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ABSTRACT

Lesson plans and student handouts for a course dealing with conserving energy in food service operations comprise this publication. The course is intended for all persons involved in the preparation of food in public and commercial institutions. By using the strategies discussed, participants should be able to analyze energy usage, identify appropriate conservation measures, and design an energy management plan. The first ten of the course's 20 one-hour lessons provide an overview of energy conservation in food service operations while the latter ten lessons are designed to instruct food service managers in energy conservation analysis, monitoring and management. Lesson plans list learning outcomes, needed supplies, resource materials, procedure, and pre-class assignments. (Author/WB)

Instructor's Guide

ENERGY CONSERVATION IN FOODSERVICE

A Course for Foodservice Personnel

Developed By

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for

Energy Conservation Curriculum and Short Course Project #8208
Program Development Section, North Carolina Dept. of Community Colleges

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FOREWORD

This instructional manual was prepared by the Department of Community Colleges as a part of its plan to provide courses on energy conservation in areas where a savings in energy usage can be effected through education and training. The manual provides instructional material to teach energy conservation in foodservice operations to all personnel involved in the preparation of food in public and commercial institutions. Using the techniques presented in this manual, foodservice personnel will be able to analyze energy usage in their particular foodservice operations, identify conservation techniques and design a plan for energy management. The concerted and widespread use of such plans of energy management can result in a significant conservation of energy. This manual is addressed to that goal of energy conservation in the area of foodservice operation.

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CONTENTS

TABLE OF CONTENTS (CON'T)

INTRODUCTION

This instructor's manual for energy conservation in foodservice has been designed to present suggestions for the development of effective participative learning strategies. The program should not be viewed as a mandatory or prescriptive guide, but as an aid. The teacher should feel free to draw upon his or her own experiences and resources. It is recommended that examples be used throughout the course from the teacher's own experiences to the extent possible.

There are twenty, one-hour lessons. The first ten lessons are designed for all foodservice employees and managers. These ten lessons should be a prerequisite for Lessons 11 through 20. The instructor's guides for Lessons 1 through 10 are designed to create practical learning situations that emphasize energy conservation steps that can be applied by everyone who works in foodservice. The second ten lessons are designed for foodservice managers. These ten lessons should be taken after successful completion of Lessons 1 through 10. The instructor's guides for Lessons 11 through 20 are designed to emphasize analysis of foodservice operations and energy practices and lead up to a system for monitoring energy costs and a plan for effectively managing energy conservation.

Each lesson includes an instructional guide that contains the learning outcome of the lesson; equipment and supplies needed, if any; resources that the teacher should study to prepare for the class; and class instruction on what to do, how to do it, and any important information the teacher may need to know.

It is suggested in the opening class that the instructor determine what type of students are enrolled, their occupations, why they are taking the course, what they hope to gain from the course, and how much they already

know about energy conservation. The first class meeting should be used to become familiar with the class and to set the tone for a high level of participation by the students.

After determining the number of students in the class, all materials located in Appendix A, pre-class assignments, handouts and post tests, should be copied. By preparing all handouts in advance, the teacher will not only save time but find it easier and more convenient. Missing an assignment due to lack of time later in the course will also be avoided. It would be advisable to study all recommended resources (trade magazines, text materials, e.g., Resource #54, etc.) in advance of each lesson to insure the success of that lesson.

This course was designed to reduce the amount of lecturing the instructor would do in order to create a more participative classroom. Research indicates that students find discussion oriented classes more enjoyable and learn more since information is shared and directed toward their personal needs.

There are several ways a teacher may use this program to facilitate student participation. One suggested method is having students complete assignments (found in Appendix A) prior to class meetings. This will prepare the students for questions that can be asked of them in class. The instructor can follow suggestions on what to do, found in column one of the instructor's guide and how to do it, column two. Column three contains ideas, in brief, that the instructor should see are brought out in class discussion. The teacher should be sure to read resources suggested for content information. The resources are clearly identified in Appendix B and numbered for easy reference in the instructor's guides.

Part I

INTRODUCTION TO ENERGY CONSERVATION IN FOODSERVICE

Instructor's Guide

LESSON 1: Introduction to Energy Conservation in Foodservices

Learning Outcome: The ability to identify and discuss the need for energy conservation in foodservice operations.

Equipment and Supplies: Chalkboard and chalk, Pre-Class Assignment for Lesson 2

Resources: 54 (pages 1-3)

What to Do	How to do It	Remarks
Before class		
Before class begins, place on chalkboard the yearly energy usage and cost for five types of foodservice operations.	The chart can be found on page 2 of Resource 54.	Explain to the class that the survey is now outdated and with inflation the cost of energy is even higher.
	Review the purpose of the course and how the course will be structured. Review the different elements of the course: a) Pre-Class Assignments b) Class participation	

What to Do	How to do It	Remarks
20 min.		
Familiarize yourself with the class and vice versa.	Tell the class about yourself--name, education, occupation, experience, how you came to be teaching the course, etc. Find out what types of students are enrolled by asking their occupations, why they are there, what they hope to gain from the course, and how much they already know about energy conservation, etc.	The more you are able to get students to tell about themselves in their introductions, the more they will be willing to open up and participate later in the course. Do not rush through this "get acquainted" session. It will establish the learning climate for the entire course.
20 min.		
Give some basic information on energy conservation in foodservice operations.	Discuss the information contained in Resource 54, pp. 1-3. You can always ask students if they are also aware of the implications of energy conservation by asking questions like "Has anyone had any problem purchasing natural gas?" or "What was the price of gasoline the last time you purchased gas?" These questions will develop participation and add realism to the points you are about to cover.	Bring out the following key points: a. rising fuel prices b. shortages of propane and natural gas c. % of energy consumed by foodservice operations d. energy was once inexpensive and unlimited e. types of equipment that use most of the energy in foodservice operations f. foodservice equipment can be wasteful if not controlled.

What to Do	How to do It	Remarks
(Con't)		While discussing these key points with the class, generate further discussion by asking the class to acknowledge if they are also aware of these facts.
10 min.		
Find out if there are any questions.	Generate a discussion on the material if you have not already done so while discussing information above. Some may have further questions about the course.	
5 min.		
Give homework assignment.	Pass out Pre-Class Assignment for Lesson 2. This can be found in Appendix A. Review the assignment and make sure the students understand the elements of the assignment and the purpose of the assignment.	Allow time for questions and inform the class that they will be called on in the next class meeting concerning Pre-Class Assignment for Lesson 2.

LESSON 2: Food Preparation and Storage

Learning Outcome: The ability to identify and explain general energy conservation principles in the foodservice industry.

Equipment and Supplies: Pre-Class Assignment for Lesson 3

Resources: 54 (pages 11-12), 1, 2, 4, 6, 12, 38; 42; 43; 46; 47; 49

What to Do	How to do It	Remarks
Before class		
Before class begins, choose students to answer questions and fill in their names in the 2nd column. Also choose an alternate student in case of absentee or for another opinion.	Use rollbook to choose names.	This would not only enable you to learn the names and faces of your students, but also increase the likelihood of student participation.
5 min.		
Administration		
50 min.		
Lead a discussion of ways to conserve energy. Try to restrict discussion on each subject to 7 minutes in order to cover each area.	Ask (Name)_____ (Alternate)_____ What are advantages of cooking food in volume, and how is it done in your unit?	Try to bring out the elements of partially precooking, freezing, loading ovens to capacity, planning production, and keeping hot equipment in use.

What to Do	How to do It	Remarks
(Con't)	Ask (N)_____ (A)_____ What might be some disadvantages for cooking in volume?	No good for delicate foods. Okay for: pies and cakes, hard boiled eggs, to some degree, hamburger patties, and chicken. Not suitable for: eggs (fried or scrambled), pancakes, steak, fried potatoes.
	Ask (N)_____ (A)_____ Name some foods that can be cooked in volume and some that might cause problems if cooked in volume.	
	Ask (N)_____ (A)_____ What are the advantages of cooking foods at lower temperatures?	Less expenditure of energy, reduce shrinkage of meats, less heat loss. In a convection oven foods will cook just as fast as in a regular oven but at a lower temperature. Cooking slowly prevents meat from shrinking and gives it an improved color while retaining more nutrients. Lower temperatures, while taking foods longer to cook in regular ovens, use less energy since less heat is lost to surrounding air.

What to Do	How to do It	Remarks
(Con't)	Ask (N)_____ (A)_____ Name three pieces of cooking equipment used in their unit. How long does it take to preheat these pieces of equipment?	Try to cover the monitoring of preheat times and cooking temperatures, preheat just before use, turning off or reducing equipment when not in use. Not preheating at a higher temperature than necessary. Some common preheating times: a. electric fryers 5-6 min. b. beck ovens 20-30 min. c. electric griddles 7-12 min. d. 2-pan bake ovens 30-40 min. (450°) e. convection ovens 9-10 min. (450°) f. hot plate 12 min. (400°) g. french plate 30 min. (960°) h. pizza oven 45 min. i. broilers 5-10 min. Also, preheating times are generally indicated in the operator's manual for that piece of equipment.
	Ask (N)_____ (A)_____ When cooking in succession (one item following another) should the item requiring the lowest temperature be cooked first or last?	First--decrease operating time.

What to Do	How to do It	Remarks
(Con't)	Ask (N)_____ (A)_____ What types of maintenance checks are made by you or other employees on the equipment at your operation?	Indicator lamps, heating elements, doors of oven and refrigerator, capillary tubes, thermostat bulbs, cleanliness, and records maintained.
5 min.		
Finish discussing any area not completely covered. Find out if there are any other questions about the discussion or about assignments. Hand out Pre-Class Assignment for Lesson 3.	Go over assignment and clear up any questions.	

LESSON 3: Rangetops, Griddles and Broilers

Learning Outcome: The ability to describe and explain the operation and maintenance of rangetops, griddles and broilers for conserving energy.

Equipment and Supplies: Pre-Class Assignment for Lesson 4

Resources: 54 (pages 13-16); 55 (pages 1-8); 56 (pages 42-43, 33-35, 14, 15); 1; 2; 4; 6; 7; 11; 12; 13; 14; 15; 29; 38

What to Do	How to do It	Remarks
5 min.		
Administration		
5 min.		
Show examples of common range types: (a) open top, (b) closed or solid top, (c) griddle or fry top, and (d) broiler.	Use pictures located in Resource 54, p. 13-16 to identify range types.	Mention that all these pieces of equipment run off either gas or electricity and in case of char-broilers--coals.
15 min.		
Divide the class into four groups. Have each group discuss among themselves a selected piece of equipment which you verbally give them (open top ranges, closed top, griddles or fry tops, and broilers).	Limit groups to six students each. Tell each group to choose a spokesman who will then tell the rest of the class how the particular piece of equipment operates, how to keep it clean (gas or electric) and some ways of conserving energy when using that piece of equipment.	This activity is designed to develop group participation and encourage students to share their findings with one another.

