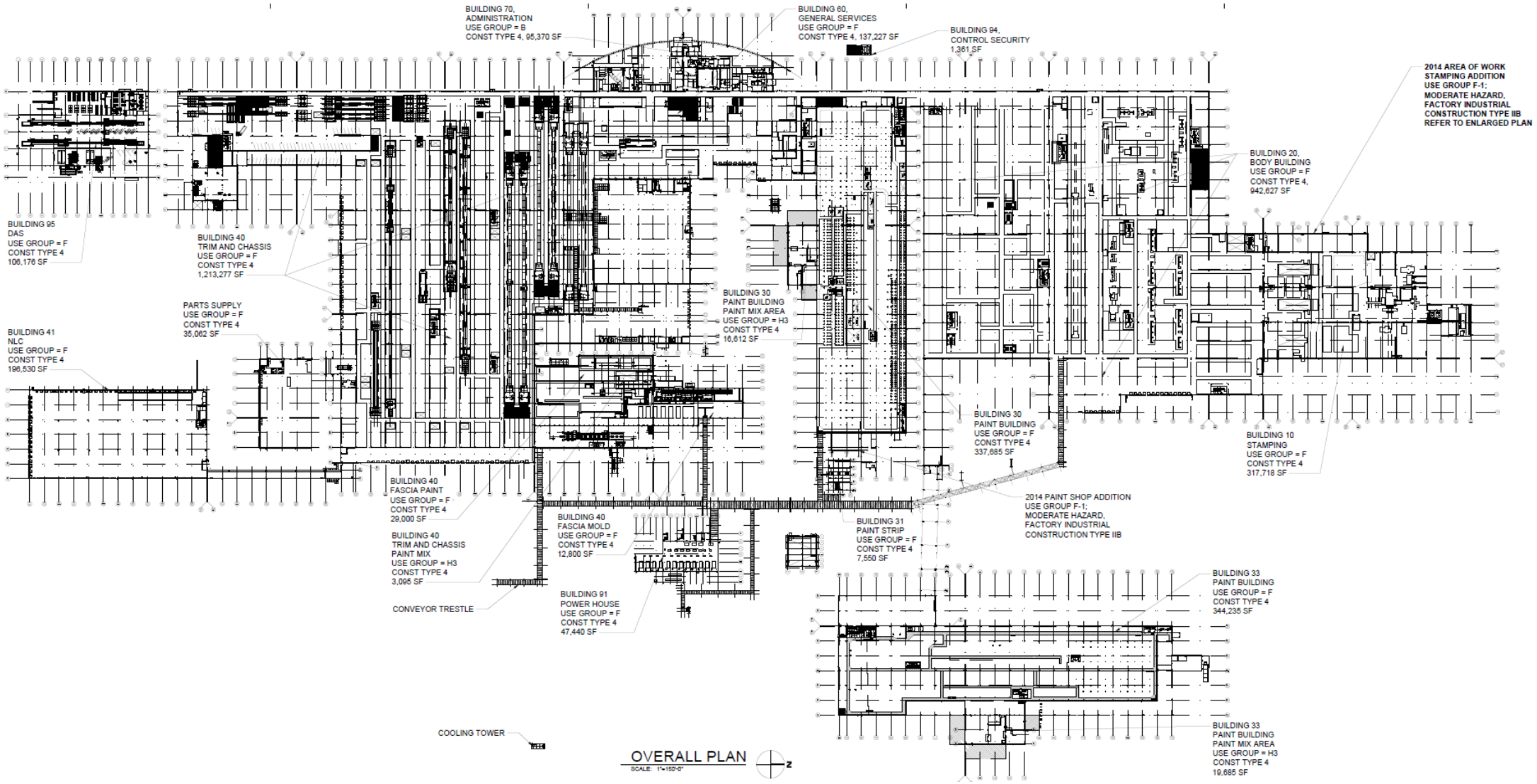
1. ***Education on Compressed Air Optimization***
2. ***Reduce energy intensity based on the production rate***
3. ***Reduce system pressure fluctuations with additional volume***
4. ***Establish more aggressive leak identification/repair program***
5. ***Identify appropriate uses of compressed air***
6. ***Reduce artificial demand by lowering pressure at point of use which in turn will require less compressed air and reduce energy***
7. ***Replication across facilities and divisions.***

