NONRESIDENTIAL MARKET SHARE TRACKING STUDY

APPENDIX A
PHASE 1 INDUSTRIAL PURCHASES AND PRACTICES SURVEY

CONSULTANT REPORT

Prepared For:
California Energy Commission

Prepared By:
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With
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Robert Thomas Brown Company

April 2005
CEC 400-2005-013-AP1

YEAR 2001
INDUSTRIAL ENERGY END-USER SURVEY

Business Name:
Address:

Location ID #:
SIC Code from Frame:
Utility Territory:

CONTACT LOG

	Date	Time	Caller	Respondent/phone #	Action/Comment
1					
2					
3					
4					

Site Visit Date:	Time Arrived	Time Left

Site Visit Contacts: _____ Phone #: _____

_____ _____

_____ _____

CONTENTS

Surveyor Name: _____ Phone #: _____

Signature: _____ Date: _____

Thank you for volunteering to help us with this important research project. The goal of this survey is to learn how California manufacturers run their facilities and make energy-related decisions. Your responses will be used to help plan for future power needs, as well as energy efficiency programs.

The following questions were designed to allow you to describe your use and maintenance practices for different types of energy-using equipment. First we will ask a few general questions that will help us group similar businesses together for our analysis. Rest assured, your business's privacy is of utmost concern to us. Therefore, individual responses from your business will never be reported in such a way as to risk revealing proprietary information; only aggregated responses will be reported.

For multiple-choice questions, please select the single best answer unless instructed to do otherwise with "Check all that apply" or similar language.

<For any quantitative questions, if the respondent has trouble answering, inform him/her that a rough, approximate answer is fine.>

General

1. What do you make?

   _____
   _____
   _____

2. What are the major processing steps used to produce these goods?

   _____
   _____
   _____
   _____
   _____

3. When was this facility built? *Month (if available)* _____ *Year* _____

4. About how many people work at your facility (full time equivalents)? *<Definition of full-time equivalents: Number of people working expressed as if everyone worked 40 hours per week. For example, five people working 48 hours per week each, would be 5 * (48/40) = 6.0 FTEs.>*

   _____ people ☐ Not sure, this is a rough estimate

   ☐ Don't know

5. How many shifts per week does the plant run, on average?

   _____ shifts/day _____ days/wk ☐ Not sure, this is a rough estimate

   ☐ Don't know

6. Which department specifies equipment such as motors and air compressors?

   ☐ Facilities
   ☐ Maintenance
   ☐ Engineering
   ☐ Manufacturing
   ☐ Other _____
   ☐ Not sure

7. Does that department pay the electric bills out of their accounts?

   ☐ Yes
   ☐ No
   ☐ Other _____
   ☐ Not sure

8. What is the maximum your department can spend on a piece of equipment without getting executive approval?

   <Read the following if the respondent is unclear about the question.>

   Most companies allow supervisors or lower level managers to approve purchases up to a limited price ceiling. This allows quick purchases for general operating expenses. If more expensive items need to be bought, such as capital improvements, higher approval is required. What is the maximum expense allowable without executive approval?

   $ _____

   ☐ Don't know

9. Have there been budget cuts in the last 2 years at this plant?

- ☐ Yes.
- ☐ No. <*Skip to Q11.*>

- ☐ Don't know

10. What budget areas were cut? <*Read the choices out loud.*>

- ☐ Staff levels
- ☐ Salaries
- ☐ Maintenance
- ☐ Quality of equipment purchased
- ☐ Administration
- ☐ Training
- ☐ Other:

_____

_____

_____

_____

- ☐ Don't know

11. Can you estimate your monthly or annual electric bill for this plant?
Choose one.

- ☐ _____ kWh/yr
- ☐ _____ kWh/mo
- ☐ **$**_____ /mo
- ☐ **$**_____ /yr
- ☐ _____ kW
- ☐ Not sure

If refused, write in refusal.

<Surveyor should write a description of the space to be surveyed in the blank space below.

As a reminder, we define an establishment is as follows:

A manufacturing establishment is defined as "all buildings in a contiguous area that are controlled by a common decision-maker regarding energy." It may produce one or multiple products. There typically is one plant manager, and one maintenance staff. >

Example site descriptions:

1. *Plant receives printed circuit boards and microchips, presses boards together for multilayer boards, and mounts the chips on the boards. Presses require heat and compression; surface mount machines all are automated and powered by fractional hp motors and compressed air. Compressors and presses are only big energy users.*

2. *Plant receives raw vegetables from the valley (corn, beans, peas, rhubarb), processes them as necessary, and freezes them prior to bagging. Lots of small motors for corn cobbers, shakers, and conveyors. Lots of cleaning. Most of the rest of the load is a blast freezer and 50,000 square feet of –20F storage.*

GLOSSARY - MOTORS

Premium Efficiency
All new motors manufactured after October 1997 between 1 and 200 hp must meet minimum energy efficiency standards established by the Federal government. They sometimes are referred to as post-EPAct (Energy Policy Act) motors. EPAct was the Congressional order that directed DOE to define the minimum standards. Motors that are even more efficient and meet or exceed NEMA-specified standards can be labeled ***premium efficiency***.

EASA
Electrical Apparatus Service Association, Inc., the trade organization for many electrical repair shops that perform motor rewinding.

New Packaged Equipment
Purchased equipment such as compressors, lathes, or conveyors that are delivered with motors as part of the complete assembly.

Variable Speed Drive (VSD)
A controller used to modulate motor shaft rotational speed. As an energy-efficiency tool, VSDs most often are adjustable frequency drives. They reduce speed on pumps, fans, and compressors instead of throttling or other less efficient means of flow reduction.

MOTORS

In this section we want to learn if you routinely buy premium efficiency motors, to learn about your motor rewinding practices, and to record any recent purchases of variable speed drives.

1. Does your purchasing department have a standard clause or routinely follow a procedure to specify that "premium efficiency" motors must be used when ***new packaged equipment*** is purchased? See the definition of "premium" on facing page if necessary.

   ☐ Yes
   ☐ No
   ☐ Under certain conditions
   ☐ Not sure

2. When buying ***replacement motors such as those stocked in an on-site store room***, is it your policy to buy regular or premium efficiency motors?

   ☐ Regular (this includes motors labeled "standard efficiency" or "energy efficient")
   ☐ Premium efficiency
   ☐ The plant does not stock any back-up motors
   ☐ No set policy
   ☐ Not sure

3. Consider the ***most recent five motors you special-ordered*** during the past three years**.** How many were specifically ordered to be premium efficiency motors?