What to Do	How to do It	Remarks
30 min.		
Have each spokesman speak for five or six minutes. Allow the rest of the class to ask questions or add to what each spokesman reported.	After each spokesman has finished, question the class for additional ideas on their findings (operation or cleaning) or other ideas on conserving energy.	Bring out the differences of each piece of equipment based on whether it is run on gas or electricity. Determine what material and cleansers they are using and comment on advantages or disadvantages: whether the piece of equipment should be warm or cold when cleaned, what parts of the equipment should be cleaned and when, ways to make clean up easier. On conserving energy, lead a discussion about the color of the flame on gas burners and how that is important, the importance of reducing the amount of area or sections to be heated, covering utensils with lids, cooking at lowest temperatures, preheating equipment just before use, turning down temperatures, turning equipment off before removing utensils, setting griddle temperature lower when preheating.

What to Do	How to do It	Remarks
5 min.		
Hand out Pre-Class Assignment for Lesson 4.	Review requirements of Pre-Class Assignment for Lesson 4 that can be found in Appendix A. Review and answer any questions.	

LESSON 4: Ovens

Learning Outcome: The ability to describe and explain the operation and maintenance requirements of ovens for energy conservation.

Equipment and Supplies: Pre-Class Assignment for Lesson 5, chalk and chalkboard

Resources: 54 (pages 17-19); 55 (pages 28-68); 56 (pages 39-42). If using opaque projector: 1; 2; 4; 6; 9; 11; 12; 14; 15; 21; 29; 33; 38

What to Do	How to do It	Remarks
5 min.		
Administration		
30 min.		
Show examples of ovens and discuss the different types of ovens.	Use pictures located in Resource 54, pp. 17-19. After going through pictures once, go back through them getting volunteers to give advantages of each oven over the other types of ovens. Discuss how energy can be conserved when using each type of oven, ways they clean that particular oven in their operation, and foods that can be cooked in that oven. Find out how long different foods are cooked in different ovens and what difference this makes in conserving	In this discussion the instructor should see that the importance of checking doors and gaskets is brought out. Discuss the need for proper placement of pans in a convection oven allowing air to circulate and the importance of checking to see if the thermostat is calibrated correctly. Discuss avoiding use of caustic cleansers that may remove the wall coating which decreases the ability of the oven walls to reflect heat, so that walls

What to Do	How to do It	Remarks
(Con't)	energy. The teacher may want to make a chart of baking and roasting times on the chalkboard as the students give the information, making it easier to talk about it as questions come up or to refer back to during the discussion.	may radiate heat more efficiently. Discuss the value of timers in avoiding opening the oven and expending heat.
10 min.		
Find out the average time required to preheat different types of ovens.	Ask students to give you the amount of time it takes to preheat their different ovens and record the figures on the board. Sum the preheat times of each separate type of oven, dividing this number by the number of preheating times given. Ask students why the preheat time might vary within each type and with one type compared to another.	Bring out the following concepts: 1) some ovens heat faster 2) microwave ovens require no preheating (How is that an advantage?) 3) gas ovens might vary because they are not calibrated 4) the wastefulness of preheating ovens for longer than necessary.
5 to 7 min.		
Go over any additional questions from the homework assignment which the students may ask.	Ask if there are any questions about the homework assignment. If so, try to get other students to answer the questions before you try.	At this point in the course seek out the answer to some questions by listening to the question and asking a student: "Is there anyone who thinks they can share

What to Do	How to do It	Remarks
(Con't)		information about that question?" This should be attempted before trying to answer all questions yourself. If you allow a student to answer a question and the answer is not quite correct, thank the student for the correct information offered, qualify the incorrect answer, and if time allows, seek out another student's response.
3 to 5 min.		
Hand out Pre-Class Assignment for Lesson 5.	Give them a chance to look over assignment and be sure they understand the elements of the assignment.	

LESSON 5: Fryers

Learning Outcome: The ability to describe and explain the efficient operation and maintenance of fryers.

Equipment and Supplies: Pre-Class Assignment for Lesson 6, chalk and chalkboard

Resources: 54 (pages 20-21); 55 (pages 81-93); 56 (pages 25-33). If using opaque projector: 1; 2; 4; 6; 10; 12; 13; 14; 15; 18; 29; 38

What to Do	How to do It	Remarks
5 min.		
Administration		
25 min.		
Show pictures of fryers and discuss how energy can be conserved through proper operation and maintenance.	Using the pictures of a deep fat fryer, pressure fryer, and tilting fry pan or skillet located in Resource 54, pp. 20-21, initiate a discussion by asking students what types of food items can be cooked in these types of fryers. Include a discussion of preheating times, cleaning of fryers, cutting the temperature down when not in use, not overloading baskets, salting or breading, filtering oil, overheating or smoking oil, the breakdown of oil, calibrating thermostat, thawing foods before frying, and the breakup of oil by water.	As you generate discussion on each of these areas, allow the students to determine the recommended principle concerning that area.

What to Do	How to do It	Remarks
20 min.		
Have several students discuss their findings on the comparison of cooking french fries in a deep fat fryer asked for in the Pre-Class Assignment for Lesson 5.	Choose four or five volunteers to discuss the comparison of how their operation cooks french fries as compared with other foodservice operations.	Make sure they bring out the following comparisons: preheating times, whether french fries are thawed and drained before cooking, the amount of time they are cooked, how the oil is filtered and how frequently, how often oil is added and the amount, the temperature at which french fries are fried and which fries taste better. You can conclude each segment by asking (if it hasn't been identified already) "What are the advantages of doing that?"
5 min.		
Discuss any questions from homework assignment.	Ask for questions concerning homework assignment, allowing students in class to have the opportunity to answer them.	
5 min.		
Hand out Pre-Class Assignment for Lesson 6.	Review requirements of assignment and ask for questions.	

LESSON 6: Steam Cooking and Holding

Learning Outcome: The ability to describe the use of steam-operated equipment for energy conservation.

Equipment and Supplies: Pre-Class Assignment for Lesson 7.

Resources: 54 (pages 22-24); 55 (pages 9-27); 56 (pages 45-49). If using opaque projector: 1; 2; 4; 6; 8; 11; 12; 13; 14; 15; 17; 21; 38

What to Do	How to do It	Remarks
5 min. Administration		
45 min. Lead a discussion on the use of steam as a method for cooking foods and a way of conserving energy.	Ask the class how many of them use steam cooking equipment. Show types of steam-operated equipment from Resource 54, pp. 22-24. Identify students from the class who have this equipment in their operation and ask what types of foods are cooked with it, how it is cleaned and how long it takes to preheat the equipment. Students should be able to suggest why steam would be a better method for cooking some foods and why they would conserve energy by using it.	Material which needs to be brought out includes preheating just before use, checking calibration of thermostats; checking for leaks in steam-lines; checking gaskets and doors for leaks, tightness and cleanliness; turning down or off equipment when not in use; leaving door open when not in use; lengthening gasket life. Steam cooking conserves energy by reducing cocking times through faster heat transfer, thus reducing cooling and ventilating costs since there is

What to Do	How to do It	Remarks
(Con't)		less radiated heat. To use residual heat to cook food, cover steam-jacket kettle with lid when cooking. Turn down steam tables when you spot clouds of steam rising.
5 min.		
Answer and discuss questions from assignment.	Ask if there are any other questions about homework assignment. See if other students can answer questions before trying.	
5 min.		
Pass out Pre-Class Assignment for Lesson 7.	Review and answer any questions.	

LESSON 7: Refrigerators, Freezers, and Ice Machines

Learning Outcome: The ability to discuss the operation and maintenance of refrigerators, freezers, and ice machines for conserving energy.

Equipment and Supplies: Pre-Class Assignment for Lesson 8.

Resources: 54 (pages 25-26); 55 (pages 211-246); 1; 2; 4; 6; 11; 12; 13; 14; 15; 19; 21; 28; 30; 31; 38; 43

What to Do	How to do It	Remarks
Before class		
Prepare for class.	Go through your rollbook and choose students to ask questions and fill in the blanks below.	
5 min.		
Administration.		
45 min.		
Lead a discussion of ways to conserve energy through the efficient operation and maintenance of refrigerators, freezers and ice machines, after you review the pictures of these pieces of equipment found in Resource 54, pp. 25-26.	Ask (N)_____ (A)_____ How can you reduce the time refrigerator and freezer doors are open?	Plan trips so that all items are removed at one time.

What to Do	How to do It	Remarks
(Con't)	Ask (N)_____ (A)_____ How does keeping refrigerators and freezers full conserve energy?	The appliances use more energy when not full since it is harder to keep air cold than chilled food or liquids. Also there is less room for hot air to enter when it is full.
	Ask (N)_____ (A)_____ Why is it not a good idea to place hot foods directly into a refrigerator or freezer?	It makes the appliance work harder and expends more energy than is necessary.
	Ask (N)_____ (A)_____ Why should you thaw frozen items in your refrigerator?	Besides nutritional reasons, it helps the refrigerator by helping it cool itself so it need not work as hard removing hot air.
	Ask (N)_____ (A)_____ At what temperatures should refrigerators and freezers be maintained?	Refrigerators - 38 to 40°F Freezers - 0°F
	Ask (N)_____ (A)_____ Why should the level of the refrigerator and freezer be slanted slightly backwards?	This will cause the door to automatically close after being opened and help insure a tighter fit while the door is closed.

What to Do	How to do It	Remarks
(Con't)	Ask (N)_____ (A)_____ What are some other considerations which have not been mentioned that should be checked to maintain refrigerators or freezers? You should ask volunteers for other responses.	Gaskets should be checked for wear and damage; check to see that lights are not left on in walk-in freezers, check temperatures. Check to see that the space within a few feet of the compressor is clear in order to avoid blocking the removal of hot air. Check for cold spots on the outside walls. Check belts of compressor for wear and tightness; check to see if any cold air is leaking from the doors of freezers or refrigerators. Check for interior cleanliness, cleanliness of condenser fins and plates; cleanliness of gaskets, and vacuum coils. If manually defrosted, then do it regularly. Do not allow ice to build up causing units to work harder. See that hinges and latches are lubricated once a month with food grade oil.
	Ask (N)_____ (A)_____ How far from a wall should an air-cooled ice maker be placed to allow needed air to cool the motor and compressor? How far is your ice maker from the wall?	At least six inches.

