Assignment Name: Informative Speech         Speaker’s Name: Kevin Schnaubelt

Subject: Heat Pumps in our everyday life.

Specific purpose: To explain the fundamental principles behind heat pumps in air conditioning systems,

focusing on how they transfer heat rather than generate cold, making them an efficient yet often overlooked engineering marvel

in our daily lives.

Introduction

Attention getter: "Raise your hand if you think your air conditioner produces cold." [Making sure to pause]

Likely outcome is no hands: "It sounds like a trick question, which is why probably nobody raised their hands, and good on you; it is a trick question."

Any hands outcome: "OK, it makes sense, right? That's certainly intuitive and what I thought as well. But it turns what it's actually does is, 'move heat'."

WIIFM or Listener relevance: "There's a lot of every day engineering we take for granted, and 'air conditioning' or 'heat pumps' are a cornerstone of our modern civilization."

Name and Establish Credibility: "My name is Kevin Cain and I'm an engineer. Professionally I'm a software engineer, but really all engineers are the same. Engineering is about solving problems, and heat pumps are a fantastic example of that."

Thesis/Preview of main points: "Today im going to briefly teach you how heat pumps work, and the many places you'll find them in your everyday life."

Transition: "Who can tell me the boiling point of water?"

Body

1. Water boils at 121f or 100c, AT SEA LEVEL. The higher up you go, the easier it is to boil water because there's less pressure. In a near perfect vacuum, water will boil at 1f. That's according to The Engineering ToolBox.

    a. "Why is this important? Because boiling is a phase change."

        i. "When a liquid boils, it transforms in to gas, and this transformation requires energy. Think of it like its trying to break free of its liquid bonds."

        ii. "Any time a phase change uses energy, it's called a endothermic reaction. Endo like in. It's taking in energy.

        iii. "The reverse is also true. When a gas condenses back into a liquid, it releases energy. This is called an exothermic reaction. Exo like out. It's giving off energy."

Transition: "So if you have a process that can absorb heat in one place, and then release it in another, you have a heat pump. So how exactly is that accomplished?"

1. "So lets go over the eat pump system... There's really only 3 main things."

    a. "Starting with the refrigerant".

        i. "The refrigerant is a fluid a very low boiling point."

        ii. "R-134a, which was a common refrigerant that's being phased out, boils at only -15f, at sea level."

    b. "You also have a hermetically sealed pipe system with a radiator on either side.

        i. "If it's a good seal, the refrigerant will never leave the system."

    c. "And finally, a compressor."

        i. "The compressor is what moves the refrigerant around the system."

        ii. "It's also what changes the pressure of the refrigerant, which is what changes its boiling point."

        iii. "The compressor is kind of the heart of the system, and it's what makes the whole thing work."

2. How it works, part 2.

    a. "So the refrigerant starts in the evaporator, which is the radiator inside your house."

        i. "The refrigerant is boiling and turning into a gas at this point, absorbing heat from the air in your house."

        ii. "There's a fan that blows the air inside your home over the evaporator, removing the heat before dumping the air back into your home."

    b. "The compressor then moves the refrigerant to the condenser, which is the radiator outside your house."

        i. "The refrigerant is a turned back into a liquid at this point, releasing the heat it absorbed inside the home, outside."

        ii. "There's also a fan that blows air over the condenser, just like inside the house."

    c. "The refrigerant then goes back to the evaporator, and the cycle repeats."

        i. "The system is actually on or off, there is no temperature setting."

        ii. "When you set a temperature on your thermostat, you're actually setting a target temperature, and the system will run until it reaches that temperature, and then turn off until it needs to run again."

Transition: "You can even reverse the process, and now you have a heater!"

1. "Many homes in warmer climates such as much of the United States simply reverse the flow of their AC system to heat their homes."

    a. "According to the U.S. Department of Energy, heat pumps have an COP or Coefficient of Performance of 3-4, meaning for ever 1 unit of energy you put in, you get 3-4 units of heat out."

        i. "This is much more efficient than a traditional electric heater, which has a COP of 1, meaning you get 1 unit of heat out for every 1 unit of energy you put in."

    b. "Can actually be used in fairly cold climates, as long as it doesn't get too cold."

        i. "According to the U.S. Department of Energy, heat pumps can be used in climates as cold as 5f, but below that, they start to lose efficiency. Thats according again to the U.S. Department of Energy."

Transition: "Heat pumps are used all over the place"

1. "Heat pumps are used all over the place"

    a. "You use multiple heat pumps every day."

        i. "Obviously your air conditioner is a heat pump."

        ii. "But so it your refrigerator."

        iii. "Any freezer you might have is a heat pump."

        iv. "And your car's air conditioner is a heat pump."

    b. "Heat pumps also have extensive industrial applications. According to the American Council for an Energy-Efficient Economy (ACEEE), heat pumps replacing many traditional heating solutions to save energy and reduce greenhouse gas emissions."

Transition: "Such an amazing feet of engineering in just we control the temperature in enclosed spaces."

Conclusion

Signal: "Now, that's just a brief overview of how heat pumps work. It can certainly get way more complicated than that."

Thesis restatement/Review/Summary: "So what did we learn? We learned that heat pumps are a way to move heat from one place to another, and that they're used in a lot of places you might not expect."

Clincher/WOW Statement: "Such a relatively simply harnessing of physics has revolutionized our lives, it's all around us, and yet we hardly ever think about it."

Works Cited

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