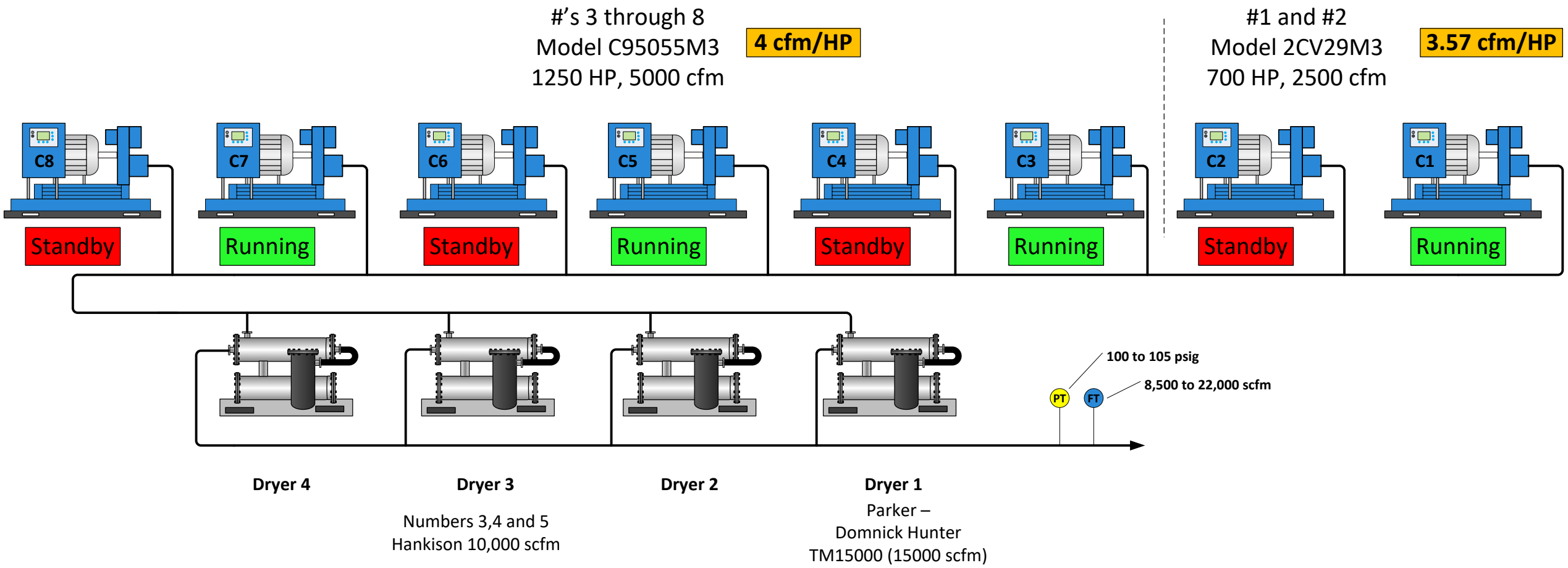
Best Practices Identified:

- Wet and dry tanks in tire and wheel
- ½ inch rubber hose which minimizes pressure loss
- Grayco pumps
- Implementing vacuum cups that shut off when not touching parts
- Electric assembly tools versus pneumatic tools in use for torque control
- Zero air loss drains for condensate removal