What to Do	How to do It	Remarks
(Con't)	Ask (N)_____ (A)_____ What other suggestions can you make to maintain ice machines?	The condenser coil should be cleaned once a week; clean incoming water filter once a month; check to see that the float level of water is correct; check to see fans are aligned and oiled.
	Ask (N)_____ (A)_____ Name ways of conserving energy when using the refrigerator, freezer, or ice machine.	One way to conserve energy in all three appliances is to keep the door or lid closed as much as possible.
5 min.		
Go over any questions from homework assignment.	Ask for other questions from homework assignment, allowing other students to have the first chance in answering.	
5 min.		
Hand out Pre-Class Assignment for Lesson 8.	After passing out copies of assignment, allow them to read it over and see if there are any questions.	

LESSON 8: Dishwashers or Warewashers

Learning Outcome: The ability to identify and describe principles of energy conservation regarding the use and maintenance of dishwashers and warewashers.

Equipment and Supplies: Pre-Class Assignment for Lesson 9, Lesson 8 Handout: Recommended Warewashing Procedu

Resources: 54 (pages 64-65); 1; 2; 4; 6; 12; 14; 22; 24; 29; 38; 53

What to Do	How to do It	Remarks
5 min.		
Administration		
8 min.		
Give each student a copy of the handout. Mentally compare recommended procedures with actual procedures.	Allow each student to review the handout and note where their system differs from the recommended warewashing procedures.	
20 min.		
Discuss handout. Discuss the differences between recommended procedures and actual procedures followed by the students. Relate these differences to energy conservation.	Find out if there are any questions about the handout. Then ask students for procedural differences in their own dishwashing operation and cleaning from the steps described in the handout. Discuss what these differences mean as far as expenditure of energy is concerned.	Remember to refer back to the assignment questions as backup for further questions. You may want to ask the class or a particular student to answer specific questions.

What to Do	How to do It	Remarks
15 min.		
Initiate a discussion on energy conservation through efficient use and maintenance of dishwashers.	Ask the class how many use a decoy system to organize their work (stacking dishes, glasses, etc.) in separate areas before washing. If not, what method do they use? Discuss things to check for. Also discuss pot washing.	Things to check for include full loads, turning on machine just before use, checking clogged spray arms, lime buildup, temperature. Check to see if drying agents are being pumped into machine, that utensils, etc. are presoaked before being washed in machine, that machine is turned off after use. Batch wash when cleaning pots.
7 min.		
Discuss any questions about homework assignment.	Ask students if there are any other questions about homework assignment. Give students an opportunity to answer questions.	
5 min.		
Pass out Pre-Class Assignment for Lesson 9.	Tell the class that they will be getting into groups at the next meeting. Inform them that they will be developing a plan of action for how they will conserve energy when they go back to their jobs.	

LESSON 9: Energy Conservation on the Job

Learning Outcome: The ability to develop an "action plan" for conserving energy in your foodservice operation.

Equipment and Supplies: Chalk and chalkboard, flip chart

What to Do	How to do It	Remarks
5 min.		
Administration		
15 min.		
Divide the class into groups and allow them 15 minutes to discuss elements of their assignment.	The class should be divided into groups of students who work in the same types of foodservice operations (fast food, restaurant, cafeteria, hospital, school foodservice). Have each group choose a leader.	Students should share their list with each other and consolidate the lists.
35 min.		
Have a group leader from each group write on the board a consolidated plan for conserving energy on the job and have them each explain these steps and how they might monitor progress.	If enough room is available on the chalkboard, have each leader place the group's steps on it. (You might also use flipchart paper.) After this step, have each leader explain the group's	

What to Do	How to do It	Remarks
(Con't)		
Ask the rest of the class to contribute anything which they think should be included.	steps and how they could monitor progress. Have the class discuss advantages and disadvantages or any additions they would make.	
5 min.		
Tell the class that they will have a post test at the next and last class meeting. Find out if there are any questions.	There will be multiple choice and short answers with one discussion question.	

LESSON 10: Post Test and Review

Learning Outcome: The ability to answer questions about principles of energy conservation related to the use of equipment found in foodservice operations.

Equipment and Supplies: Post Test copies

What to Do	How to do It	Remarks
Before class		
Make sure you have enough copies.	The test can be found in Appendix A. Make copies if you have not already done so.	
5 min.		
Administration		
25 min.		
Pass out test.	Give the students 35 minutes to take the test.	
20 min.		
Use the remaining time to discuss the answers to the test after having students exchange papers for grading.	Go through the test asking different students to answer the questions. If time does not permit this, answer the questions yourself.	Answers to Post Test: 1. D 6. C 2. F 7. turn off 3. D 8. cover; lids 4. B 9. turn down or off 5. B 10. doors; gaskets

What to Do	How to do It	Remarks
(Con't)		11. when fat smokes 12. residual heat 13. compressor 14. decoy 15. defrosted; drained
10 min.		
Summarize the course.	Utilize the students' discussion question. Ask a student to give an answer. Ask other students if they support that idea. You may need to ask two or three students this question. Summarize by challenging the students to apply what they have learned. Ask one or two students to summarize what they have gained from the course that they can use while working in their foodservice operation.	

Part II

MANAGEMENT OF ENERGY CONSERVATION IN FOODSERVICE

Instructor's Guide

LESSON 11: Introduction to Energy Conservation Management

Learning Outcome: The ability to discuss the need for effective management of energy in order to conserve energy and develop energy conserving work habits in employees.

Equipment and Supplies: Trade magazines such as Institutions, Hospitality, Restaurant Business, School Food Service Journal. Equipment catalogs and brochures. Copies of Pre-Class Assignment for Lesson 12 for the entire class.

Resources: 54 (Read this entire resource before beginning the course. This resource is the primary text for the course.)

What to Do	How to do It	Remarks
5 min.		
Administration		
20 min.		
Get to know your students.	Go through the names of the students, asking their occupation, who they work for, what kind of food operation they run, why they are taking the course, what they hope to gain by taking the course, etc.	The more you are able to get students to tell about themselves in their introductions, the more they will be willing to open up and participate later in the course. Do not rush through this "get acquainted" session. It will establish the learning climate for the entire course.

What to Do	How to do It	Remarks
10 min.		
Let the class get to know you.	Tell the class who you are, your occupation and education, how you came to be teaching this course, and what you hope the class gains by taking the course.	
15 min.		
Lead a discussion on how managers may conserve energy in their foodservice operation. Find out the extent of the students' knowledge in this area. Also discuss how managers can get employees to be energy conscious.	Ask for energy conservation ideas that were brought out in the first course on energy conservation. Then try to get students to bring out not only what employees can do or what managers can get employees to do, but also what managers can do specifically in conserving energy, in more or less general terms. Ask the students how they would attempt this or how they have attempted to get employees involved.	General energy conservation principles: (preheating just before use, cooking at lowest temperatures, maintenance, etc.) Conserving by proper use and maintenance of pieces of equipment (rangetops, griddles, broilers, ovens, fryers, etc.) Bring out general areas in which managers can participate (lighting, heating, ventilation, air conditioning, planning, etc.). Methods that might be used include: a reward system based on goals of energy conservation devised by management and/or by discussing with employees the need to conserve, if for no other reason than to prevent the

What to Do	How to do It	Remarks
		company from having to lay off employees due to energy scarcity and spiraling costs.
5 min.		
Ask whether there are any questions about the course. Tell the class to begin looking in magazines, etc. for new equipment with innovative energy conserving features which can be discussed later in the course.	Ask the students for questions concerning the course.	Tell them the course format will be the same as the pre-requisite course's format.
5 min.		
Distribute Pre-Class Assignment for Lesson 12.	Pre-Class Assignment for Lesson 12 can be found in Appendix A marked "for copying." Go over the requirements. Be sure the students understand the requirements, choose a partner before leaving class, and are aware that they will have to share their findings with the rest of the class at the next meeting.	

LESSON 12: Energy Resource People

Learning Outcome: The ability to discuss the energy management assistance available to the foodservice manager through local resource people.

Equipment and Supplies: Copies of Pre-Class Assignment for Lesson 13 for entire class.

Resources:

What to Do	How to do It	Remarks
5 min.		
Administrative		
50 min.		
Have students relate their experiences with the individuals they interviewed. Discuss with class their findings (energy conservation ideas) from the interviews.	Depending on the number of students and the amount of time it takes students to relate their experiences, have as many pairs as possible describe their experience and the materials they obtained. After each pair finishes, discuss with the class the findings and how it may benefit them.	Some things the students should bring out include, the ease or difficulty of obtaining the interview, how helpful the individual was in answering questions, what energy conservation ideas were mentioned, and other sources (people, places, material) the person being interviewed mentioned as sources of additional information.
5 min.		
Pass out Pre-Class Assignment for Lesson 13.	Go over assignment and ask for questions.	

73

LESSON 13: Lighting

Learning Outcome: The ability to analyze lighting requirements and costs associated with lighting a foodservice facility.

Equipment and Supplies: Copies of Pre-Class Assignment for Lesson 14 for entire class; copies of Lesson 13 Handout: Comparison of Lamp Efficiency for entire class; chalkboard and chalk; if possible, an assortment of bulbs (incandescent, fluorescent, mercury, metal halide, low and high pressure sodium bulbs)

Resources: 54 (pages 31-41); 1; 2; 4; 14; 16; 21; 25; 28; 35; 38; 42; 43

What to Do	How to do It	Remarks
Before class		
Prepare for class.	Place on chalkboard the Lesson 13 Table which can be found with the Lesson 13 Pre-Class Assignment in Appendix A, entitled Comparison of Lamp Efficiency.	
5 min.		
Administration		
50 min.		
Open a discussion based on the Pre-Class Assignment.	Have different students define the following terms: a. watts b. lumens c. foot candles d. ballast e. luminaire	a. watts - amount of electricity required to produce light. b. lumens - the amount of light output, illumination.