   ☐ None bought

   _____ (0 to 5) ☐ Not sure, this is a rough estimate

   ☐ Don't know

4. How many were not premium efficiency?

   _____ (0 to 5) ☐ Not sure, this is a rough estimate

   ☐ Don't know

5. Please estimate the ***total horsepower*** of new motors installed in the last 3 years.

☐ _____ hp installed in the last 3 years ☐ Not sure, this is a rough estimate
☐ _____ Hp to _____ Hp Total
☐ None bought

☐ Don't know

6. Please estimate the source of new motors installed in your facility in the last 3 years ***(Entries must be mutually exclusive and sum to 100%)***:

_____ % motor hp installed with new packaged equipment (like Q1)
_____ % replacement motor hp such as those stocked in an on-site store room (like Q2)
_____ % motor hp special-ordered other than out of stock in hand (like Q3)
100 % TOTAL

7. Do you ever send motors to an electrical shop for rewinding or do you always replace them with new motors?

☐ Sometimes rewind
☐ Always replace with new (*Skip to Q14)*
☐ Not sure (*Skip to Q14)*

8. When you choose to rewind, what are the main reasons you do so? Check all that apply.

☐ Lower first cost
☐ Faster turnaround time
☐ To keep older motors, which are built better than new ones
☐ Rewinding doesn't require funds from the capital budget
☐ We rewind pre-EPAct (1997) motors only, because they are cheaper to rewind
☐ To adjust from nameplate voltage to our actual plant voltage
☐ Other _____
☐ Not sure

9. What is the smallest size motor that you rewind, not counting unique or "special application" motors?

_____ hp ☐ Not sure, this is a rough estimate

☐ Don't know

10. Consider the last five motors of that size or larger that needed to be replaced. How many were rewound?

_____ (0 to 5) ☐ Not sure, this is a rough estimate

☐ Don't know

11. When you have a motor rewound, do you require the rewind shop to provide any quality assurance features?

☐ Yes
☐ No
☐ Not sure

<If yes>

12. What do you require? (check all that apply)

	Required	Not Sure
Delivery of oven chart recorder burnout temperature	☐	☐
Repair report	☐	☐
Winding resistance test results	☐	☐
Core loss test results	☐	☐
Identical materials replacement	☐	☐
Lap windings instead of concentric windings	☐	☐
Other (specify)	☐	☐

13. Do you require EASA membership (of the rewind shop)?

☐ Yes
☐ No
☐ Not sure

14. Please estimate the total horsepower of variable-flow applications in your plant.

☐ _____ hp total

☐ Not sure, this is a rough estimate

<If 0, Skip to Q20.>

☐ _____ hp to _____ hp

☐ Don't know.

15. What is the approximate total horsepower of variable-flow applications *run by motors with VSDs* in your plant?

☐ _____ hp total

☐ Not sure, this is a rough estimate

<If 0, Skip to Q18.>

☐ _____ hp to _____ hp

Answer must be less than or = Q14 answer.

☐ Don't know.

16. Please estimate the total horsepower of variable speed drives (VSDs) installed on motors *in the last 3 years.*

☐ _____ hp

☐ Not sure, this is a rough estimate

☐ _____ hp to _____ hp

Answer must be less than or = Q15 answer.

☐ Don't know

17. Are the VSDs performing satisfactorily?

☐ Yes

☐ One or more are not. Explain:

_____

_____

☐ Not sure

18. What are factors you consider in deciding whether to buy a VSD for a variable-flow application motor? *<Allow the respondent to come up with factors. Do NOT prompt for the answers below. Check all that apply.>*

Q18 CHECK BOX	**Q19 CHECK BOX**
☐ Don't generally consider buying motors with VSDs	☐
☐ It's generally not worth thinking about adding VSD's to motors	☐
☐ Longer delivery time with VSD	☐
☐ VSD's are expensive	☐
☐ VSD's offer better control of the motor	☐
☐ VSD's allow for energy savings	☐
☐ VSD's often cause synchronization problems	☐
☐ Suitability of VSD for the process run by the motor	☐
☐ Whether or not the motor is compatible with a VSD	☐
☐ Other:	☐

_____

_____

<If more than one factor indicated:>

19. Is one of the factors more important than the rest? *<If so, check the corresponding box to the right above (only1).>*

20. Who most often specifies motor attributes (efficiency, features) when purchased? (Choose 1.)

☐ President
☐ Plant engineer
☐ Plant electrician
☐ Operations manager
☐ Maintenance supervisor
☐ Facilities manager
☐ Purchasing department
☐ Other _____

☐ Not sure

21. From whom do you most often buy motors? <*Lowest bidder can be chosen along with one of the other choices.*>

- ☐ Lowest bidder
- ☐ National distributors (Grainger, Graybar, etc.)
- ☐ Manufacturer's representative
- ☐ Local or regional distributor/supplier (Wesco, etc.)
- ☐ Other _____

☐ Not sure

22. About how many suppliers do you generally check with to buy a given motor?

- ☐ _____ suppliers
- ☐ Varies a lot. Comments:

_____
_____

☐ Don't know

23. Please tell me how you think premium efficiency motors compare to standard motors in each of the following categories:

a. How long it takes to procure them:
   - ☐ Longer
   - ☐ Shorter
   - ☐ About same
   - ☐ Don't know

b. Cost of installation
   - ☐ Higher
   - ☐ Lower
   - ☐ About same
   - ☐ Don't know

c. Cost of maintenance
   - ☐ Higher
   - ☐ Lower
   - ☐ About same
   - ☐ Don't know

24. How do you become aware of new products and product improvements related to motors? *Check all that apply*.

- ☐ Read about them in trade journals
- ☐ Sales personnel
- ☐ Utility staff/programs
- ☐ Business associate
- ☐ Other _____

☐ Not sure

25. How many 50 or more hp motors did you buy in the last 3 years?

_____ motors

26. How many motors at least 1 hp and less than 50 hp did you buy in the last 3 years?

_____ motors

If Q25, Q26 seem inconsistent with Q5, Q6, then probe.

27. For question 27 sampling of motors, the following procedure applies:

<u>10 MOTORS MAXIMUM TO BE SAMPLED</u>

The assumption is the customer can provide you some form of a list of motors.

Note: No. of motors sampled > or = 50 h.p. and No. under 50 h.p. must be consistent with Q25, Q26 and sampling rules provided, or note reason for inconsistency in notes or reasons space for selected motor on pp. 16,

1. Sample motors 50 HP or larger bought in last 3 years first.

   A If 5 or less motors, record data for all motors.
   B If more than 5, use table of random numbers to determine which 5 motors to sample.

2. Sample motors at least 1 HP but under 50 HP bought in last 3 years next.

   A If none, return to motors 50 HP or larger to complete table.
   B If 5 or less, record all motors and then return to 50 HP or more to complete table.
   C If more than 5, use table of random numbers to determine which 5 motors to sample.

If a list of motors is not available, the surveyor should:

1) Sketch a diagram of the facilities.

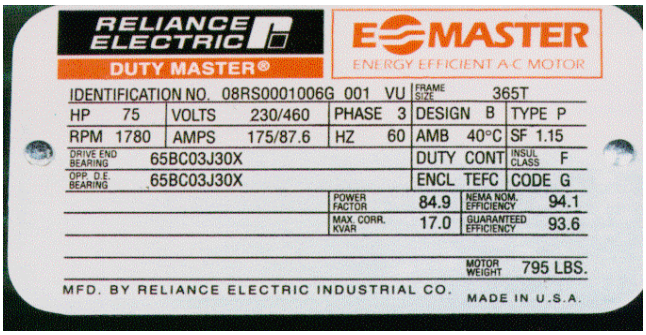
2) Partition the facilities into 16 parts.

3) Randomly select one of the partitions using the random number table.

4) For the motors in the selected partition, create 2 lists of the motors that were bought in the last 3 years – 1 of those 50 HP and above, the other of those less than 50 Hp, but greater than 1 HP.

5) Randomly select from those motors using the procedures outlined for when a list is available.

6) Got back to step 3 until 10 motors are chosen.



What Do All Those Things on an AC Motor Nameplate Mean?

