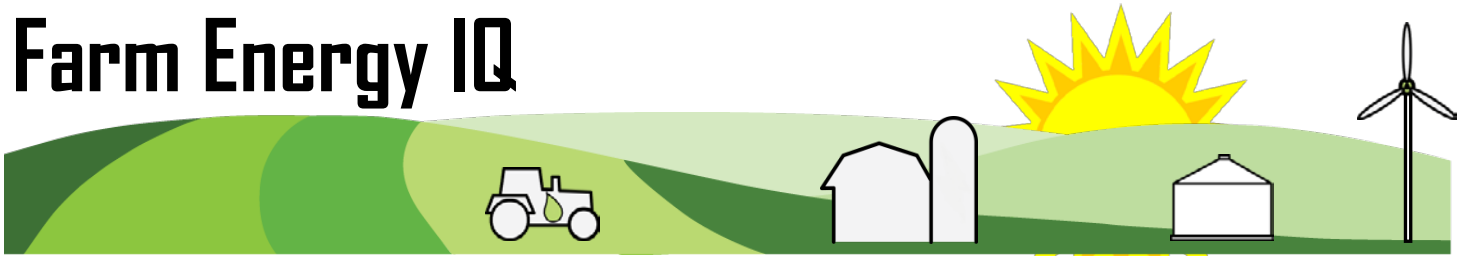
Farm Energy IQ



Farm Energy Efficiency Principles Farmer Presentation Outline

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Slide 1-2 Introduction

Slide 3 Basics of energy efficiency on farms

Slide 4 Greenhouse thermal screens provide additional insulation to reduce heat loss and shading to reduce ventilation needs. Double cropping (hanging baskets) increases crop production per unit area. Spray foam is one approach to insulating new or existing structures. LED lights are 4 to 5 times more efficient than incandescent bulbs. Cleaning filters and other maintenance measures reduce energy waste.

Slide 5 Grid Connected solar photovoltaics and wind power are functionally indistinguishable from grid connected electric. Apart from the cost to the user, which is typically different from grid supplied power, there is no real practical difference between these energy sources and that provided by utilities.

Slide 6 Uses of energy

Slide 7-8 Efficiency basics and terms. AFUE, HSPF and SEER are standards developed to help compare expected seasonal performance of equipment. They are not always appropriate when comparing equipment that will not operate according to more common commercial, residential and industrial schedules. A more accurate comparison in some agricultural operations may require evaluating the equipment performance over the expected range of operating conditions.

Slide 9 Typical efficiency of various energy conversion efficiencies.

Slide 10 Energy efficiency is light output in watts divided by input watts. Luminous efficiency, expressed as lumens per watt, is lamp lumens divided by wattage.

Slide 11 In most cases, heating efficiency depends a lot on the combustion equipment that is used. Natural gas and propane heaters are typically more efficient than oil. Wood burning in inefficient stoves and fireplaces can be less than 0% efficient,

Slide 12-15 Efficiency improvements basics.

Slide 16 This is a very common problem. Engineers are often trained to oversize equipment to provide a margin of safety. Where this results in redundancy of equipment it has potential benefits. Generally, oversize equipment costs more to install and operates less efficiently. Short cycling frequently reduces the life of the equipment. Oversize equipment is often more difficult to control, leading to problems like undesirable temperature oscillations.

Slide 17 Stand alone greenhouses (upper left) have a higher surface area to growing area ratio, making for a less energy efficient structure. Double polyethylene greenhouses (upper right) use about 2/3s of the energy of single glass greenhouses (lower left). Very large greenhouse ranges (lower right) have a very low wall area to roof area ratio.

Slide 18-20 Improving efficient. Condensing boilers use large heat exchange areas (using stainless steel) to remove more heat from combustion gases. Water will condense in the heater, requiring the use of corrosion resistant materials. Energy recovery systems include heat exchangers to transfer heat from exhaust air to fresh inlet air.

Slide 21 Evaporative cooling can be effective for reducing air temperatures at a much lower cost than air conditioning. High humidity can be a problem. An economizer cycle uses outside air rather than air conditioning equipment to cool when the ambient temperatures are low enough. There are several types of ground source heating and cooling systems. These are more likely to be cost effective when there is a winter heating load and a summer cooling load.

Slide 22-23 Other opportunities and alternatives.

Slide 24 Summary.

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