What to Do	How to do It	Remarks
(Con't)		c. foot candle - a measure of the quantity of light falling on an area. d. ballast - a device used to start and operate an electric discharge lamp--fluorescent and high intensity lamps (mercury, metal halide, low and high sodium pressure). e. luminaire - the complete lighting unit, containing lamp(s), ballast, if needed, fixture, cord, plug, reflector, diffuser, lens, etc.
	Ask the class as a whole how many found lights burning that were not being used. Ask several of those who found unneeded lights burning where they most frequently found them and what were the wattages of the bulbs in those areas.	Ask them to establish a goal of one month to make sure unused lights are turned off and then compare meter readings of kilowatts used for the prior month and the month in question. They could find an 8 to 15% improvement if this is done along with other suggestions made later in this class.
Continue discussion.	Ask the class as a whole how many found dirty fixtures. Ask several students why this should be a problem.	Dust absorbs light, while just as much energy is being expended.

What to Do	How to do It	Remarks
At this time, if you were able to gather the different types of bulbs, show them to the class: (1) incandescent, (2) fluorescent, (3) mercury vapor, (4) metal halide, (5) low pressure sodium, (6) high pressure sodium.	Discuss how the different types of bulbs work and what areas they are generally used for.	Local lighting fixture store is a good source of information on types and uses of lamps.
Review Table. Comparison of Lamp Efficiency.	Discuss the efficiency of different types of lamps.	A fluorescent lamp, for example, is approximately 4 times more efficient than an incandescent bulb since it puts out more than 4 times the illumination or lumens for the same amount of watts of electricity.
Discuss cost of lighting.	Ask students how much their lights cost per week, per month, and per year. Help them calculate it. Use one student's figures as example on chalkboard. Students will need to estimate the number of hours bulbs are burned each day for the problem.	Cost = total wattage x number of hours burned x number of operating days in month divided by 1000 x cost of one kilowatt hour (approx. $.05/kwh).

What to Do	How to do It	Remarks
(Con't)	Discuss the percentage of electric bill that is represented by lighting costs.	Cost of lighting divided by total electric cost x 100 = percentage of total electric bill attributed to lighting costs.
Discuss further energy conservation ideas.	Leaving time to pass out next assignment, discuss what managers can do to control lighting costs.	Try to get students to bring out the necessity of turning off lights when not used, changing to lower wattage bulbs where possible, using higher efficiency bulbs when conceivable, replacing one high wattage bulb for two low ones, installing control panels, timing switches, or photo cells that automatically turn off and on lights, developing a schedule for turning off and on lights, and color coding control panels.
5 min. or less		
Pass out Pre-Class Assignment for Lesson 14.	Go over requirements.	

LESSON 14: Ventilation

Learning Outcome: The ability to discuss general principles of energy conservation that relate to efficient use and maintenance of ventilation equipment.

Equipment and Supplies: Copies of Pre-Class Assignment for Lesson 15 for entire class.

Resources: 54 (pages 45-46+); 1; 2; 4; 12; 14; 21; 23; 24; 25; 28; 38; 42; 43; 47; 53

What to Do	How to do It	Remarks
Before class		
Prepare for class.	Go through and choose students from your class rollbook to answer questions for this lesson. Place names in supplied lines. Each question can either be asked to both students or the second name can be used as an alternate in the event that the first student listed is absent.	By selecting students ahead of time, you can give more thought to the work situations of the students who are called upon to answer specific questions. All students should be encouraged to contribute to the class discussion based upon their Pre-Class Assignment and their experiences.
5 min.		
Administration		

What to Do	How to do It	Remarks
50 min.		
Ask each question and discuss answers. Get entire class to participate by asking them to compare their findings with the student you call by name.	Ask (Name)_____ (Alternate)_____ How many exhaust fans does your foodservice operation have? How many do you run at one time, and is it really necessary to run them at the same time?	
	Ask (N)_____ (A)_____ How many speeds do your fans have? Is the lowest speed used when possible?	
	Ask (N)_____ (A)_____ Do you turn off fans when they are not needed such as after cooking?	You can conserve energy by turning off fans when they are not needed.
	Ask (N)_____ (A)_____ How often are your hood filters cleaned and changed? How often are your fans oiled?	Check weekly, and if necessary, change or clean filters on kitchen exhaust. Oil fans quarterly.
	Ask (N)_____ (A)_____ How many inches is the overhang on the hoods for your kitchen exhaust system?	The overhang should be 40% of the distance between the bottom of the hood and the top of the range, and not less than 12".

What to Do	How to do It	Remarks
Continue questions and discussions.	Ask (N)_____ (A)_____ How many inches is the depth of your hood?	A minimum of 24 inches in depth is recommended.
	Ask (N)_____ (A)_____ Are your fresh air intakes which replace exhausted air located near or within the hood? (which)	When the fresh air intakes are located in or near the hood, the fan and ventilation system will operate more efficiently.
	Ask (N)_____ (A)_____ Does your hood contain any joints, seams or grease lips?	It shouldn't. The hood should have rolled edges without corners or lips to prevent dead air pockets.
	Ask (N)_____ (A)_____ How many feet from the floor is the bottom of the hood?	About 6 1/2 feet is recommended, allowing free movement under the hood while being as close to the cooking surface as possible.
	Ask (N)_____ (A)_____ In checking to see if the exhaust fan was changing air correctly, did the towel placed in the crevice of the door blow or pull inwards? Was there any stale odors or smoke in your dining rooms?	The exhaust flow should be equal to or slightly more than the make-up air to prevent kitchen air entering the dining room. However, the make-up air for the entire restaurant should be greater than exhaust air. This prevents outside air from rushing in when doors are opened.

What to Do	How to do It	Remarks
Continue questions and discussions.	Ask (N)_____ (A)_____ How far apart are your exhaust outlets?	They should be no more than six feet apart to prevent dead air spaces.
	Ask (N)_____ (A)_____ What size are your ducts? Your fan(s)? Is it the correct size for your size kitchen?	
Ask students and then the class for hands on the number of exhaust hoods that are self-cleaning.	Ask (N)_____ (A)_____ Is your exhaust hood self-cleaning? If not, how often do you clean grease collecting containers in kitchen exhaust system and hood?	
	Ask (N)_____ (A)_____ Does your foodservice operation have an exhaust hood located near your dishwasher to carry wet air out of the kitchen, reducing load on air conditioning?	

What to Do	How to do It	Remarks
Continue questions and discussions.	Ask (N)_____ (A)_____ Are the dampers on your exhaust system motorized? Are the dampers closed when the restaurant is not open? Are they low leakage dampers?	The dampers should automatically close and open. Damper leakage should not exceed 3% of the pressure of heating or air conditioning within the building.

5 min.

Distribute Pre-Class Assignment for Lesson 15.

LESSON 15: Heating and Cooling

Learning Outcome: The ability to discuss general principles of energy conservation through effective use and maintenance of heating and cooling equipment.

Equipment and Supplies: Chalkboard and chalk; copies of Pre-Class Assignment for Lesson 16 for entire class.

Resources: 54 (pages 46-56); 1; 2; 3; 4; 6; 14; 21; 23; 24; 25; 28; 30; 32; 34; 37; 38; 42; 43; 44; 47

What to Do	How to do It	Remarks
5 min. Administration		
5 min. Find out the different temperature settings managers use for heating and cooling.	Ask students at what temperature settings they set their thermostats in the summer and winter. Discuss the amount of energy saved by the reducing or raising of the thermostat.	Recommended temperature setting: 68° in winter; 78° in summer. In the winter, energy consumption will be decreased by 3% for each degree the thermostat is lowered. In the summer, consumption will be decreased by 5% for each degree the thermostat is raised.
20 min. Lead a discussion on ways to conserve energy when heating and cooling a foodservice establishment. Write the key suggestions on the chalkboard	Ask the class for suggestions and ideas on energy conservation in heating and cooling their establishments. (May use a class volunteer to actually record the	

What to Do	How to do It	Remarks
in abbreviated form to develop a list of suggestions.	list on the chalkboard.) If the discussion does not open up and produce ideas, use their Pre-Class Assignment as the basis for asking questions that will lead to the key points.	Some suggestions or ideas that should come out of the discussion: a. Be sure to bring out the raising or lowering of the thermostat, depending on conditions, and turning the systems off after closing. b. Fixing the thermostat so employees cannot change setting to suit individual differences. c. The use of a clock thermostat that can automatically turn the heat and air conditioning up and down, eliminating human error. d. Staggering the times individual heating and cooling units are turned on and off to avoid peak demand periods. e. Cooling off kitchen with cold or cool outside air. f. Using awnings on windows to cut down on the amount of sun entering and thereby reducing the work on the air conditioner.

What to Do	How to do It	Remarks
(Con't)		g. The use of dual or double paned windows or storm windows keeping warm or cold air in or out depending on time of year. h. Use of vestibules at doorway entrances keeping the cold air out during the winter and in during the summer. i. Weatherstripping all doors and windows. j. The use of heat recovery devices from exhaust systems, refrigeration or cooling systems, dishwashers, etc. k. The turning off of lights, saving electricity and saving workload of the air conditioner. l. The use of a heat pump which can be used to cool as well as to heat. Using 1 kilowatt of electricity, the heat pump produces approximately the same amount of heat as electric strip heat produces using 2.5 kilowatts of electricity.

What to Do	How to do It	Remarks
(Con't)		m. Closing off rooms and vents not used. However if you have a heat pump, you should not close off the vents because of possible damage to the heat pump. Closing off 1/5 or more of the vents puts a counter pressure on the compressor that could be harmful.
10 min.		
Lead a discussion on the maintenance of heating and cooling equipment.	Ask the class for things which should be checked and cleaned on heating and air conditioning equipment. Also determine the frequency of these checks and cleanings.	The students should include blowers and grills, filters, condenser coils, ducts, and fan belts. All should be checked weekly or monthly depending on amount of use.
5 min.		
Discuss the use of humidifiers and dehumidifiers.	Find out from the class how many use a humidifier or dehumidifier in their foodservice operation, and when they use it.	Use a dehumidifier in the summer instead of the A/C since people can tolerate dry air more than humid air, when it is hot, while being cheaper to run than an A/C. Use a humidifier in the winter since people can tolerate lower temperatures when it is

What to Do	How to do It	Remarks
(Con't)		humid. Also if you have a window box A/C, turn the fan on low when it is very humid weather since it will reduce humidity more than at fast speed.
10 min.		
Discuss types of energy used to run heaters and how heaters and air conditioners operate.	After checking (by a show of hands) to see what the majority of students have as a source of energy for their heaters, choose two students to come to the chalkboard and demonstrate the chart they drew for homework, one showing how his or her heating system works and the other his or her air conditioning system. Follow this up by class discussion.	Be prepared to discuss the flow of operation of a heating system, an air conditioning system, and a heat pump system. (You may choose to invite a heating and air conditioning representative from the community to assist with this portion of the class.)
5 min.		
Pass out Pre-Class Assignment for Lesson 16.	Go over requirements; ask for any questions.	