Introduction:
Ever order a motor on power, speed, and enclosure? PO says maybe "5 hp, 1,800 rpm, TEFC." New-motor nameplate says "HP 5, RPM 1748, Enclosure TEFC, Des B, Frame 184T, Amps 7.0, PH 3, HZ 60, Duty Cont, Volts 460, Type P, Amb 40 C, SF 1.15, INS CL F, EFF 82.5, P.F. 80, DE bearing 35BC02JGG30A26, ODE bearing 3OBC02JGG3OA26."

Should you reject the motor because it is not rated at 1,800 rpm? What does all that extra information on the nameplate mean? Do you care? The answers are "maybe," "we'll discuss it in a minute," and "you probably should."

To define the basic performance and mounting parameters of a motor, the National Electrical Manufacturers Association (NEMA) defines some basic design and dimensional parameters in NEMA Standard MG 1. These parameters are then coded onto the motor nameplate to give you a basic definition of what you have received. Manufacturers often include additional information to further define some key motor features.

Section MG 1-10.40, "Nameplate Marking for Medium Single-Phase and Polyphase Induction Motors," of the NEMA standard requires that "The following minimum amount of information shall be given on all nameplates of single-phase and polyphase induction motors. For abbreviations, see MG 1-1.80."

* Manufacturer's type and frame designation
* Horsepower output.
* Time rating. (See MG 1-10.36.)
* Maximum ambient temperature for which motor is designed. (See Note I of MG 1-12.43.)
* Insulation system designation.
* RPM at rated load.
* Frequency.
* Number of phases.
* Rated load current.
* Voltage.
* Code letter for locked rotor kVA. (See MG 1-10.37.)
* Design letter for medium motors. (See MG 1-1.16.)
* NEMA nominal efficiency when required by MG 1- 12.55
* Service factor if other than 1.0.
* For motors equipped with thermal protectors, the words "thermally protected" if the motor provides all the protection described in MG 1-12.52. (See MG 1-1.71 and MG 1-1.72.)

	Motor Number				
	1	2	3	4	5
Location					
Make					
Model No.					
VSD in Use?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Variable-flow application?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Year of Manufacture					
Output power (check hp or kW)	☐ HP ☐ kW	☐ HP ☐ kW	☐ HP ☐ kW	☐ HP ☐ kW	☐ HP ☐ kW
Enclosure	☐ Open Drip Proof (ODP) ☐ TEFC ☐ Other ☐ Cannot be determined	☐ Open Drip Proof (ODP) ☐ TEFC ☐ Other ☐ Cannot be determined	☐ Open Drip Proof (ODP) ☐ TEFC ☐ Other ☐ Cannot be determined	☐ Open Drip Proof (ODP) ☐ TEFC ☐ Other ☐ Cannot be determined	☐ Open Drip Proof (ODP) ☐ TEFC ☐ Other ☐ Cannot be determined
RPM					
Volts (V)					
Phase					
Amps (A)					
Efficiency (%) (Nominal)					
Power Factor (%)					
Average weekly run hours					
Mo./**Yr. Bought** (just year ok)					
Purchase price ***MOTOR ONLY***					
Reason(s) bold field(s) missing	☐ Not on nameplate ☐ Not legible ☐ Nameplate data not visible ☐ Other (specify in notes)	☐ Not on nameplate ☐ Not legible ☐ Nameplate data not visible ☐ Other (specify in notes)	☐ Not on nameplate ☐ Not legible ☐ Nameplate data not visible ☐ Other (specify in notes)	☐ Not on nameplate ☐ Not legible ☐ Nameplate data not visible ☐ Other (specify in notes)	☐ Not on nameplate ☐ Not legible ☐ Nameplate data not visible ☐ Other (specify in notes)
Notes (use next page if needed)					

Notes for Motor Number:				
1	2	3	4	5

	Motor Number				
	6	7	8	9	10
Location					
Make					
Model No.					
VSD in Use?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Variable-flow application?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Year of Manufacture					
Output power (check hp or kW)	☐ HP ☐ kW	☐ HP ☐ kW	☐ HP ☐ kW	☐ HP ☐ kW	☐ HP ☐ kW
Enclosure	☐ Open Drip Proof (ODP) ☐ TEFC ☐ Other ☐ Cannot be determined	☐ Open Drip Proof (ODP) ☐ TEFC ☐ Other ☐ Cannot be determined	☐ Open Drip Proof (ODP) ☐ TEFC ☐ Other ☐ Cannot be determined	☐ Open Drip Proof (ODP) ☐ TEFC ☐ Other ☐ Cannot be determined	☐ Open Drip Proof (ODP) ☐ TEFC ☐ Other ☐ Cannot be determined
RPM					
Volts (V)					
Phase					
Amps (A)					
Efficiency (%) (Nominal)					
Power Factor (%)					
Average weekly run hours					
Mo./**Yr. Bought** (just year ok)					
Purchase price ***MOTOR ONLY***					
Reason(s) bold field(s) missing	☐ Not on nameplate ☐ Not legible ☐ Nameplate data not visible ☐ Other (specify in notes)	☐ Not on nameplate ☐ Not legible ☐ Nameplate data not visible ☐ Other (specify in notes)	☐ Not on nameplate ☐ Not legible ☐ Nameplate data not visible ☐ Other (specify in notes)	☐ Not on nameplate ☐ Not legible ☐ Nameplate data not visible ☐ Other (specify in notes)	☐ Not on nameplate ☐ Not legible ☐ Nameplate data not visible ☐ Other (specify in notes)
Notes (use next page if needed)					

Notes for Motor Number:				
6	7	8	9	10

Modulating compressor
When a facility has a compressed air plant with multiple compressors running simultaneously to supply air to a single distribution system, usually operation is configured so that all compressors run at full capacity except one unit that varies output with air demand. This compressor is called the modulating compressor, the swing compressor, or the topping compressor. Modulation can be with either cycling or proportional control.

Minimum discharge pressure
This is the air pressure at the discharge port of the compressor. For compressors with control systems that cycle between high and low setpoints, this is the low setting. For sequenced or staged compressor systems with different pressure settings for each compressor, this is the minimum pressure setting for the compressor most often running as the modulating compressor.

Intermediate flow controller
Intermediate flow controllers are electronically-controlled valves installed between one or more air compressors and the compressed air distribution system. They monitor air requirements and adjust compressor pressure settings to meet anticipated demand with minimal energy use. Conservair, Zeks' Xpandair, Honeywell's XCEED, and Kaeser's flow controller are examples of such devices.

COMPRESSED AIR SYSTEM

Industrial compressed air systems deliver air to power tools and pneumatic equipment that require air in the range of 20 to 150 psig. Compressors for such systems are typically reciprocating, screw, or centrifugal type units.

1. Given the definition above, does this facility use compressors that together total at least 50 hp, excluding backup compressors?