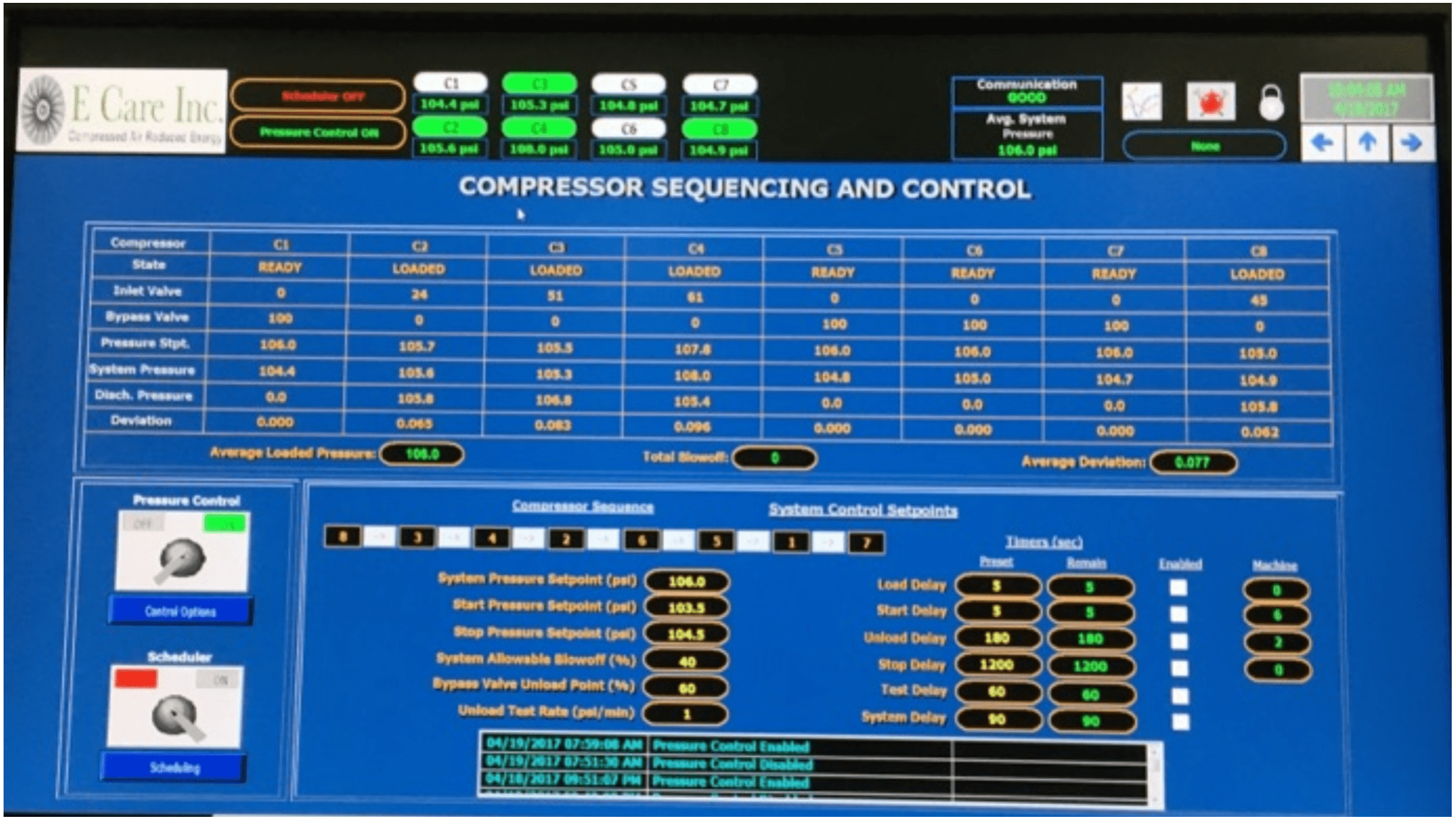
Data Collection




BUILDING 70,
ADMINISTRATION
USE GROUP = B
CONST TYPE 4, 95,370 SF
BUILDING 60,
GENERAL SERVICES
USE GROUP = F
CONST TYPE 4, 137,227 SF
BUILDING 94,
CONTROL SECURITY
1,361 SF
2014 AREA OF WORK
STAMPING ADDITION
USE GROUP F-1;
MODERATE HAZARD,
FACTORY INDUSTRIAL
CONSTRUCTION TYPE IIB
REFER TO ENLARGED PLAN
BUILDING 20,
BODY BUILDING
USE GROUP = F
CONST TYPE 4,
942,627 SF
BUILDING 95
DAS
USE GROUP = F
CONST TYPE 4
106,176 SF
BUILDING 40
TRIM AND CHASSIS
USE GROUP = F
CONST TYPE 4
1,213,277 SF
PARTS SUPPLY
USE GROUP = F
CONST TYPE 4
35,062 SF
BUILDING 30
PAINT BUILDING
PAINT MIX AREA
USE GROUP = H3
CONST TYPE 4
16,612 SF
BUILDING 41
NLC
USE GROUP = F
CONST TYPE 4
196,530 SF
BUILDING 30
PAINT BUILDING
USE GROUP = F
CONST TYPE 4
337,685 SF
BUILDING 10
STAMPING
USE GROUP = F
CONST TYPE 4
317,718 SF
BUILDING 40
FASCIA PAINT
USE GROUP = F
CONST TYPE 4
29,000 SF
2014 PAINT SHOP ADDITION
USE GROUP F-1;
MODERATE HAZARD,
FACTORY INDUSTRIAL
CONSTRUCTION TYPE IIB
BUILDING 40
FASCIA MOLD
USE GROUP = F
CONST TYPE 4
12,800 SF
BUILDING 31
PAINT STRIP
USE GROUP = F
CONST TYPE 4
7,550 SF
BUILDING 40
TRIM AND CHASSIS
PAINT MIX
USE GROUP = H3
CONST TYPE 4
3,095 SF
BUILDING 33
PAINT BUILDING
USE GROUP = F
CONST TYPE 4
344,235 SF
CONVEYOR TRESTLE
BUILDING 91
POWER HOUSE
USE GROUP = F
CONST TYPE 4
47,440 SF
COOLING TOWER
BUILDING 33
PAINT BUILDING
PAINT MIX AREA
USE GROUP = H3
CONST TYPE 4
19,685 SF
OVERALL PLAN
SCALE: 1"=150'-0"