LESSON 16: Hot Water Systems

Learning Outcome: The ability to conserve energy by efficient operation and maintenance of hot water systems and through an understanding of how energy losses can occur.

Equipment and Supplies: Chalkboard and chalk; copies of Pre-Class Assignment for Lesson 17 for entire class; if possible, bring in samples of hot water line insulating materials.

Resources: 54 (pages 59-63); 1; 2; 4; 6; 12; 14; 28; 38; 43; 47

What to Do	How to do It	Remarks
5 min. Administration		
10 min. Determine the number, of those within the classroom, using different sources of energy to heat their water tanks. Discuss the most efficient.	Asking for a show of hands, mark on the board the number whose hot water heater runs off steam, oil, gas or electricity. Ask students which source of energy is the most economical and why.	Electric water heaters are more energy efficient when converting the water from cold to hot but are usually slower than other fuels and require a larger tank.
10 min. Find out the average sized tank within the room and if anyone has ever run out of hot water.	Ask the students for the sizes of their hot water tanks, calling out a few sizes until everyone has raised their hand. Ask if anyone has ever run out of hot water in their operation.	Running out of hot water shows that the recovery rate is not high enough and indicates a need for a larger tank.

What to Do	How to do It	Remarks
20 min.		
Discuss types of checks needed on hot water systems to avoid energy losses and devices used to save water.	Ask the class for areas they checked for energy loss. Ask if there were any leaky faucets; pipes or water tanks that lacked insulation; what their temperature checks were at the different locations--what differences existed and why. Discuss different insulating materials for hot water pipes. Ask students how many had pressure regulating valves on their dishwashers. Find out what their pressure gauges read.	One drop a second can waste 60 gallons a week of hot or cold water. That's over 3,000 gallons a year. If the water is 140°, that's a waste of approximately 47 kwh a month at an average rate of .05 and is equal to $27 a year wasted. Sample insulation will help this discussion take on more meaning. The standard pressure reading, according to the National Sanitation Foundation, is 20 psi. Poor drying, inadequate rinsing and unsanitized dishes results from pressure below 15 psi and above 25 psi due to atomization of rinse water causing a drop in water temperature.

What to Do	How to do It	Remarks
10 min.		
Discuss maintenance of hot water systems.	Ask class for the frequency that they clean out their hot water heaters to avoid lime buildup and inefficient heat transfer. Ask if they ever use a water conditioner in their hot water tank to reduce lime buildup. Ask someone to describe in detail how to drain and flush a hot water tank.	Six months is the recommended time unless you live in an area with heavy lime buildup, in which case it should be cleaned once a month. Be prepared to coach this discussion if no one is knowledgeable.
5 min.		
Pass out Pre-Class Assignment for Lesson 17.	Allow them time to look over the assignment and then go over requirements.	

LESSON 17: Identifying New Energy Conserving Equipment

Learning Outcome: The ability to discuss energy conserving equipment on the market that could be used to replace less efficient pieces of equipment now in use.

Equipment and Supplies: Copies of Pre-Class Assignment for Lesson 18 for entire class.

Resources: 54 (p. 27); 26; 27; 34; 38; 44; 45; 47; 48; 50; 52; 53

What to Do	How to do It	Remarks
5 min. Administration		
50 min. (allowing 5 min. discussion on each piece of equipment)		
Find out from the class new pieces of energy saving equipment that are now on the market.	Ask the class for their findings about the new energy saving pieces of equipment for each of the following:	
	1. Lighting	Someone should bring up the use of photo cells which automatically turn down or off the lights when the sun comes up and turns the lights on again when it gets dark or cloudy.

What to Do	How to do It	Remarks
(Con't)	2. Refrigeration equipment	Someone should bring up the use of putting all related compressors and condensers associated with refrigerators, freezers, and ice machines on the roof thus reducing utility costs and air conditioning requirements, plus the saving of money from installation. By placing all units in one container at the factory, it costs 4 1/2 times less to install than if done individually at the site. Also the use of curtain strip doors which keeps cold air in and hot air out no matter how long doors stay open; saves energy by reducing compressor running time.
	3. Disposals	The use of disposal-pulping systems which grind up anything except metal, glass and stone; saves on water, using only 100 gallons an hour compared to traditional disposals which can use as much as 300 to 600 gallons an hour by recycling the water. Another design uses centrifugal force to flush waste away, saving 50% over traditional models.

What to Do	How to do It	Remarks
(Con't)	4. Exhaust or ventilation systems	Control devices are now being used which turn exhaust fans on and off automatically at specified times. The fans can be manually turned on in case of an emergency, but automatically turn off again after a short period of time. Also, new exhaust systems exist that recycle the air through filteration so there is no need for additional make-up air.
	5. Heating and cooling	The use of heat exchangers which take heat emitted from refrigerators, air conditioners, diswashers, ice machines, etc. and transmit it to a tank of water. From there the heat exchanger transfers the thermal energy to an insulated storage tank which can be used for heating the establishment, drying dishes, etc. One new system compares outside temperature with that of the inside and determines the thermal quality of the air, including temperature and humidity, by using special sensors. The information is fed into an electronic control system and

What to Do	How to do It	Remarks
(Con't)		when the outside temperature is cool enough, it turns off the air conditioning system and turns on a fan that draws air from outside. Paddle-blade ceiling fans are being used again. In the summer they provide a breeze and circulate heat in winter. Savings are substantial since they run off the same amount of power as a light bulb. They also help to rid odors, smoke, and insects.
	6. Dishwashers	New chemical dishwashers are used which require rinse water to be only 140°, saving on the cost of a hot water booster and using less heated water. A germicide solution consisting of a chlorine base is used to keep dishes sanitized. Energy is also saved since a hood and exhaust fan is no longer needed since less hot air is generated. Also there are savings in the energy that would be needed to run the booster, and savings in electrical wiring and pipes.

What to Do	How to do It	Remarks
(Con't)	7. Gas ranges or any gas fired equipment	Electronic ignition pilot lights are now in existence so that gas is no longer wasted from pilot lights burning all the time.
	8. Griddles	Griddles that use expandable liquid beneath its metal surface as a heat element. The liquid is contained in a vacuum-sealed container and when heated, the liquid transforms into a vapor that transfers heat to the surface of the griddle. Less energy is needed than by traditional griddles, saving 30 to 40% in energy usage.
	9. Steam cooking equipment	A steam cooker that can be used either as a pressurized or nonpressurized cooker by a flip of a switch. This can save money and energy.
	10. Any other foodservice equipment or controls not mentioned above.	Also, use of a "black box" which programs equipment to automatically turn on and off at preset times such as lights, water heaters, dishwashers, heating and air conditioning, and all kinds of cooking equipment.

What to Do	How to do It	Remarks
(Con't)		This will cut utility costs by using less energy.
3 min.		
Inform the class that energy saving equipment is only secondary to that of the efficient use of their present equipment.	After going over energy saving equipment, ask the class if they know of anything in saving energy that is more important than buying energy efficient equipment.	Summary: a. buy energy efficient equipment b. manage the use of all equipment with energy conservation foremost.
2 min.		
Pass out Pre-Class Assignment for Lesson 18.	Review the assignment and clear up questions.	

64

LESSON 18: Tracking Energy Usage

Learning Outcome: The ability to analyze energy costs as the basis for distributing energy usage based on efficiency of the energy source.

Equipment and Supplies: Copies of utility bills; portable calculator; copies of Pre-Class Assignment for Lesson 19 for entire class.

Resources: 54 (pages 67-72); 5; 14; 20; 38; 39; 40; 41; 43; 49

What to Do	How to do It	Remarks
5 min.		
Administration		
15 min.		
Go over and discuss homework assignment.	Ask class if there were any problems in getting information.	
10 min.		
	Discuss the use of BTU's to convert all sources of energy to one universal measurement.	British Thermal Unit is the amount of energy or unit of heat needed to raise the temperature of one pound of water one degree of Fahrenheit.

What to Do	How to do It	Remarks
15 min.		
	Ask the class to relate how their energy consumption varies from month to month and have them give reasons for the variations. Ask them where consumption varied as much as costs. Ask the class which fuel source they used the most of according to the amount of BTU's used. Ask which fuel source by cost did they use the most. This can then be followed by a discussion on which fuel they think they should use.	Get them to bring out the cost of inflation and differences of weather conditions, equipment breakdown, etc. for the difference in cost and consumption. They should be able to see which fuels they can consume at a lower cost and which fuels they should try to conserve. If looking just at cost, for example, you may want to use gas over electricity, but you also have to look at things like the availability of gas or electricity in your area, time of operation, the particular type of production, the cost to replace kitchen air that has been overheated with conditioned air, also the energy efficiency of gas or electric equipment, etc.
5 min.		
Discuss utility charges.	Ask how many believe that the utility company has to charge them the lowest rate or that they are required by law to do so.	They are not. Utility rates are negotiable. It is a good idea to shop around for the best buy when possible.

What to Do	How to do It	Remarks
5 min.		
Hand out Pre-Class Assignment for Lesson 19 and explain requirements.	Tell the class they will be getting into groups at the next meeting. Inform that several of them will be giving a plan of action on how they can conserve energy in their jobs.	

LESSON 19: Energy Management Plan

Learning Outcome: The ability to develop a plan of action for conserving energy for use by the students in their jobs.

Equipment and Supplies: Chalkboard and chalk

Resources: 54 (pages 5-7); 36; 47; 51

What to Do	How to do It	Remarks
5 min.		
Administration		
15 min.		
Divide the class into groups and allow them 15 minutes to discuss and come up with an overall plan for energy conservation on the job.	The class should be divided into groups of students who work in the same types of foodservice operations (fast food, restaurant, cafeteria, hospital, etc.).	Limit groups to six students per group.
35 min.		
Have a group leader from each group present their proposed plan for conserving energy on the job and have them each explain these steps and how they would monitor its progress. Ask the rest of the class to contribute anything which they think should be included.	Have each group choose a leader. If enough room is available on the board, have each leader place their steps on it. After each explains their steps and the way they will monitor its progress, have the class discuss the strengths and weaknesses of each plan or any additions they would make.	Steps should include the following: a. informing the employees of energy conserving ideas and getting their support. b. going through your foodservice operation looking for wasted energy learned from this course and the prerequisite course taken before this one.