   ☐ Yes ☐ No – *Skip to the next technology form*

COMPRESSORS

2. Please list and describe all of your air compressors in the table below.
<Surveyor should collect data on all compressors.>

No.	Compressor Motor Horsepower	Typical Operating Condition (Choose one per compressor)			Check if Variable Speed Drive Control	Check if Heat Recovery (oil or head cooling)
		Base Unit Runs at Full Load	Modulating Unit	Back-Up Unit		
1		☐	☐	☐	☐	☐
2		☐	☐	☐	☐	☐
3		☐	☐	☐	☐	☐
4		☐	☐	☐	☐	☐
5		☐	☐	☐	☐	☐
6		☐	☐	☐	☐	☐
7		☐	☐	☐	☐	☐
8		☐	☐	☐	☐	☐
9		☐	☐	☐	☐	☐
10		☐	☐	☐	☐	☐
11		☐	☐	☐	☐	☐
12		☐	☐	☐	☐	☐

3. What type of part load control does the modulating unit employ?
   If there is more than one modulating compressor, enter for the unit that modulates most often.

   ☐ Throttle (or other variable inlet pressure device on screw compressors)
   ☐ Slide, poppet, or turn valve (or other variable inlet volume device on screw compressors)
   ☐ Cycling
   ☐ Variable speed drive
   ☐ Bypass or none (rare, centrifugal only)
   ☐ Other _____
   ☐ Not sure

4. Do you use automatic controls to optimally sequence multiple air compressor operation?

   ☐ Yes
   ☐ No
   ☐ Not sure

5. The compressors draw air to compress from:

   ☐ The compressor room
   ☐ Outside
   ☐ Another room
   ☐ Not sure

COMPRESSED AIR DISTRIBUTION SYSTEM

6. Do you have multiple compressed air distribution systems that maintain different pressure levels?

   ☐ Yes
   ☐ No
   ☐ Not sure

7. Does your distribution system include an intermediate air flow controller? This question does not refer to fixed pressure regulators.

   ☐ Yes
   ☐ No
   ☐ Not sure

8. What is the minimum compressor discharge pressure setting?
   If the minimum pressure setting varies over the course of a production day, answer for the highest minimum pressure setting. If there are multiple compressed air systems, answer for the largest system.

   _____ psig ☐ Not sure, this is a rough estimate

   ☐ Don't know

9. What is the highest air pressure required by air-using equipment?

   _____ psig ☐ Not sure, this is a rough estimate

   ☐ Don't know

   Must be less than or = answer Q8.

<If more than 10 psi difference between answers>

10. Why is the difference greater than 10 psi?

_____
_____
_____

11. Have you increased or decreased the discharge pressure in the last two years? If there are multiple compressed air systems, please answer for the largest system.
<If respondent knows pressure has been increased/decreased but doesn't know amount, mark increased or decreased box and leave the psig blank.>

☐ No, it has stayed the same
☐ Increased pressure from _____ psig to the discharge pressure noted in Q8.
☐ Decreased pressure from _____ psig to the discharge pressure noted in Q8.
☐ Not sure

<If Decreased >

12. Why were you able to reduce the pressure? Check all that apply.

☐ Eliminated air-using equipment:
___ Process being performed by air-using equipment no longer performed
___ Process activity still performed, but now with non-pneumatic equipment
___ Amount of processing decreased, reducing need for air-using equipment
___ Other:
_____
_____
_____

☐ Eliminated leaks
☐ Process or tool changes reduced air pressure requirements
☐ Added receiver(s)
☐ Added, joined, or increased diameter of distribution headers
☐ Added an intermediate flow controller
☐ Installed dryers or coolers with reduced pressure drop compared to previous
☐ Other
_____

13. How often do you search for air leaks?

☐ Never *<Skip next 2 questions.>*
☐ When compressors start to have trouble meeting air requirements
☐ Regularly but not often; once a year or less
☐ Regularly; more than once per year
☐ Not sure

14. Is the monitoring done in-house or by outside consultants?

- ☐ In-house
- ☐ By outside consultants

15. What do you do when leaks are found?

- ☐ Repair them
- ☐ Other:

_____

_____

16. Has your compressed air system received a systematic compressed air leak audit in the last two years?

- ☐ Yes
- ☐ No
- ☐ Don't know

17. Have you added any receivers to store compressed air in the last two years?

- ☐ Yes.
- ☐ No. <*Skip next question.*>
- ☐ Not sure. <*Skip next question.*>

18. Where did you install the receivers?

- ☐ Near existing compressors
- ☐ Near new compressors
- ☐ Near equipment that uses large bursts of air
- ☐ Elsewhere in the distribution system

EQUIPMENT USING COMPRESSED AIR

19. Have you replaced any electric equipment with pneumatic equipment in the last two years? *(Examples include: Fluid agitation, conveyance, electrical cabinet coolers, diaphragm pumps, power tools)*

- ☐ Yes – Estimated electric horsepower removed: _____ hp
- ☐ No. <*Skip next question.*>
- ☐ Not sure <*Skip next question.*>

20. Why was this change made?

_____

_____

_____

21. Conversely, have you replaced any pneumatic equipment with electric equipment in the last two years?

- ☐ Yes – Estimated electric horsepower installed: _____ hp
- ☐ No <*Skip next question.*>
- ☐ Not sure <*Skip next question.*>

22. Why was this change made?

_____

_____

_____

23. Have you installed engineered nozzles or air knives to reduce air flow rates or increase air velocity in the last two years?

- ☐ Yes – nozzles on clean up hoses
- ☐ Yes – nozzles or air knives or similar device on process equipment
- ☐ No
- ☐ Not sure

24. Have overall increases or decreases in production affected your compressed air requirements in the last two years?

- ☐ Yes – production increased about _____% in the last two years and increased air needs
- ☐ Yes – production decreased about _____% in the last two years and decreased air needs
- ☐ No
- ☐ Other _____

- ☐ Not sure

GENERAL

25. Please estimate the total amount you have spent over the last two years on compressed air systems to reduce energy costs (*such as new controls, leak reduction, nozzles, studies)*:

    $_____ ☐ Not sure, this is a rough estimate

    ☐ Don't know

26. How do you become aware of new products and product improvements related to compressed air?

    Check all that apply

    ☐ Read about them in trade journals
    ☐ Sales personnel
    ☐ Utility staff/programs
    ☐ Business associate
    ☐ Other _____

    ☐ Not sure

GLOSSARY - MAINTENANCE

Full-time equivalents
Number of people working expressed as if everyone worked 40 hours per week. For example, five people working 48 hours per week each, would be 5 * (48/40) = 6.0 FTEs; 20 people working, half of which worked 20 hours per week, would be 10 + 10 * (20/40) = 15 FTEs.

Blower
In this survey industrial blowers are defined as *air-moving devices that operate in the range of 1-20 psi.* They are generally centrifugal or positive-displacement types, and they are typically used for agitation, material conveying, or forced-draft combustion. Blowers **do not** include fans that move air at less than 1 psi (27.70 inw) static pressure difference.

Automated lubrication
Automated lubrication systems apply grease, oil, or other fluids to bearings and other mechanical devices to minimize or eliminate manual lubrication requirements. Examples of types of automated systems are drip lubrication, pressurized oil systems, and automated greasing systems.

Maintenance Policies
As Needed
Typically run equipment until noticeable performance loss or failure, then repair or replace it.

Unscheduled Preventive Maintenance
Perform preventive maintenance when convenient or when the need for it arises, but do not follow a formal schedule to do so. May use rules of thumb to occasionally spot check equipment condition.

Limited Scheduled Preventive Maintenance
Maintain key process equipment on a schedule. Other equipment may be informally maintained or repaired as needed.

Aggressive Scheduled Preventive Maintenance
Maintain most or all equipment on a preventive maintenance schedule. Likely use a computer tracking program to manage the effort. Either in-house or contracted staff perform the work.