Baseline Energy $1,000,000 last 12 months


E Care Inc.
Scheduler OFF
Pressure Control ON
C1 104.4 psi
C3 105.3 psi
C5 104.8 psi
C7 104.7 psi
C2 105.6 psi
C4 108.0 psi
C6 105.0 psi
C8 104.9 psi
Communication GOOD
Avg. System Pressure 106.0 psi
None
COMPRESSOR SEQUENCING AND CONTROL
Compressor | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8
State | READY | LOADED | LOADED | LOADED | READY | READY | READY | LOADED
Inlet Valve | 0 | 24 | 51 | 61 | 0 | 0 | 0 | 45
Bypass Valve | 100 | 0 | 0 | 0 | 100 | 100 | 100 | 0
Pressure Stpt. | 106.0 | 105.7 | 105.5 | 107.8 | 106.0 | 106.0 | 106.0 | 105.0
System Pressure | 104.4 | 105.6 | 105.3 | 108.0 | 104.8 | 105.0 | 104.7 | 104.9
Disch. Pressure | 0.0 | 105.8 | 106.8 | 105.4 | 0.0 | 0.0 | 0.0 | 105.8
Deviation | 0.000 | 0.065 | 0.083 | 0.096 | 0.000 | 0.000 | 0.000 | 0.062
Average Loaded Pressure: 106.0
Total Blowoff: 0
Average Deviation: 0.077
Pressure Control
Control Options
Scheduler
Scheduling
Compressor Sequence
8 3 4 2 6 5 1 7
System Control Setpoints
System Pressure Setpoint (psi) 106.0
Start Pressure Setpoint (psi) 103.5
Stop Pressure Setpoint (psi) 104.5
System Allowable Blowoff (%) 40
Bypass Valve Unload Point (%) 60
Unload Test Rate (psi/min) 1
Timers (sec)
Preset | Remain | Enabled | Machine
Load Delay 5 5 0
Start Delay 5 5 6
Unload Delay 180 180 2
Stop Delay 1200 1200 0
Test Delay 60 60
System Delay 90 90
04/19/2017 07:59:08 AM Pressure Control Enabled
04/19/2017 07:51:30 AM Pressure Control Disabled
04/18/2017 09:51:07 PM Pressure Control Enabled

Data Entry | Profile Summary | **Totals**

System Summary

Daytype	Total OpHrs	Avg Airflow, acfm	Avg Airflow, %Cs.	Peak Demand, kW	Load Factor, %	Annual Energy, kWh	Annual Energy Cost, $
Friday	1,248	9,365	42.6	2,145.4	50.4	2,251,006	112,550
Mon - Thurs	4,992	14,688	66.8	3,106.3	77.2	13,787,760	689,388
Saturday	1,248	8,006	36.4	1,878.4	45.5	2,030,989	101,550
Sunday	1,248	9,967	45.3	2,669.0	50.1	2,237,436	111,872
System Totals	8,736	12,299	55.9	3,106.3	65.0	20,307,190	1,015,360