What to Do	How to do It	Remarks
(Con't)		c. setting a goal to conserve a certain percentage of energy within a particular span of time. d. getting a utility company representative or equipment manufacturer to tour your facility to spot areas you may have missed and in the case of equipment manufacturer, to suggest more energy efficient equipment. e. make an energy audit and post the cost and energy consumption so that all employees can see their progress in saving energy. f. also, you may want to give rewards to employees for reducing energy consumption.
5 min.		
Tell the class that they will have a post test at the next and last class meeting. Find out if there are any questions.	Ask them to review all prior Pre-Class Assignments and class notes.	There will be 10 multiple choice and one discussion question.

LESSON 20: Post Test and Review

Learning Outcome: The ability to review the knowledge the students have gained about how they can conserve energy in the foodservice industry through more effective management.

Equipment and Supplies: Copies of Post Test

What to Do	How to do It	Remarks
Before class		
Make sure you have enough copies.	The test can be found in Appendix A. Make copies if you have not already done so.	
5 min.		
Administration		
25 min.		
Pass out post test.	Give the students 25 minutes to take the post test.	
25 min.		
Use the remaining time to discuss the answers to the post test after having students exchange papers for grading.	Go through the test asking different students to answer each question and then discussing the answers.	Make notes for yourself on one copy of the post test. Write the name of a student beside each question so that you will remember names when you call on students to give answers. Positively reinforce all correct answers and emphasize the key points.

What to Do	How to do It	Remarks
5 min.		
Summarize the course.	Challenge the students to apply what they have learned. Ask one or two students to summarize what they have gained from the course that they can use in managing their foodservice operation.	Answers to post test: 1. B 2. C 3. E 4. B 5. C 6. B 7. A 8. B 9. D 10. C

APPENDIX A

MATERIALS TO BE COPIED FOR CLASS

PRE-CLASS ASSIGNMENT FOR LESSON 2 - FOOD PREPARATION AND STORAGE

PURPOSE: To gather data which can help determine if your foodservice unit is applying energy conservation principles.

1. Does your foodservice operation cook some of its food in advance--either partially or completely? Yes/No If yes--what types of food? If no--why not? What types of food might not be to your advantage to cook in advance?

2. Does your foodservice operation cook their food in volume? Yes/No If not--could they? What would be the advantages? Disadvantages?

3. Are ovens loaded fully for each baking cycle? Yes/No Is it practical? Why?

4. After a load has been removed, is another one put right in? Yes/No

5. Does your foodservice operation cook its food at the lowest temperatures possible? Yes/No Why would this be to their advantage?

6. Does the first person in the building switch everything on (stoves, ovens, etc.)? Yes/No or is the equipment being preheated just before use?

7. During slow periods of the day, is equipment turned off or temperatures reduced? Yes/No

8. Do you know how long it takes for major cooking (oven, broiler, etc.) equipment to preheat? Yes/No How long does it take to preheat one of the following: deep fat fryer, broiler, oven?

9. Is equipment checked regularly for possible repair needs? Yes/No

PRE-CLASS ASSIGNMENT FOR LESSON 3 - RANGETOPS, GRIDDLES AND BROILERS

PURPOSE: To determine information about ranges, broilers, and griddles that can be used for class discussion about energy conservation.

1. Does your operation have the following type ranges?
   a. Flat top (solid)
   b. Open top
   c. Griddle or fry top

   What is the source of energy? (Electricity? Gas?)

2. What kind of cooking is done on the range in your unit?
   a. Sauteing
   b. Stock kettle work
   c. Stewing
   d. Frying
   e. Simmering and boiling

3. Are your range tops cleaned using the following methods?
   a. Scraping burnt food and grease
   b. Wash off with soap and water
   c. Cleaning top when still warm

4. What cleaning agent is used to clean your range?

5. Using a watch, check to see how long it takes to preheat your griddle and broiler.

6. How can you determine if the temperature of the griddle and broiler matches the thermostatic control setting?

7. What type(s) of broiler does your operation have?

   What is the energy source (Electricity? Gas?)

8. How are the griddle(s) and broiler cleaned in your operation? How often?

9. Are foods cooked on different sections of the griddle? Why?

PRE-CLASS ASSIGNMENT FOR LESSON 4 - OVENS

PURPOSE: Determine information about ovens that can be used for class discussion about energy conservation.

1. What type(s) of oven do you have in your operation?
   a. Standard
   b. Convection
   c. Microwave
   d. Revolving

   Name an advantage for using that type of oven.

2. Name two kinds of foods cooked in the oven(s) in your operation and how long it takes to cook them.

	Foods	Cooking Time	Type of Oven
1.			
2.			

3. How does a convection oven reduce cooking time?

4. When using a convection oven are:
   a. pans spaced to allow air to move between them? Yes/No
   b. pans turned to allow air to move evenly around them? Yes/No

5. List three containers that can be used in a microwave oven.

6. How long does it take to preheat the oven(s) in your foodservice operation? Use a watch and an oven thermometer to determine.

7. Do the doors on the oven(s) close tightly? Yes/No

8. Are timers used when cooking foods in your operation? Yes/No

9. What are the advantages of using timers when cooking in ovens?

PRE-CLASS ASSIGNMENT FOR LESSON 5 - FRYERS

PURPOSE: To determine information about deep fat frying that can be shared with the class.

1. For each of the following fryers, name two food products that may be cooked by them:
   a. deep fat fryer
   b. pressure fryer
   c. tilting fry pan or skillet

2. Using a deep fat thermometer and watch, check preheating times of the types of fryers within your foodservice operation.

3. Describe the method used to clean your fryers.

4. How do you filter your oil?

5. Do you add new oil to your old oil when it gets low Yes/No or do you throw away old oil and use only fresh? Yes/No

6. Name three signals which indicate your cooking oil is breaking down.

7. Does your foodservice operation salt its foods before or after frying? Why?

8. Are fryers turned down or off during slack periods? Yes/No
   If turned down, to what degree?

9. Compare your foodservice operation's frying of french fries with that of another's operation (McDonald's might serve as a good example, if you don't work for McDonald's). If your foodservice operation does not fry french fries, then compare two other foodservice operations. Indicate the following:

	Operation 1	Operation 2
a. What are the preheat times?	____ minutes	____ minutes
b. Are fries thawed and drained before cooking?	Yes/No	Yes/No
c. How long are they cooked?	____ minutes	____ minutes
d. Is the oil filtered?	Yes/No	Yes/No
e. How often is it filtered each day?	_____	_____

PRE-CLASS ASSIGNMENT FOR LESSON 5 (CON'T)

	Operation 1	Operation 2
f. How often is oil added?	_____	_____
g. At what temperature are the fries cooked?	_____	_____
h. Do the fries taste good to you?	Yes/No	Yes/No

PRE-CLASS ASSIGNMENT FOR LESSON 6 - STEAM COOKING AND HOLDING EQUIPMENT

PURPOSE: To determine information about steam operated equipment in order to participate in class discussion.

1. Is your steam cooking and/or holding equipment preheated just before use? For how long?

2. Check doors for tightness. Is steam leaking through doors on steam equipment? Yes/No

3. Is equipment turned down or off when not in use? Yes/No

4. Are the doors to steam cookers left open after use? Yes/No

5. When using steam-jacket kettle, do you use a lid to cover kettle when cooking? Yes/No

6. What do you do when you spot steam rising from your holding table? What was the cause of the steam?

7. How are your steam cookers, steam-jacket kettle, and steam table cleaned in your foodservice operation?

8. Name three foods that can be cooked in a steam-jacket kettle and three foods that can be prepared in a steam cooker.

PRE-CLASS ASSIGNMENT FOR LESSON 7 - REFRIGERATORS, FREEZERS AND ICE MACHINES

PURPOSE: To gather information about refrigerators, freezers, and ice machines for class discussion about energy conservation.

1. Are refrigerator and freezer doors opened and closed:
   Occasionally?
   Frequently?

2. Are refrigerators and freezers maintained full or partially full?

3. Do door gaskets fit tightly? Place a dollar bill half way in the door and close the refrigerator or freezer. Try this all around the door. Are you able to pull it out easily? Yes/No

4. When frost builds up on evaporator cells; is refrigerator equipment defrosted? Yes/No

5. Are condenser coils vacuumed or cleaned when dusty? Yes/No

6. At what temperatures have your refrigerators and freezers been set?

7. Check the doors on your refrigerators and freezers. When you open them and let go, do they automatically close? Yes/No

8. How far is your ice machine from the wall?

9. What maintenance checks are performed on the ice machine in your operation?

10. What types of maintenance checks are made on your refrigerators and freezers?

11. Name two ways to conserve energy when using the:

    Refrigerator

    Freezer

    Ice Machine

PRE-CLASS ASSIGNMENT FOR LESSON 8 - DISHWASHERS AND WAREWASHERS

PURPOSE: To gather information about dish machines in order to participate in class discussion about energy conservation.

1. Is your dishwasher or warewasher turned on just before being used? Yes/No

2. Are dish machine racks fully loaded with each run through the dish machine? Yes/No

3. When enough dishes, utensils, etc. have accumulated for two washes, are the two cycles run consecutively? Yes/No

4. How many times a day is your machine flushed? Is it flushed after each use? Yes/No

5. Is the machine cleaned after a day's operation? Yes/No

6. How often are mineral deposits removed from your dishwasher?

7. Does your foodservice operation use a decoy system to organize their work before using the dishwasher? Yes/No

8. Are utensils, etc. soaked before being placed in the machine? Yes/No

9. Are pots washed as they get dirty or allowed to pile up before being cleaned? Yes/No

10. What is the temperature setting for the wash cycle of your machine? Rinse cycle?

LESSON 6 - HANDOUT: RECOMMENDED WAREWASHING PROCEDURES

DAILY PROCEDURE TO SET UP AND CLEAN UP DISHWASHING MACHINE

Set Up

1. Check to see machine is clean. Pay special attention to wash arms, scrap trays, and final rinse jets. Place scrap trays, wash arms, and curtains in their proper places within the machine.

2. Close drain valves tightly. Open fill valves and fill all tanks to proper level. Shut off all fill valves.

3. Turn on the gas, electric, or steam heater for all tanks and final rinse.

4. Check to be sure rinsing agent bottle or reservoir is filled. Replace or refill if necessary.

5. Turn on all dishmachine motors and the electronic dispenser. A red light and buzzer on the electronic dispenser will tell you when more detergent is needed. Add proper amount of detergent to the reservoir.

6. Do not wash dishes until the temperature for all tanks is correct. Check temperatures regularly; Pre-Wash tank 100-120°F, Wash 155-170°F, Power Rinse 165-180°F, Final Rinse 180-195°F. Change water in all tanks every 2-4 hours.