Predictive Maintenance
Maintain most or all equipment on a preventive maintenance schedule. Likely use a computer tracking program to manage the effort. Likely use permanent instrumentation to monitor equipment performance during routine operation. Likely to use observed changes in equipment performance data to forecast occurrences of equipment failures, and predict when maintenance needs to be supplied. Example predictive maintenance tools include vibration and ultrasonic monitors and built-in manometers.

MAINTENANCE PRACTICES

1. What type of maintenance policy does your company follow for each of the following types of equipment? *Please see the Glossary for definitions.*

Equipment	As Needed	Unscheduled Preventive	Limited Scheduled Preventive	Aggressive Scheduled Preventive	Predictive	Not Applicable	Don't Know
Motor lubrication	☐	☐	☐	☐	☐	☐	☐
Bearing lubrication	☐	☐	☐	☐	☐	☐	☐
Motor belt replacement	☐	☐	☐	☐	☐	☐	☐
Fan/blower blade cleaning	☐	☐	☐	☐	☐	☐	☐
Fan/blower wheel balancing	☐	☐	☐	☐	☐	☐	☐
Fan/blower air flow test	☐	☐	☐	☐	☐	☐	☐
Air compressor intake filters	☐	☐	☐	☐	☐	☐	☐
Compressed air water traps & pressure regulators	☐	☐	☐	☐	☐	☐	☐

2. What is the size of your maintenance staff?

_____ Full Time Equivalents

☐ Not sure, this is a rough estimate

☐ Don't know

See previous page for definition of Full-Time equivalents.

3. Over the last two years, has maintenance staffing—including contracted labor—increased, decreased, or stayed the same?

☐ Increased substantially
☐ Increased somewhat
☐ Stayed the same
☐ Decreased somewhat
☐ Decreased substantially
☐ Don't know

4. Over the last two years, has maintenance effort on energy-related issues such as compressed air, blowers, and lubrication, increased, decreased, or stayed the same?

☐ Increased substantially
☐ Increased somewhat
☐ Stayed the same
☐ Decreased somewhat
☐ Decreased substantially
☐ Don't know

<If increased or decreased>

5. Why do you think that is?

_____

_____

_____

6. On multiple-belt driven equipment, what belt-replacement procedure do you most often follow when replacing belts?

- ☐ Replace all belts at the same time
- ☐ Replace all belts at the same time with machine-matched sets
- ☐ Replace broken or worn belts.
- ☐ No belt driven blowers
- ☐ Not sure
- ☐ Not applicable
- ☐ Other

7. Who in your company makes the decisions that affect maintenance policies the most?

- ☐ Maintenance staff
- ☐ Facilities or plant engineer
- ☐ Engineering manager
- ☐ Plant manager
- ☐ Off-site corporate office
- ☐ Other

  _____

- ☐ Not sure

8. Please estimate the total horsepower of your blowers. (motor nameplate, 1 to 20 psig per glossary)

- ☐ _____hp
- ☐ _____hp to _____hp
- ☐ None
- ☐ Not sure

If no blowers, check "none."

9. Some mechanical devices such as bearings, gears, chains, and pulleys require lubrication to run properly. Automated lubrication systems minimize or eliminate manual lubrication. Do you use automated lubrication systems in your facility?

☐ Yes
☐ No – <*Skip to Q15*>
☐ Not sure – <*Skip to Q15*>

10. Please estimate the total horsepower of motors at your facility that are automatically lubricated or drives equipment that is automatically lubricated.

_____ hp ☐ Not sure, this is a rough estimate

☐ Don't know

11. Why did your firm install the lubrication system(s)? *Check all that apply.*

☐ Reduce maintenance time spent manually lubricating
☐ Reduce maintenance time/money spent on equipment repair
☐ Increase equipment reliability or productivity
☐ Energy savings→ Can you estimate the amount expected ? _____
(*write respondent's answer including "no" or qualifiers like "about")*
☐ It came with new equipment being installed
☐ Other _____
☐ Don't know

12. Are the lubrication system(s) working as designed?

☐ Yes
☐ No
☐ Not sure

13. Does someone have responsibility for monitoring lubricant reservoir levels?

☐ Yes
☐ No
☐ Not sure

14. Have you realized any benefits since installation? *Check all that apply.*

- ☐ Reduce maintenance time spent manually lubricating
- ☐ Reduce maintenance time/money spent on equipment repair
- ☐ Increase equipment reliability or productivity
- ☐ Energy savings: _____ (estimated amount saved per year (kW or $); *write respondent's answer including "no" or qualifiers like "about"*)

- ☐ Other _____

- ☐ Don't know

15. Which maintenance functions are done in-house vs. contracted out:

	In-house	Contracted Out	Mixture of Both	New Equipment / Not Applicable
Motors	☐	☐	☐	☐
Compressors	☐	☐	☐	☐
Compressed Air Distribution System	☐	☐	☐	☐
Refrigeration	☐	☐	☐	☐
Lights	☐	☐	☐	☐
HVAC	☐	☐	☐	☐

16. If you contract certain portions out, why do you do so?

- ☐ We don't have staff availability
- ☐ We don't have staff expertise
- ☐ Contractor costs less
- ☐ Other. Explain _____

- ☐ Don't know

17. In the last two years have maintenance personnel received training that included a section on energy management practices?

- ☐ Yes
- ☐ No
- ☐ Not sure

<If Yes>

18. What topics were included in the training? (Check all that apply.)

- ☐ Lighting
- ☐ Electrical fundamentals
- ☐ Electrical distribution equipment
- ☐ Motors
- ☐ Compressors
- ☐ Controls
- ☐ HVAC
- ☐ Heat recovery
- ☐ Power quality
- ☐ On-site generation / cogeneration
- ☐ Other: _____

19. If someone were to compile information on the effects of maintenance on energy use, how useful would that information be to you?

- ☐ Very
- ☐ Somewhat
- ☐ Not very
- ☐ Not at all

20. If someone were to compile information on the effects of maintenance on equipment reliability, how useful would that information be to you?

- ☐ Very
- ☐ Somewhat
- ☐ Not very
- ☐ Not at all

GLOSSARY – ELECTRONIC PROCESS CONTROL

Electronic Control of Process Equipment
For the purposes of this survey, electronic control of process equipment specifically refers to controls that unload or turn off process equipment when the equipment is not in use. It also includes process controls that provide energy management or load shedding capabilities. For the purposes of this questionnaire, process controls exclude HVAC and compressed air controls.

Load Shedding
Intentionally turning off equipment to reduce electrical demand during peak load periods to reduce utility demand charges.

ELECTRONIC CONTROL OF PROCESS EQUIPMENT

For the purposes of this survey, electronic control of process equipment specifically refers to controls that unload or turn off process equipment when the equipment is not in use. For example, a line that runs for two shifts and is off during a third could be controlled to automatically shut down after 15 minutes of non-use. It also includes process controls that provide energy management or load shedding capabilities. For the purposes of this questionnaire, process controls exclude HVAC and compressed air controls.