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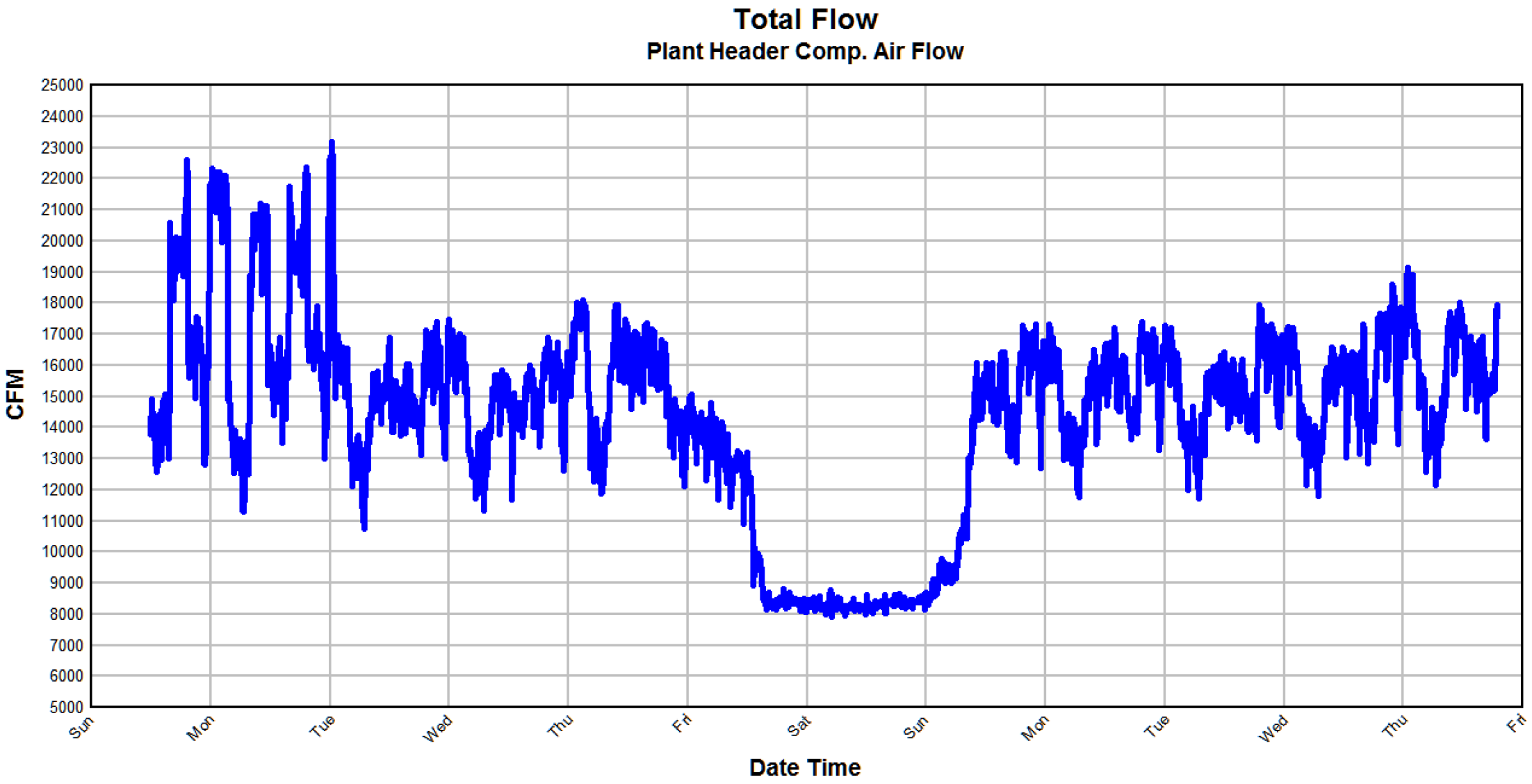
Total demand cost, $ $ 0