Dishwashing Operating Procedures

7. Scrape off food soil from plates. Sort and stack dirty dishes on dish table. Remember the dishwashing machine is not a garbage disposal.

8. Rack dishes of same size together. Place in straight rows. Do not overload or overlap. Place cups, glasses, bowls, etc. upside down in racks. Do not mix. One layer in rack is enough. Do not stack them on top of each other.

9. Soak all flatware 15-20 minutes. For machine washing, place flatware with handles down--eating end up--in the vertical silver baskets. Knives, forks, and spoons should be mixed so spoons do not nest and can be washed clean.

Clean Dish Handling

1. Allow dishes to drain and air dry for several seconds after leaving machine. Tilt cup and glass racks to drain excess water from recessed bottoms.

2. Remove clean dishes from racks and stack them in their proper storage places.

PRE-CLASS ASSIGNMENT FOR LESSON 9 - ENERGY CONSERVATION

PURPOSE: Review and list those things that you can put into use in your own foodservice operation to conserve energy.

Based on what you have learned so far about conserving energy in your foodservice operation, make a list of steps you could take to reduce energy usage. Bring this list of steps to the next class.

PART I: POST TEST

Multiple Choice: Place the letter of the correct answer in the blank provided.

_____ 1. Energy conservation is needed in the foodservice industry because of:
a. inflation
b. energy shortages
c. the tremendous expense due to wasted energy
d. all the above
e. none of the above

_____ 2. The advantage of cooking foods at lower temperatures is:
a. reduced cooking time
b. less expenditure of energy
c. increased heat loss
d. reduced shrinkage of meats
e. a and b
f. b and d
g. e and d

_____ 3. Ways to reduce excess heat loss include:
a. monitoring preheat times and cooking temperatures
b. preheating just before use
c. turning off or reducing equipment when not in use
d. all of the above
e. none of the above
f. a and e
g. b and c
h. a and b

_____ 4. When cooking in succession (one item following another), the item requiring the _____ temperature should be cooked first.
a. highest
b. lowest
c. neither a or b

_____ 5. When cleaning closed or solid top electric ranges, be sure never to do which of the following:
a. remove burnt food and grease by scraping
b. to wash off with soap and water
c. to clean while still warm

_____ 6. When using a gas range, the flame should be _____ with a clear solid core.
a. green
b. red
c. blue
d. yellow

PART I: POST TEST (CON'T)

Short Answer: Fill in the following blanks with a proper word or sentence.

7. When using range top or oven, _____ _____ surface unit or oven before removing utensil.

8. When possible, _____ pots, pans, and kettles with _____ to cook foods faster and reduce amount of energy needed.

9. To conserve energy during slack periods, _____ pieces of equipment.

10. The _____ and _____ on ovens, refrigerators, freezers, ice machines, and steam equipment should be checked for tightness and wear to prevent leakage.

11. In using a deep fryer, three signals which indicate your cooking oil is breaking down include a sharp acid pungent odor, irritating effect on the eyes, and _____.

12. Before food has completely cooked in a steam cooker, oven, etc., turn off equipment and allow _____ to finish cooking product.

13. The space within a few feet of the _____ of a freezer or refrigerator should be clear in order not to block the removal of hot air.

14. One way to organize your work before using the dishwasher is to use the _____ system to sort dishes, utensils, etc.

15. Before putting foods into your deep fat fryer, the foods should first be _____ and _____.

Discussion

16. Has this course made you aware of energy conservation ideas that you did not consider before taking this course? What one idea do you think will be the most beneficial to your foodservice operation in conserving energy? How will you implement this idea in your foodservice operation and monitor its progress and success?

PRE-CLASS ASSIGNMENT FOR LESSON 12 - ENERGY RESOURCE PEOPLE

PURPOSE: To see how the knowledge and assistance of resource people can be used by the foodservice manager to determine ways to conserve energy.

Identify a resource person who is concerned with conserving energy in foodservice. Choose a partner from the class to participate with you in interviewing this resource person who could be an equipment dealer, someone from an electric or gas company, an equipment maintenance person, a consultant who specializes in energy conservation, an architect, a person from the federal or state energy administration, the local sanitation director, or any other person who would have knowledge of energy conservation within the foodservice industry. Interview the person to obtain energy conservation ideas, and to determine other sources (people, places, and material) where you could obtain additional information. Follow the attached interview guide.

PRE-CLASS ASSIGNMENT FOR LESSON 12 (CON'T)

INTERVIEW GUIDE

Name of Resource Person_____

His or Her Position_____

Date of Interview_____ Location of Interview_____

Questions:

1. How are you involved in energy conservation in your position?

2. Are you involved directly with foodservice operations in energy conservation? If so, how?

3. How much would your services cost if you assisted a foodservice operation with energy conservation?

4. What do you see as the most significant ways that energy is lost in foodservice operations?

5. What are some immediate steps that foodservice managers can take to reduce energy usage?

6. What sources of energy are the most economical for foodservice operations for each of the following applications?

   a. Heating

   b. Air Conditioning

   c. Dishwashing

   d. Hot Water Heating

   e. Cooking

f. Refrigeration

g. Other miscellaneous applications

7. What new and innovative equipment is available to conserve energy?

8. What are some ways to encourage employees to conserve energy?

9. How important is equipment maintenance to energy conservation?

10. Who would you recommend that I contact to obtain additional information on energy conservation?

PRE-CLASS ASSIGNMENT FOR LESSON 13 - LIGHTING

PURPOSE: To conduct a lighting survey of your foodservice operation or arrange to do so in a foodservice operation to gather objective information that can be used in class to analyze the energy used for lighting the operation.

Before beginning the survey, use a dictionary or other references and write a brief non-technical definition of the following lighting terms:

a. Watts

b. Lumens

c. Foot candles

d. Ballast

e. Luminaire

Survey:

Complete the following Lighting Survey Table. The wattage of each bulb should be printed on the bulb.

LESSON 13: LIGHTING SURVEY

Area (Kitchen, Dining Room, Storeroom, Parking Lot, etc.)	Wattage of Bulbs in Each Area						Total Wattage
	Incandescent	Fluorescent	Mercury Vapor	Metal Halide	High Pressure Sodium	Low Pressure Sodium	
Total Wattage							

NOTE: A local fixture house or lighting distributor (see telephone yellow pages) may be helpful in distinguishing between different types of lamps.

LESSON 13 Handout: COMPARISON OF LAMP EFFICIENCY

Type of Lamp	Lumens (Illuminations per watt)
Incandescent	20
Fluorescent	83
Mercury Vapor	63
Metal Halide	115
High Pressure Sodium	140
Low Pressure Sodium	178

Explanation: Fluorescent is 4.15 times as efficient as incandescent.

$$\frac{83}{20} = 4.15$$

Low Pressure Sodium is 8.90 times as efficient as incandescent.

$$\frac{178}{20} = 8.90$$

PRE-CLASS ASSIGNMENT FOR LESSON 14 - VENTILATION

PURPOSE: To survey the ventilation systems in use in operations of students within the class as a basis for class discussion of ventilation.

1. How many exhaust fans does your foodservice operation have?
   How many are run at one time?
   Are they all needed?

2. Do your fans have more than one speed?
   Is the lowest speed used when possible?

3. Are fans turned off when not needed or after cooking?

4. How often are filters cleaned and changed?
   How often are your fans oiled?

5. How many inches is the overhang on your hood for your kitchen exhaust system?

6. How many inches is the depth of your hood?

7. How many feet from the floor is the bottom of the hood?

8. Are your fresh air intakes, which replace exhausted air, located near or within the hood?

9. Does your hood contain any joints, seams or grease lips?

10. In order to check whether your exhaust fan is taking in too much air and not being replaced by enough make-up air, place a towel at the crevice of your kitchen door and check to see if the towel is blown or pulled inwards. To see if your exhaust fan is not taking in enough air, check for odors and smoke filled rooms. What are your findings?

11. How far apart are your exhaust outlets?

12. What size are your ducts? Your fan(s)?
    The duct size should be large enough to move air with a minimum velocity of 2,000 cubic feet per minute. Your fan should be large enough to change the air a minimum of every two minutes. Determine the cubic feet of your kitchen--length x width x ceiling height. If your room is 10 x 10 x 10, your room would be 1,000 cubic feet. Calculate your cubic feet. Next, check your fan to see how many cubic feet per minute it changes air. It should be written right on the fan. What did you determine it to be? For a room of 1,000 c.f. the fan should say 500 cfm. The cubic feet of space in the room should be double the fan's cfm rating. Is your exhaust fan adequate based on this calculation?

13. Is your exhaust hood self-cleaning? If not, how often do you empty and clean grease collecting containers in kitchen exhaust system and hood?

14. Does your foodservice operation have an exhaust hood located near your dishwasher to carry wet air out of the kitchen, reducing load on air conditioning?

15. Are the dampers on your exhaust system motorized? Are the dampers closed when the restaurant is not open? Are they low leakage dampers?

PRE-CLASS ASSIGNMENT FOR LESSON 15 - HEATING AND COOLING

PURPOSE: To gather information as the basis for a class discussion of ways to conserve energy through management of air conditioning and heating systems.

1. At what temperature is your air conditioning thermostat set in the summer?

2. At what temperature is your heating thermostat set in the winter?

3. Is your thermostat raised or lowered, depending on conditions, or turned off at closing?

4. Is the thermostat fixed so employees cannot change setting?

5. How often are your air conditioner blower and grills inspected and cleaned?

6. How often are air filters cleaned or changed?

7. How often is the air conditioning condenser coil cleaned? The ducts?

8. Does your foodservice operation use a heat pump system to heat and cool the building?

9. Does your foodservice operation have a clock thermostat that automatically turns down and up the heat and air conditioning?

10. Does your foodservice operation have a humidifier or dehumidifier? Are they used instead of your heating or cooling system? When and why?

11. In order to avoid peak demand periods, are individual heating and cooling units turned on and off at different times?

12. Do you try to cool kitchen off by using cold or cool outside air?

13. Does your foodservice operation have awnings on its windows?

14. Are the windows dual-paned or insulated with storm windows?

15. Does your foodservice operation have vestibules at doorway entrances?

16. Do all doors and windows have weatherstripping?

17. Does your foodservice operation contain separate heating and cooling systems or a central system?

18. Does your foodservice operation have any heat recovery devices? What are they and how do they work?

19. During the summer do you reduce the amount of lighting? Name two ways that this will help to conserve energy.

20. What is the fuel source for your heating system?

21. Interview an individual who services (performs maintenance) heating and air conditioning equipment. Find out what types of preventive maintenance steps should be taken to keep equipment running well. Find out how the heating and air conditioning systems work and draw a chart from the source of energy through the generation of hot air, steam, or water for the heating system and trace the ventilation system to the point of heat dispersion. Make a similar diagram for your air conditioning system.

PRE-CLASS ASSIGNMENT FOR LESSON 16 - HOT WATER

PURPOSE: To gather information as the basis for a class discussion of ways to conserve energy through management of hot water systems.

1. What is the source of energy for your hot water heater?

2. What is the capacity of your hot water tank?

3. Identify hot water outlets in your operation and estimate the percentage each outlet contributes to your hot water bill.

4. Check your hot water storage tank and pipes for insulation. Are you losing heat due to inadequate insulation?

5. Does your foodservice operation ever run out of hot water?

6. Take a thermometer and measure the temperature of the water which comes directly from your hot water heater, out of your faucets (kitchen and lavatories), also from the fill line of your dishwasher.

7. Check your establishment for leaky faucets. Did you find any?

8. Does your foodservice operation have devices on their faucets to save water, such as spring operated valves or foot pedals?

9. How often are your hot water heaters drained and flushed?

10. Do you ever add a water conditioner to your hot water tank to reduce lime buildups?

11. Check and see if your dishwasher is equipped with a pressure regulating valve located on your supply pipe. What is the psi (pounds per square inch of pressure) reading on your gauge?

PRE-CLASS ASSIGNMENT FOR LESSON 17 - NEW ENERGY CONSERVING EQUIPMENT

PURPOSE: To identify new equipment designed with energy saving features as the basis for a classroom discussion on ways to increase energy efficiency when replacing equipment.

In order to identify what new energy saving equipment is on the market, review trade magazines (Restaurant Hospitality, Institutions, Restaurant Business, Food Service Marketing, etc.), visit equipment dealers or talk to your purchasing representative (if you have one). List at least one piece of energy conserving equipment for each of the following categories, describing briefly how the pieces of equipment conserve energy.

1. Lighting

2. Refrigeration equipment

3. Disposals

4. Exhaust or ventilation systems

5. Heating and cooling

6. Dishwashers

7. Gas ranges or any gas fired equipment

8. Griddles

9. Steam cooking equipment

10. Any other foodservice equipment or controls not mentioned above

PRE-CLASS ASSIGNMENT FOR LESSON 18 - ANALYZING UTILITY COSTS

PURPOSE: To analyze actual utility cost and usage data as a basis for discussing how to manage consumption and distribution of energy sources.

Locate copies of utility bills for the previous twelve months. (If you do not have access to utility bills from your foodservice operation, you may use utility records for your home.)

From the copies of utility bills, complete the following charts as applicable. Using the multipliers and formulas below, convert the utility costs to BTU's.

Add the total BTU's of energy used and be prepared to discuss your findings in class.

Formulas:

Electricity: BTU = Kilowatt hours x 3413

Gas: BTU = Cubic feet x 1000

Oil: BTU = Gallons x 140,000

Steam: BTU = Pounds x 1000

(BTU's are expressed in millions by the above formulas.)

PRE-CLASS ASSIGNMENT FOR LESSON 18 (CON'T)

ENERGY CONSUMPTION: ELECTRICITY

Month	Electricity used in KWH	BTU (KWH x 3413)	Cost of Electricity	Cost per BTU (Cost ÷ BTU)
Jan.				
Feb.				
March				
April				
May				
June				
July				
Aug.				
Sept.				
Oct.				
Nov.				
Dec.				
Total				

PRE-CLASS ASSIGNMENT FOR LESSON 18 (CON'T)

ENERGY CONSUMPTION: GAS

Month	Gas Used In Cubic Feet	BTU (Cu. Ft. x 1000)	Cost of Gas ($)	Cost per BTU (Cost ÷ BTU)
Jan.				
Feb.				
March				
April				
May				
June				
July				
Aug.				
Sept.				
Oct.				
Nov.				
Dec.				
Total				

PRE-CLASS ASSIGNMENT FOR LESSON 18 (CON'T)

ENERGY CONSUMPTION: OIL

Month	Oil Used In Gallons	BTU (Gal x 140,000)	Cost of Oil	Cost per BTU (Cost ÷ BTU)
Jan.				
Feb.				
March				
April				
May				
June				
July				
Aug.				
Sept.				
Oct.				
Nov.				
Dec.				
Total				

PRE-CLASS ASSIGNMENT FOR LESSON 18 (CON'T)

ENERGY CONSUMPTION: STEAM

Month	Steam Used In Pounds	BTU (Pounds x 1000)	Cost of Steam ($)	Cost per BTU (Cost ÷ BTU)
Jan.				
Feb.				
March				
April				
May				
June				
July				
Aug.				
Sept.				
Oct.				
Nov.				
Dec.				
Total				

PRE-CLASS ASSIGNMENT FOR LESSON 19 - ENERGY MANAGEMENT PLAN

PURPOSE: To develop a plan to improve energy management in the food-service operation.

Design a plan of action to conserve energy that you can use on your job. Make a list of steps that you will take and specify ways to monitor your progress and success. Organize your plan according to the following outline:

1. Assessment Steps (to determine the present state of energy management)

2. Use of Resource People (to assist in assessment or corrective actions)

3. Employee Involvement (in assessment and improvement)

4. Employee Training (to educate them to energy conservation techniques)

5. Maintenance Steps (to increase the energy efficiency of existing equipment)

6. Equipment Replacement (realistic capital expenditure plans to increase the efficiency of the operation)

7. Goals (expressed in terms of reductions in energy consumption)

PART II: POST TEST

Multiple Choice: Read all possible answers and place the letter of the single best answer in the blank provided.

_____ 1. Which of the following will not conserve energy when dealing with lighting?
a. by reducing the wattage size of bulbs
b. by changing your lamps from fluorescent to incandescent bulbs
c. by cleaning fixtures
d. by turning off lights when not needed

_____ 2. The amount of light output or illumination is known as:
a. watts
b. foot candle
c. lumens
d. ballast
e. luminaire

_____ 3. Which of the following statements about exhaust systems is true?
a. The overhang on the hood should be 40% of the distance between the bottom of the hood and the top of the range.
b. The overhang should not be less than 12 inches.
c. The depth of the hood should be a minimum of 24 inches.
d. The hood should not contain any joints, seams or grease lips.
e. Exhaust systems should have all of the characteristics in statements a, b, and c.

_____ 4. The exhaust flow should be equal to or slightly _____ than the make-up air to prevent kitchen air entering the dining room. The make-up air for the entire foodservice establishment should be _____ than the exhaust air to prevent outside air from entering.
a. more; less
b. more; greater
c. less; less
d. less; greater

_____ 5. The recommended temperature setting in the winter is _____ degrees F. and _____ degrees F. in the summer.
a. 78; 68
b. 68; 68
c. 68; 78
d. 78; 78
e. 70; 70

PART TWO: POST TEST (CON'T)

_____ 6. Each degree that a thermostat is lowered when heating in the winter will save _____ percent of the energy consumed, and _____ percent will be saved in the summer when cooling, with each degree the temperature is raised.
a. 10; 10
b. 3; 5
c. 5; 10
d. 10; 5
e. 5; 5

_____ 7. You should use a _____ in the summer instead of the air conditioner, and a _____ in the winter.
a. dehumidifier; humidifier
b. humidifier; dehumidifier
c. heat pump; dehumidifier
d. humidifier; heat pump

_____ 8. Under normal water conditions, the recommended time for draining and flushing your hot water heaters to avoid lime buildup and inefficient heat transfer is every _____.
a. year
b. six months
c. month
d. week

_____ 9. The British Thermal Unit (BTU) is the amount of energy or unit of heat needed to raise the temperature of one _____ of water one degree of Fahrenheit.
a. ounce
b. gallon
c. quart
d. pound

_____10. Which of the following pairs do <u>not</u> go together, the first being the type of energy source and the second being the unit it is measured in?
a. Electricity: KWH
b. Gas: cubic feet
c. Oil: cubic meters
d. Steam: pounds

16. Has this course made you aware of energy conservation ideas that you did not have before entering this course? What one idea do you think will be the most beneficial to your foodservice operation in conserving energy? How will you implement this idea in your foodservice operation and monitor its progress and success?

APPENDIX B

RESOURCES

PAMPHLETS

1. Carolina Power and Light Company. Conservation Tips for Industrial and Commercial Users of Electricity. 16 pages. Available from CP&L Customer Service, P.O. Box 1551, Raleigh, NC 27602.

2. Federal Energy Administration. Tips for Energy Savers. 31 pages. Available from U.S. Dept. of Energy, Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830.

3. Channing, L. Bete Bo., Inc. What Everyone Should Know About Heat Pumps. Greenfield, Mass., 1978. 15 pages. Available from Channing Bete Bo., Inc., 45 Federal Street, Greenfield, MA 01301.

4. Energy Research and Development Administration. Tips for Energy Savers. 1977. 46 pages. Available from Energy Conservation Now, Pueblo, CO 81009.

5. Consumer-Owned Electric Utility. How Your Electric Meter Works. Available from Greenville Utilities, 200 W. 5th Street, Greenville, NC 27834.

6. The East Ohio Gas Company. Food Service Operator's Guide to Saving Natural Gas and Money. 3 pages. Available from East Ohio Gas Co., 1717 East 9th Street, Cleveland, OH 44114.

7. The East Ohio Gas Company, Range Chef's Guide to Saving Natural Gas and Money. 3 pages. (See address in No.6 for source)

8. The East Ohio Gas Company, Steam Cooking Guide to Saving Natural Gas and Money. 3 pages. (See address in No.6 for source)

9. The East Ohio Gas Company, Convection Oven Guide to Saving Natural Gas and Money. 3 pages. (See address in No.6 for source)

10. The East Ohio Gas Company, Fry Chef's Guide to Saving Natural Gas and Money. 3 pages. (See address in No.6 for source)

11. The East Ohio Gas Company, Gas Cooking Equipment. 12 pages. (See address in No.6 for source)

12. The Electrification Council. A Practical Guide to Energy Management in Electric Food Service Facilities. 1977. 21 pages. Available from Electrification Council, 90 Park Avenue, New York, NY 10016.

13. American Gas Association. Saving Energy in Commercial Gas Kitchens. 10 pages. Available from American Gas Assoc., 1515 Wilson Blvd., Arlington, VA 22209.

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