1. Do you have any electronic controls on process equipment that *(check all that apply):*

   ☐ Unload or turn off equipment to save energy during idle periods?
   ☐ Manage process equipment operation to minimize peak demand?
   ☐ Have other energy management capabilities?
   ☐ Not sure -- (S*kip to the Water Re-Use section)*
   ☐ None -- (S*kip to the Water Re-Use section)*

2. Why did you install the control system(s)? *Check all that apply.*

Q2 CHECK BOX		**Q3 CHECK BOX**
☐	To extend machine life	☐
☐	To increase process reliability	☐
☐	To increase product quality	☐
☐	Came with purchased equipment	☐
☐	For energy savings. Please compare savings with original expectations:	☐
☐	Saving more than expected	
☐	Savings meet expectations	
☐	Savings fall short of expectations	
☐	Savings fall far short of expectations	
☐	No reliable way to tell energy savings	
☐	Don't know what original expectations were	
☐	Other	☐

_____

_____

☐ Not sure

<If more than one reason chosen>

3. Was one of the reasons most important? *<If so, check the corresponding box above to the right (only 1).>*

4. What is the approximate total electrical demand of the process(es) under automatic control?

   _____ hp ***OR*** _____ kW ☐ Not sure, this is a rough estimate

   ☐ Nothing
   ☐ Don't know

5. What is the approximate electrical demand that the controls can turn off to save energy?

   _____ hp ***OR*** _____ kW ☐ Not sure, this is a rough estimate

   ☐ Not controlled to save energy
   ☐ Nothing
   ☐ Don't know

6. Do you maintain your control system, or do you contract for maintenance services?

   ☐ Maintain it ourselves
   ☐ Use outside maintenance services
   ☐ Combination of both
   ☐ Don't know

7. Do you regularly recalibrate or recommission the control system to ensure peak performance?

   ☐ Yes – every _____ months
   ☐ Yes – when performance appears to degrade
   ☐ Yes – when something fails
   ☐ No – let it run as installed
   ☐ No – no longer using system
   ☐ Other:

   _____

   _____

8. Who sold you the control system?

   ☐ Engineering firm
   ☐ Controls contractor or Systems Integrator
   ☐ Control Manufacturer
   ☐ Manufacturer of equipment being controlled
   ☐ Developed in-house
   ☐ Other – specify_____

9. Who initiated the idea to install your power control equipment?

- ☐ We initiated the idea and sought suppliers.
- ☐ Supplier's representatives approached us.
- ☐ Corporate or other central planning entity directed us to install or consider installing.
- ☐ Other, explain _____

10. Who in your firm decided on the design of the control system ?

- ☐ Operator of the process
- ☐ Plant engineer
- ☐ Plant maintenance
- ☐ Plant Manager
- ☐ Other – please specify_____

11. Who in your firm gave final approval to purchase the control system?

- ☐ Plant Manager
- ☐ Corporate Manager
- ☐ Plant engineer
- ☐ Purchasing Dept
- ☐ Other – please specify _____

12. Please briefly describe the process(es) being controlled

_____

_____

_____

_____

_____

_____

13. Let's talk now just about your most recently purchased electronic process control system. Are the controls dedicated to energy savings, or is the energy-saving feature part of a more complex control system?

- ☐ Dedicated energy saving controls
- ☐ Part of more complex system
- ☐ Both
- ☐ Not sure

<If "Dedicated">

14. About how much did the most recently purchased control system cost?

$_____ ☐ Not sure, this is a rough estimate

- ☐ Nothing
- ☐ Don't know

<If "Part of a more complex system" or "Both">

15. About how much extra did you have to pay for the energy saver feature of your most recently purchased electronic process control system?

$_____ ☐ Not sure, this is a rough estimate

- ☐ Nothing
- ☐ Don't know

GLOSSARY – WATER RE-USE AND RECYCLING

Water recovery and reuse
Any process that filters, recovers, and reuses water-based discharge fluids from a facility, thereby reducing or eliminating wastewater.

Discharge flow rate from the facility before it is recycled
The total flow rate in gallons per day of water-based effluent that would leave the plant property if there was no water re-use.

WATER RECOVERY AND RE-USE

1. Do you have a water recovery and reuse system at your facility?

   ☐ Yes
   ☐ No – *Skip rest of Water Recovery and Reuse*

2. What is the approximate wastewater flow from the facility?

   ☐ _____ gallons / day

   ☐ Not sure, ***rough estimate*** _____ gallons per day
   ☐ less than 25,000 gallons per day
   ☐ 25,001 to 100,000 gallons per day
   ☐ 100,001 to 200,000 gallons per day
   ☐ 200,001 to 500,000 gallons per day
   ☐ 500,001 to 1,000,000 gallons per day
   ☐ over 1,000,000 gallons per day, ***discharge flow rate*** _____ gallons per day
   ☐ Don't know

3. What is the approximate temperature (typically) of the wastewater?

   ____ degrees F C *(circle F or C)*
   ☐ Same as ambient
   ☐ Don't know

4. Please briefly describe the source of your wastewater flow:

_____

_____

5. What is the flow of the recovered water?

☐ ***Recycled flow rate*** _____ gallons per day

☐ Not sure, ***rough estimate*** _____ gallons per day
☐ 0-10% of wastewater flow
☐ 11-30% of wastewater flow
☐ 31-50% of wastewater flow
☐ 51-70% of wastewater flow
☐ 71-90% of wastewater flow
☐ 91-100% of wastewater flow
☐ Don't know

OR

_____ gallons per minute for _____ hours per day

6. Does your wastewater recovery system feature heat recovery?

☐ Yes
☐ No
☐ Don't know

<If yes>

7. What is the estimated heat recovery rate from your wastewater?

_____ Btu/hr

☐ Don't know

8. Please briefly describe what the recycled water is used for:

_____

_____

9. When was this plant's water recovery and reuse system installed?

- ☐ Month (if available): _____ Year: _____
- ☐ Within the last year
- ☐ 1 to 2 years ago
- ☐ 2 to 10 years ago
- ☐ Over 10 years ago
- ☐ Not sure

10. About how much did the water recovery and reuse system cost to buy and install?

$_____ ☐ Not sure, this is a rough estimate

☐ Don't know

11. What company sold your firm the system that was installed? Where are they based?

_____

12. What is the total cost savings associated with the installation of the water recovery and reuse system? This includes energy, water, operational, and regulatory cost savings.

- ☐ Measured and verified at $_____per year
- ☐ Estimated at $_____per year (by facilities staff or by vendor)
- ☐ Don't know
- ☐ Decline to state

13. Who initiated the idea to install your water re-use equipment?

- ☐ We initiated idea and sought suppliers
- ☐ Supplier's representatives approached us
- ☐ Corporate or other central planning entity directed us to install or consider installing.
- ☐ Other, explain _____
- ☐ Don't know

14. Who in your firm decided on the design of the water re-use system ?

- ☐ Operator of the process
- ☐ Plant engineer
- ☐ Plant maintenance
- ☐ Plant Manager
- ☐ Other – please specify_____

☐ Don't know

15. Who in your firm made the final decision to purchase the water re-use system?

- ☐ Plant Manager
- ☐ Corporate Manager
- ☐ Plant engineer
- ☐ Purchasing Dept
- ☐ Other – please specify _____

☐ Don't know

16. Why was the water re-use system installed? *Check all that apply.*

- ☐ Lack of available water supply
- ☐ High wastewater treatment costs
- ☐ Local wastewater treatment facility out of capacity
- ☐ Lack of local wastewater treatment facility
- ☐ Energy costs
- ☐ Energy supply concerns
- ☐ Environmental concern
- ☐ Other(s) ***describe:***