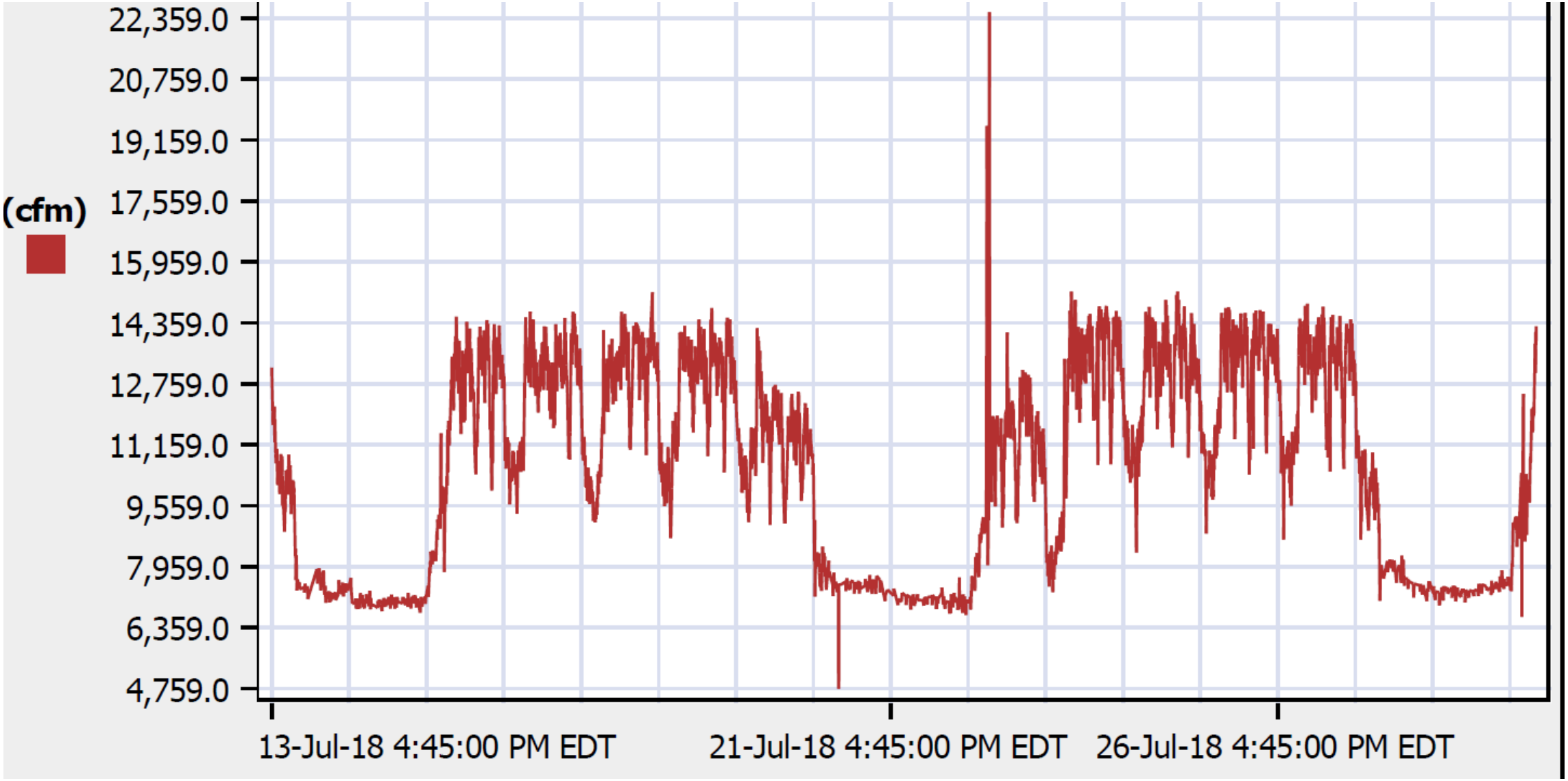
Total operating costs, $ $ 1,015,360

Baseline Energy $1,000,000 last 12 months

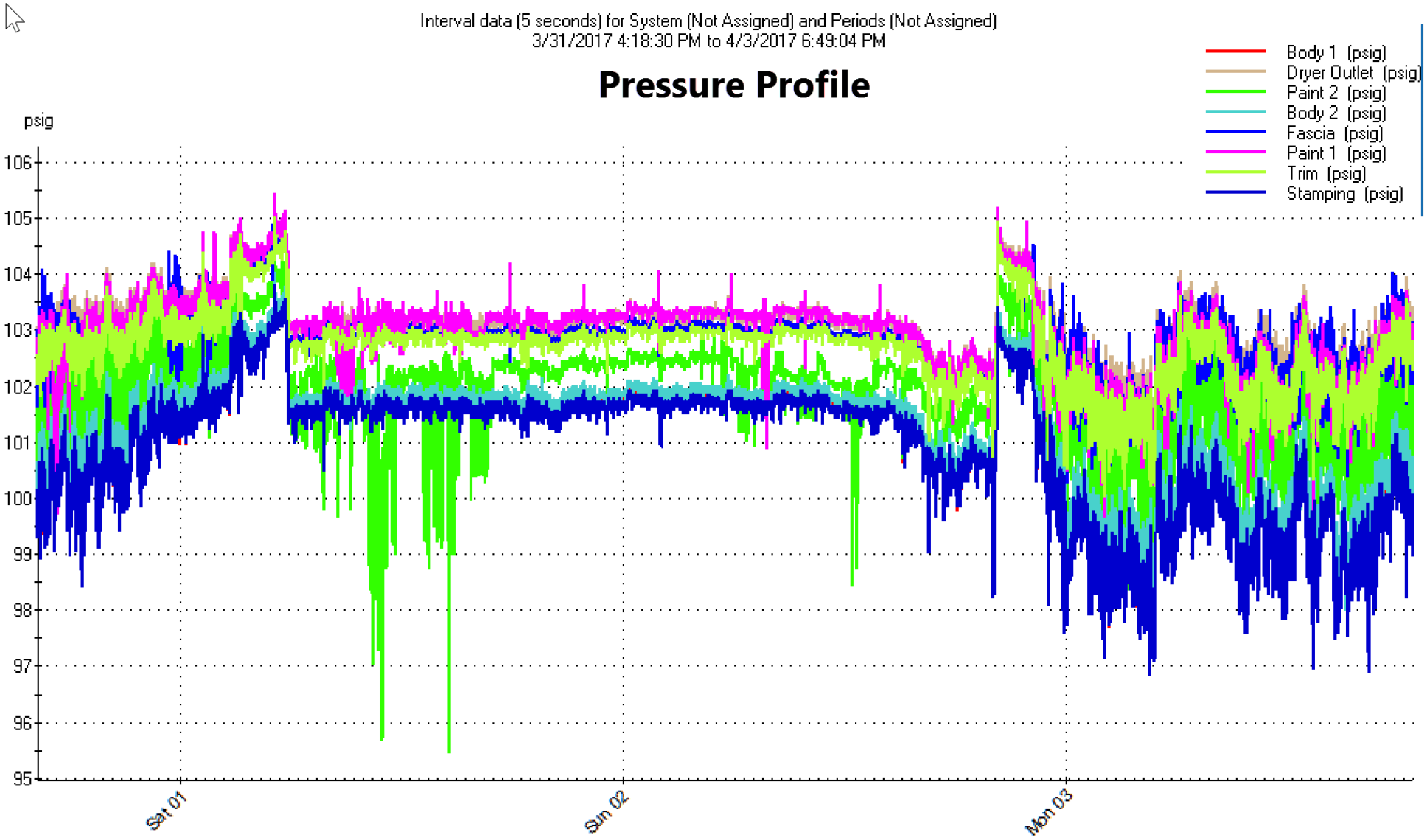
Total Flow


Total Flow
Plant Header Comp. Air Flow
CFM
25000
24000
23000
22000
21000
20000
19000
18000
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
Sun
Mon
Tue
Wed
Thu
Fri
Sat
Sun
Mon
Tue
Wed
Thu
Fri
Date Time

Total Flow


(cfm)
22,359.0
20,759.0
19,159.0
17,559.0
15,959.0
14,359.0
12,759.0
11,159.0
9,559.0
7,959.0
6,359.0
4,759.0
13-Jul-18 4:45:00 PM EDT
21-Jul-18 4:45:00 PM EDT
26-Jul-18 4:45:00 PM EDT

Pressure Profile



Energy Savings Opportunity Realized:

Data Entry | **Savings Summary**

Description	Energy Savings, kWh	Energy Savings, $	Energy Savings, %	Demand Savings, kW	Demand Savings, $	Installed Cost, $	Total Savings, $	Simple Payback, years
Use Automatic Sequencer	242,472	12,124	1.2	258.7	0	0	12,124	0.0
Reduce Air Leaks by 3000 scfn	4,618,817	230,941	22.7	158.8	0	20,000	230,941	0.1
Use of VSD Rotary Screw Com	2,194,180	109,709	10.8	327.1	0	300,000	109,709	2.7
TOTALS	7,055,469	352,774	34.7	744.6	0	320,000	352,774	0.9

Double-click row to view corresponding measure input data

Copy To Clipboard

Energy Savings Opportunity Realized:

Compressed Air Leak Repair

- ***Only 3000 SCFM***
- ***$231K Annual Energy Savings***

- ***R & M Cost $80K***

Additional Recommendations:

