



Cargo Tank 101: Insulation Options

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Tank Trailer Insulation

- Heat Transfer Principles
- Typical Insulation Options
- Important Considerations

Heat Transfer Principles



- Heat transfer into, or out of a body based on:
 - Time
 - A shorter duration results in less temperature change
 - Mass of the body (product)
 - More product resists change to temperature
 - Specific heat
 - Products with higher specific heat values resists temperature better

Heat Transfer Principles



- Temperature differential
 - Products at less difference with atmospheric change temperature slower
- Resistance to transfer
 - More resistance causes slower temperature change
- So, which of these can you control?

Resistance to Transfer

- Principle
 - Provide longest path for heat to move between product and atmosphere.



Insulating Materials

- Fiberglass batt
 - $R \approx 3\text{-}4/\text{in.}$
 - $\text{Wt} = \frac{3}{4} \text{ to } 1 \text{ \#/ft}^3$
 - Rated for very high temperatures
 - Good balance of weight, cost, insulating value
 - Risk of loss of insulating value with moisture



Insulating Materials

- Polyisocyanurate-modified polyurethane (aka “polyiso”, “Trymer”)
 - $R \approx 4/\text{in.}$
 - $\text{Wt} = 2 \text{ \#/ft}^3$
 - Rated for 300°F
 - Heavier weight, better insulator
 - Rigid foam provides support to jacket
 - Risk of breakdown at high temperatures



Insulating Materials

- Mineral wool (aka, "Roxul")
 - $R \approx 4/\text{in.}$
 - $\text{Wt} = 8 \text{ \#/ft}^3$
 - Rated for very high temperatures
 - Very heavy weight, moderate insulator
 - Rigidity provides support to jacket
 - Risk of loss of insulating value with moisture

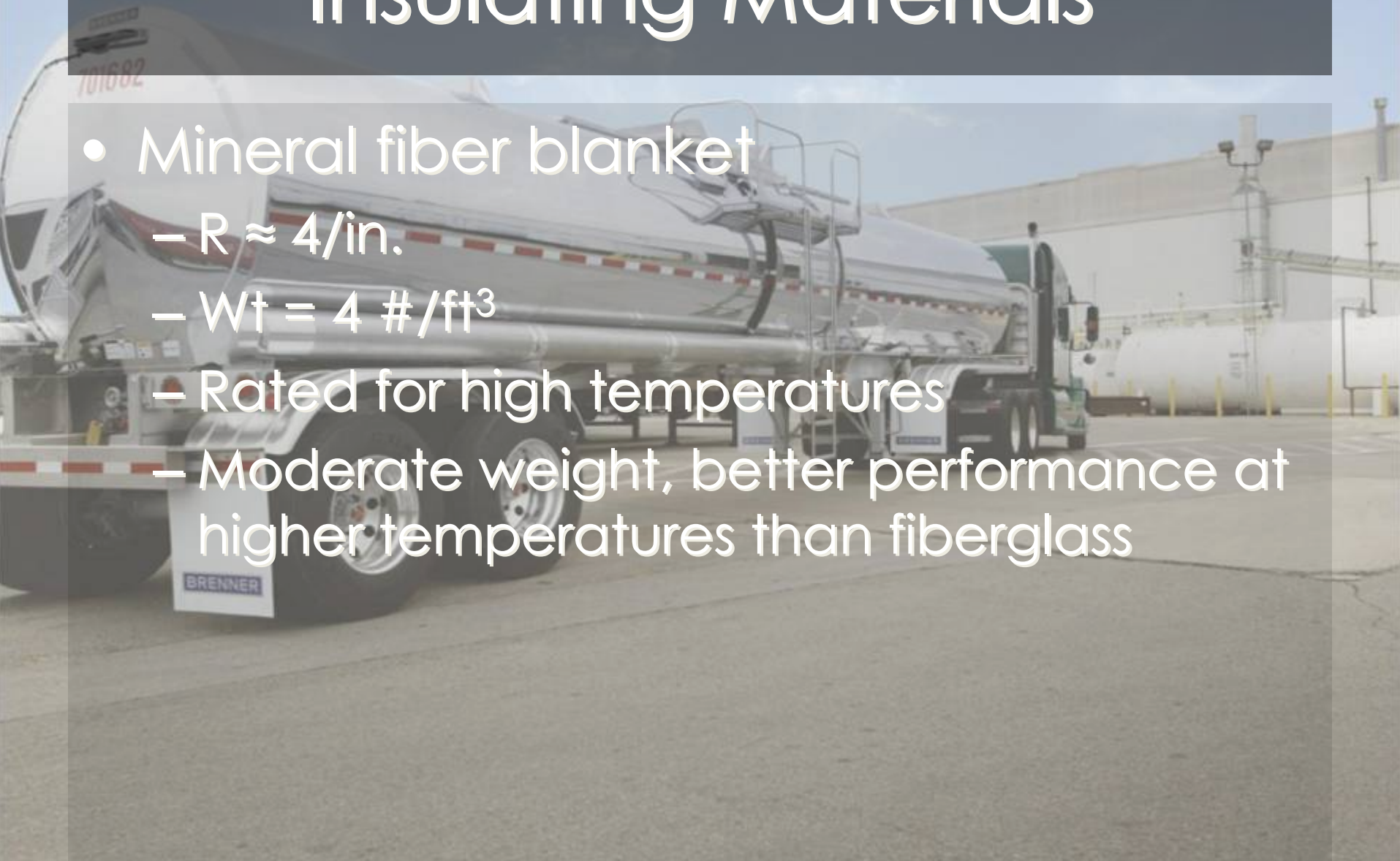


Insulating Materials

- Expanded Polystyrene (aka, “EPS”, “Styrofoam”)
 - $R \approx 4/\text{in.}$
 - $\text{Wt} = 0.9 \text{ \#/ft}^3$
 - Rated for 150°F
 - Light weight, fair insulator
 - Rigid foam provides support to jacket
 - Risk of breakdown at high temperatures

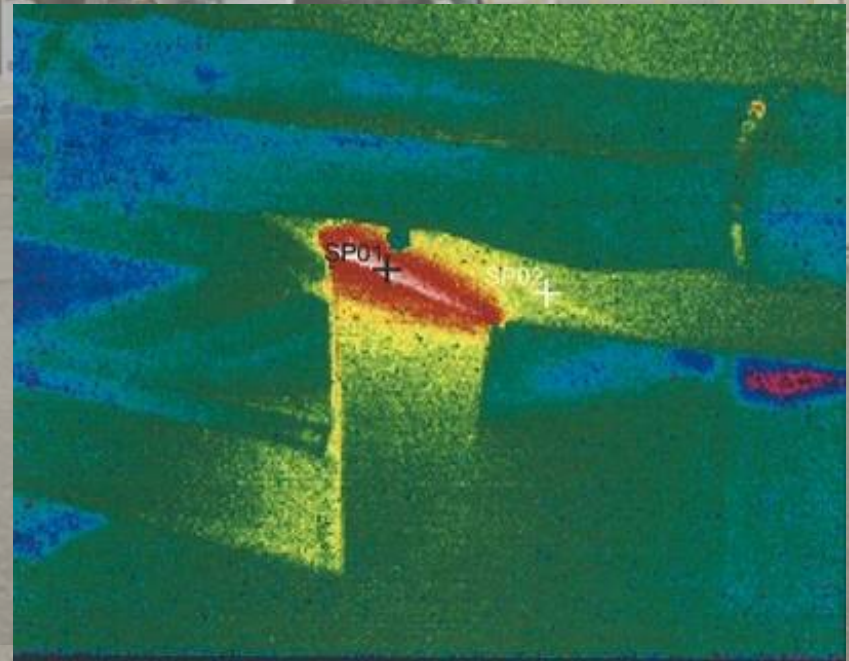
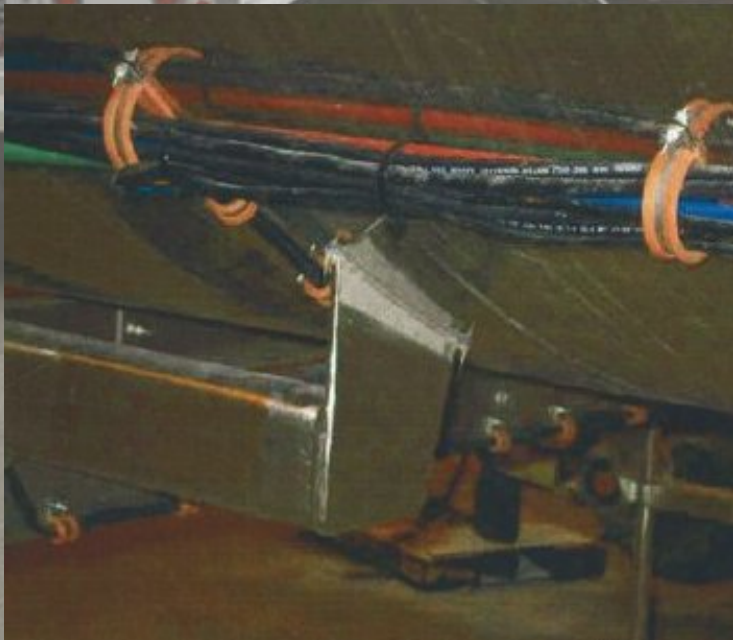
Insulating Materials

- Mineral fiber blanket
 - $R \approx 4/\text{in.}$
 - $\text{Wt} = 4 \text{ \#/ft}^3$
 - Rated for high temperatures
 - Moderate weight, better performance at higher temperatures than fiberglass



Considerations

- Insulation over majority of surface area reaches diminishing returns
 - After this point “heat sinks” become major source of transfer.



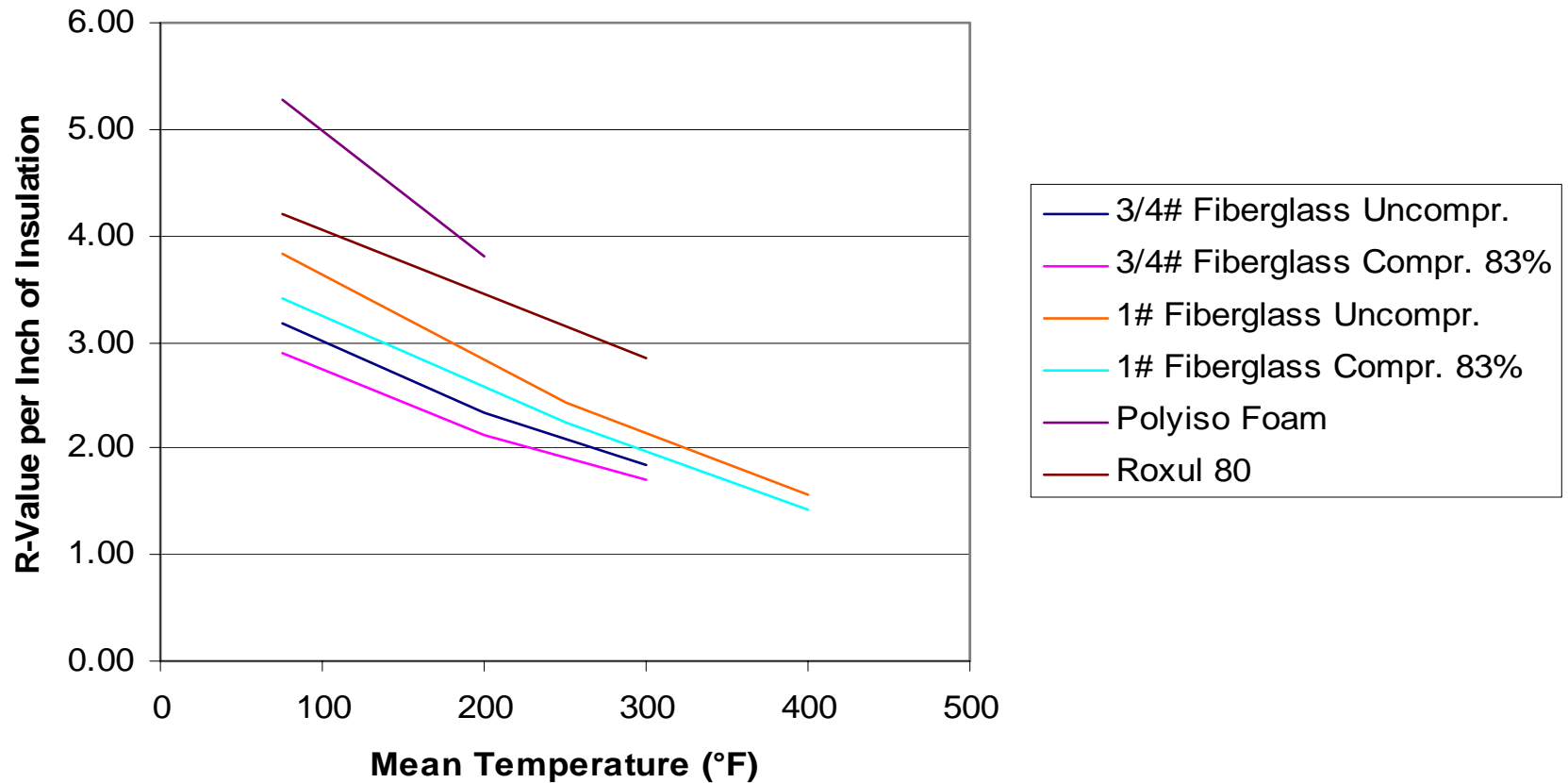
Considerations

- Insulating materials are spec'd at nominal conditions:
 - Uncompressed
 - Ambient temperatures
 - Compression and high temp. can have significant impact on performance



Considerations

R-Values of Insulation



The “Best” System

- The ideal insulation package is a balance of cost, weight, operational considerations *and* R-value
- Work with your manufacturer to see what experiences they’ve had and what they recommend for your situation.

Questions?