_____

_____

☐ Don't know

<If more than one box checked in previous question>

17. Was one of those reasons more important than the rest, and if so, which one?

- ☐ None most important.
- ☐ Lack of available water supply
- ☐ High wastewater treatment costs
- ☐ Local wastewater treatment facility out of capacity
- ☐ Lack of local wastewater treatment facility
- ☐ Energy costs
- ☐ Energy supply concerns
- ☐ Environmental concern
- ☐ Other(s) ***describe:***

_____

_____

- ☐ Don't know

<If "Energy costs" checked in either of previous 2 questions.>

18. Are you realizing the energy cost savings originally envisioned when you installed your water reuse system?

- ☐ Yes – saving more than expected
- ☐ Yes – savings meet expectations
- ☐ No – savings fall short of expectations
- ☐ No – savings fall far short of expectations
- ☐ Don't know – did not install water re-use system for energy savings purposes
- ☐ Don't know – no reliable way to tell energy savings.
- ☐ Don't know – don't know what original expectations were.
- ☐ Other - explain***:***

_____

_____

POWER GENERATION

Power generation refers to equipment on-site that generates electricity for use elsewhere in the facility. The source of energy can be fossil fuel, solar cells or other renewable sources, fuel cells, cogeneration, or batteries that store energy. Power generation does not include wires, transformers, or other distribution equipment.

1. Do you have a back-up power supply as an ***emergency*** source of electricity?

   ☐ Yes
   ☐ No
   ☐ Don't know

<If yes>

2. What type is it? *Check all that apply.*

   ☐ Uninterruptible power supply (UPS) or other battery storage
   ☐ Gas engine
   ☐ Diesel engine
   ☐ Gas turbine
   ☐ Steam turbine
   ☐ Fuel cell
   ☐ Renewable, such as wind or solar
   ☐ Other _____

   ☐ Don't know

<If other than UPS>

3. How big is it, in kW?

   _____ kW ☐ Not sure, this is a rough estimate

   ☐ Don't know

4. Do you have a power supply that you use ***regularly*** to generate electricity?
   Do not count UPS for this question.

   ☐ Yes
   ☐ No – *Skip rest of Power Generation.*
   ☐ Don't know – *Skip rest of Power Generation.*

5. What is the source of energy?
Check all that apply.

- ☐ Gas engine
- ☐ Diesel engine
- ☐ Gas turbine
- ☐ Steam turbine
- ☐ Fuel cell
- ☐ Renewable, such as wind or solar
- ☐ Other _____

☐ Don't know

6. Was the power generation capacity installed within the last 2 years?

- ☐ Yes
- ☐ No
- ☐ Don't know

7. Do you use the energy source to simultaneously generate thermal energy used at the plant (cogeneration)?

- ☐ Yes
- ☐ No
- ☐ Don't know

8. How big is the plant, in kW?

_____ kW ☐ Not sure, this is a rough estimate

☐ Don't know

9. How many hours per week would you estimate the generation or cogeneration plant runs, on average?

_____ hr/wk (1 to 168) ☐ Not sure, this is a rough estimate

☐ Don't know

<If not 168 hours per week>

10. Do you use the system specifically for "peak shaving," to reduce your monthly electric utility demand charge? *<If the respondent needs a definition: Peak shaving is the practice of reducing electrical load at the facility for the express purpose of lowering facility's monthly maximum billed demand (kW). Energy savings is not the goal, although savings may occur.>*

    ☐ Yes
    ☐ No
    ☐ Don't know

11. Are you **currently planning** to install additional generation capacity?

    ☐ Yes
    ☐ No

12. If yes to the previous question, how much are you planning to install and when?

    _____ kW Month/Year_____

GLOSSARY - REFRIGERATION

Refrigeration
For the purpose of this survey, refrigeration is defined as any mechanical cooling system 20 horsepower or over with a primary purpose other than air conditioning for human comfort. Skip this section if the facility is not primarily in the business of food processing (SIC 20).

Floating Head Control
Compressors run more efficiently when the refrigerant pressure and temperature leaving the compressor and entering in the condenser is as low as possible. When very hot outside this is not possible but during moderate weather lowering discharge pressure is an option on some types of systems. Floating head pressure controls such as liquid pumps and electronically controlled expansion valves allows the discharge pressure to drop significantly lower than without such controls.

Halocarbon
A class of refrigerant. A halocarbon is a halogenated hydrocarbon (compound containing only the elements hydrogen and carbon) containing one or more of the three halogens: fluorine, chlorine, and bromine. Hydrogen may or may not be present (EPA definition).

Heat Recovery
Heat recovery means capturing and reusing otherwise wasted heat from the discharge line or compressor heads, for example. Liquid to suction heat exchangers are not considered heat recovery.

REFRIGERATION

1. Is this facility primarily in the business of food processing (SIC 20)?

   ☐ Yes
   ☐ No -- *Skip Refrigeration section.*

2. Do you have any refrigeration systems sized 20 hp or greater, at your facility?

   ☐ Yes
   ☐ No – *Skip Refrigeration section.*

For the purposes of this survey, refrigeration is defined as any mechanical cooling system 20 horsepower or over with a primary purpose other than air conditioning for human comfort.

HEAT RECOVERY SYSTEMS

3. Was a refrigeration heat recovery system purchased for this plant in the last 5 years?

   ☐ Yes. What year was the last purchase? _____
   ☐ No
   ☐ Don't know *<Skip to Floating Head Control, at Q10.>*

<If no>

4. Was a refrigeration heat recovery system considered for this plant in the last 5 years?

   ☐ Yes. What year was the last consideration?_____
   ☐ No *<Skip to Floating Head Control, at Q10.>*
   ☐ Don't know *<Skip to Floating Head Control, at Q10.>*

5. What factors affected the decision regarding purchase?
<Check all that apply. Do NOT prompt with items from the list.>

Pros		Q6 check box
☐	Energy cost savings	☐
☐	Maintenance or other cost savings	☐
☐	Increased system capacity	☐
☐	Improved reliability	☐

Cons		
☐	Long delivery time	☐
☐	Increased maintenance or other costs	☐
☐	Decreased equipment reliability	☐
☐	Capital cost too high	☐
☐	Payback too long/savings too low/rate of return too low	☐
☐	Recovered heat not hot enough	☐
☐	Physical restrictions of the plant	☐
☐	No application for recovered heat	☐
☐	Restricts use of floating head	☐

Other		
☐	Expertise of maintenance staff	☐
☐	Environmental compliance concerns	☐
☐	It was included in the refrigeration system we bought	☐
☐	Corporate policy	☐
☐	Other:	☐

_____

_____

☐ Don't know

<If more than one answer given>

6. Was one of the reasons most important? *<Check corresponding box to right above if so.>*

7. The heat recovery was:

☐ An original design component
☐ Added (or to be added) at a later date
☐ Don't know

8. Which of the following best describes how the recovered heat is (or would have been) used?

☐ To heat domestic hot water
☐ To heat air for human comfort
☐ To defrost refrigeration coils
☐ To preheat make-up water
☐ Other ***describe***_____

☐ Don't know

9. About how much did (or would have) the heat recovery equipment cost? Include installation costs if it would have been a retrofit.