Improving Mindset

- **Reporting and fixing leaks**
- **Understanding cost of compressed air**

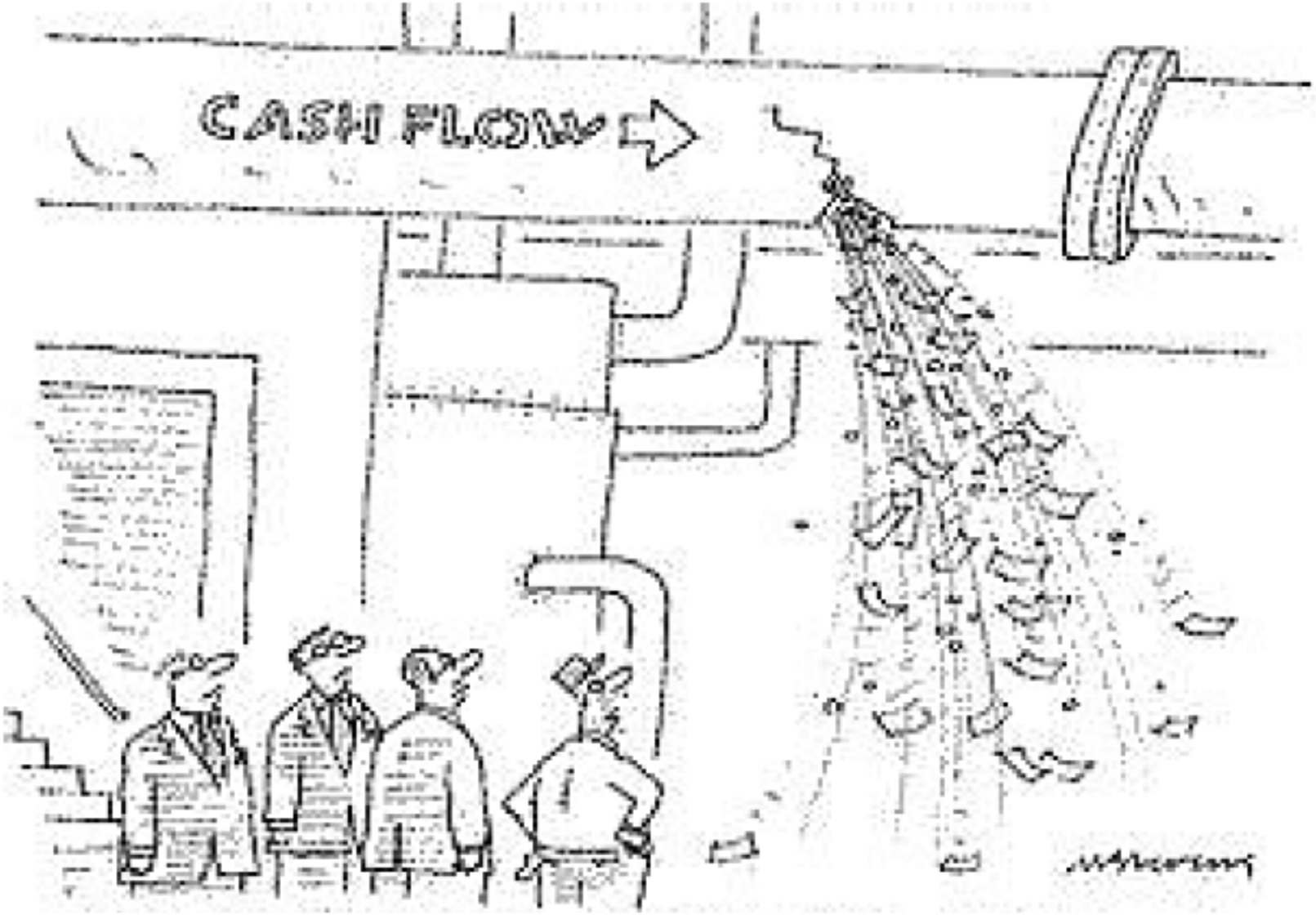
- **Potentially 1,000 scfm**
- **$112,000 Annual Energy Savings**
  - **COST OF COMPRESSED Air is $112/cfm/yr**

Nissan Canton MS, April 18-21, 2017

Summary of Study - Detail Conclusions

Savings Opportunities Identified (Annual):

1. ***Leaks: estimated at 8000 scfm (3000 scfm goal)***
   - ***Energy savings: $230,000***
2. ***Lower pressure by 3 psig:***
   - ***Energy savings: $34,000***
3. ***Open blowing: continue to replace with engineered nozzles or blowers***
   - ***Energy savings: $56,000***
4. ***Electric solenoid valves replace with zero air loss***
   - ***Energy Savings: $6,000***
5. ***Detailed study recommended to determine all optimization possibilities***



“Well, gentlemen, there’s your problem.”

Questions