$_____ ☐ Not sure, this is a rough estimate

☐ Don't know

FLOATING HEAD CONTROL

10. Has this plant purchased floating head control for any of its refrigeration systems within the last 5 years? For the purposes of this survey, condensing temperatures must be allowed to float below 80°F to be considered.

☐ Yes. What year was the last purchase? _____
☐ No
☐ Don't know *<Skip to Ammonia, at Q15.>*

<If no>

11. Has this plant considered purchasing floating head control in the last five years?

☐ Yes. What year was the last consideration? _____
☐ No *<Skip to Ammonia, at Q15.>*
☐ Don't know *<Skip to Ammonia, at Q15.>*

12. What factors affected the decision regarding purchase?
<Check all that apply. Do NOT prompt with items from the list.>

Pros		Q13 check box
☐	Energy cost savings	☐
☐	Maintenance or other cost savings	☐
☐	Increased system capacity	☐
☐	Improved reliability	☐

Cons		
☐	Long delivery time	☐
☐	Increased maintenance or other costs	☐
☐	Decreased equipment reliability	☐
☐	Capital cost too high	☐
☐	Payback too long/savings too low/rate of return too low	☐
☐	System's expansion device will not allow use	☐
☐	Problems with oil return	☐
☐	Incompatible with heat recovery	☐
☐	Incompatibility with compressor	☐

Other		
☐	Expertise of maintenance staff	☐
☐	Environmental compliance concerns	☐
☐	It was included in the refrigeration system we bought	☐
☐	Corporate policy	☐
☐	Other:	☐

_____

_____

☐ Don't know

<If more than one answer given>
13. Was one of the reasons most important? *<Check appropriate box to right above if so.>*

14. About how much did (or would have) the floating head control equipment cost? Include installation costs if it would have been a retrofit.

$_____ ☐ Not sure, this is a rough estimate

☐ Don't know

AMMONIA REFRIGERATION

15. Was an ammonia-based refrigeration system purchased for this plant in the last 5 years?

☐ Yes. What year was the last installation? _____
☐ No
☐ Don't know *<Skip to VSDs, at Q20>*.

<If no>

16. Was an ammonia-based refrigeration system considered for this plant in the last 5 years?

☐ Yes. What year was the last consideration? _____
☐ No *<Skip to VSDs, at Q20>*.
☐ Don't know *<Skip to VSDs, at Q20>*.

17. What factors affected your decision regarding purchase?
<Check all that apply. Do NOT prompt with items from the list.>

Pros	Q18 check box
☐ Energy cost savings	☐
☐ Maintenance or other cost savings	☐
☐ Increased system capacity	☐
☐ Improved reliability	☐
Cons	
☐ Long delivery time	☐
☐ Increased maintenance or other costs	☐
☐ Decreased equipment reliability	☐
☐ Capital cost too high	☐
☐ Payback too long/savings too low/rate of return too low	☐
Other	
☐ Expertise of maintenance staff	☐
☐ Environmental compliance concerns	☐
☐ It was included in the refrigeration system we bought	☐
☐ Corporate policy	☐
☐ Other:	☐

_____

_____

☐ Don't know

<If more than one answer given>

18. Was one of the reasons most important? *<Check appropriate box to right above if so>*

19. About how much did (or would have) the ammonia system or conversion process cost?

$_____ ☐ Not sure, this is a rough estimate

☐ Don't know

VARIABLE SPEED COOLING TOWER FANS

20. Has your plant purchased variable speed controls for any of the refrigeration system cooling towers in the last 5 years?

☐ Yes. What year was the last purchase? _____
☐ No
☐ Don't know *<Skip to Capacities section, at Q25.>*

<If no>

21. Has your plant considered variable speed controls for refrigeration system cooling towers in the last five years?

☐ Yes. What year was the last consideration? _____
☐ No *<Skip to Capacities section, at Q25.>*
☐ Don't know *<Skip to Capacities section, at Q25.>*

22. What factors affected the decision regarding purchase?
<Check all that apply. Do NOT prompt with items from the list.>

Pros		Q23 check box
☐	Energy cost savings	☐
☐	Maintenance or other cost savings	☐
☐	Increased system capacity	☐
☐	Improved reliability	☐
Cons		
☐	Long delivery time	☐
☐	Increased maintenance or other costs	☐
☐	Decreased equipment reliability	☐
☐	Capital cost too high	☐
☐	Payback too long/savings too low/rate of return too low	☐
Other		
☐	Expertise of maintenance staff	☐
☐	Environmental compliance concerns	☐
☐	It was included in the refrigeration system we bought	☐
☐	Corporate policy	☐
☐	Other:	☐

_____

_____

☐ Don't know

<If more than one answer given>
23. Was one of the reasons most important? *<Check appropriate box to right above if so.>*

24. About how much did the variable speed control cost?

$_____ ☐ Not sure, this is a rough estimate

☐ Don't know

REFRIGERATION SYSTEM CAPACITIES

Please list total hp of each of the following refrigeration systems. If not applicable, put NA. Ranges are acceptable. (Note-if you use process chillers, please list the capacity in tons.)

25. Total refrigeration at facility _____ hp

26. Refrigeration with heat recovery _____ hp

27. Refrigeration with floating head control _____ hp

28. Ammonia refrigeration _____ hp

29. Screw compressor capacity _____ hp

30. Screw compressor w/ VSD _____ hp

31. Cooling tower fan total power _____ hp

32. Cooling tower fans w/ VSD _____ hp

33. For any major changes or redesigns to your process refrigeration, who performs the engineering work?

- ☐ Done in-house
- ☐ Done by contracted refrigeration consultant
- ☐ Done by refrigeration equipment manufacturer's representative
- ☐ Done by local mechanical contractor
- ☐ Don't know

CLOSING

1. As a token of thanks, we could benchmark your energy use per dollar value of your output as compared to your peers. Would you like us to do that?

   ☐ Yes *<Q2 – Q5 are for benchmarking.>*
   ☐ No *<Skip to Q6.>*

2. What was this site's approximate sales volume in dollars for the year 2000?

   $ _____

   <Skip if answer given in General Section.>
3. What was your site's electrical consumption during that time period? *<If unknown, ask if may use utility data.>*

   _____ ☐ May use utility data

4. What was your site's energy consumption from fuel sources other than electricity for that time? *<Any units, e.g. BTU or therms are fine.>*

   _____

5. What was the approximate dollar value of raw materials, not including manufacturing equipment, that was used to produce goods at this site during that same period? *<This is useful for benchmarking.>*

   $ _____

6. Would you like a copy of the final report on the findings of the study? (This is a report we're delivering to the CEC summarizing the findings for all the customers. It is likely to be a large document.)

   ☐ Yes
   ☐ No

7. Would you like a copy of your filled-out questionnaire?

   ☐ Yes
   ☐ No

Please offer to give them the "thank-you" disk if you haven't already.

Thank you for taking the time to answer these questions. Now I would like to record your electric meter information and perform the motor nameplate data collection I mentioned earlier. Could you please show me where the meters are?

ELECTRIC METER INFORMATION

Electric Meter No.	Street Address(es) Served	Buildings and Processes Served	Percent of Metered Electricity Used by Establishment *(rough estimate okay)*

NOTE: We need meter numbers for all meters that track kWh only. If there are separate meters for kW and power factor and you cannot tell which meters measure what, note all questionable meter numbers on the same row and we will sort them out later.

Appendix: Example of random motor selection procedure: