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## **The Effects of Fin Spacing and Tube Outer Diameter of Evaporator on System Performance in Heat Pump Tumble Dryers**

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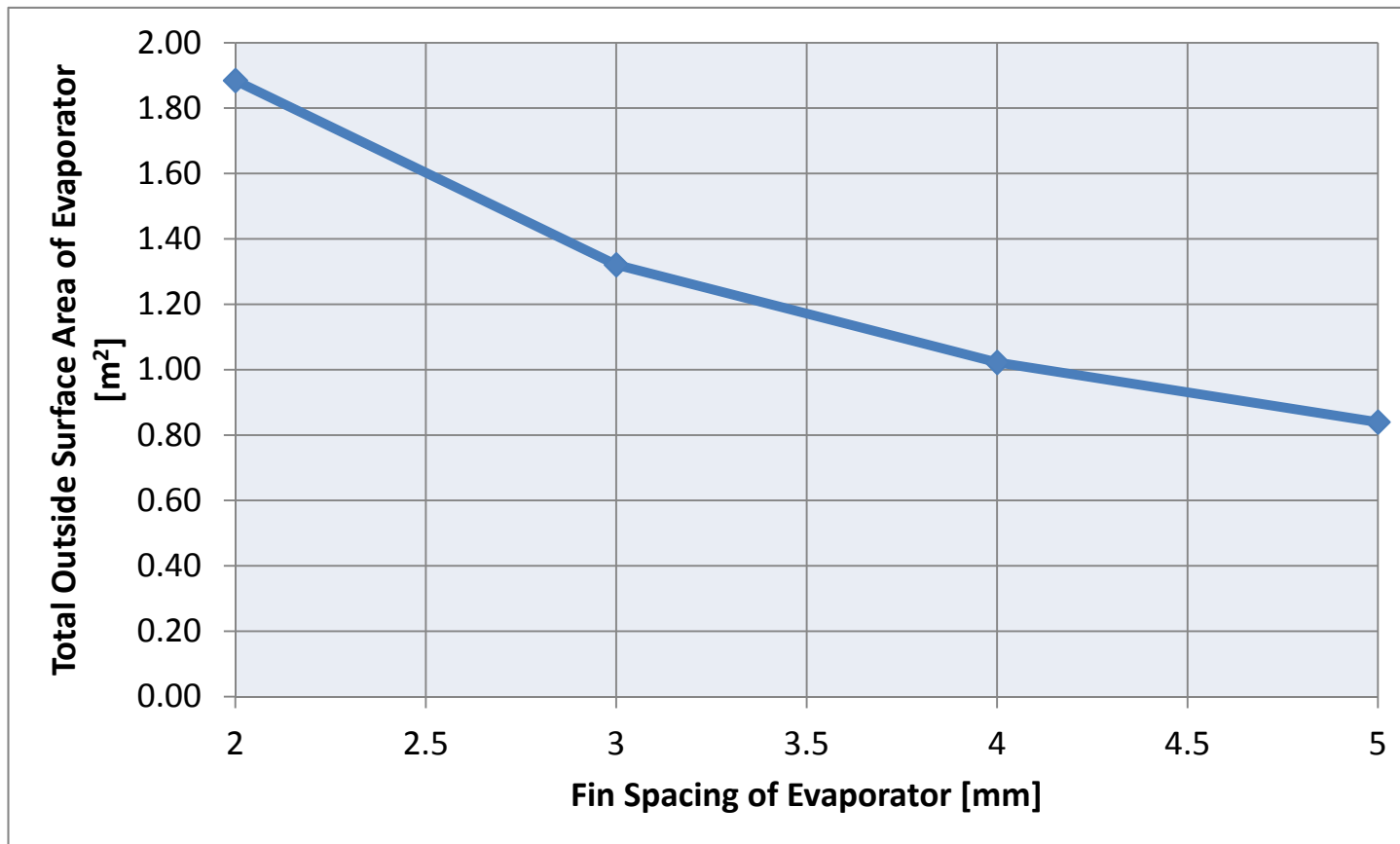
# Introduction

- In heat pump tumble dryers, moisture separates from the laundry and leaves the dryer system at the evaporator.
- Fin-and-tube heat exchangers are used as evaporators in household heat pump tumble dryers.
- In addition to optimum operating conditions, optimum evaporator geometry can significantly affect the system performance.
- This study puts forward the effect of fin spacing and tube outer diameter of fin-and-tube evaporator on the performance of heat pump tumble dryer.

# The Effects of Fin Spacing of Evaporator

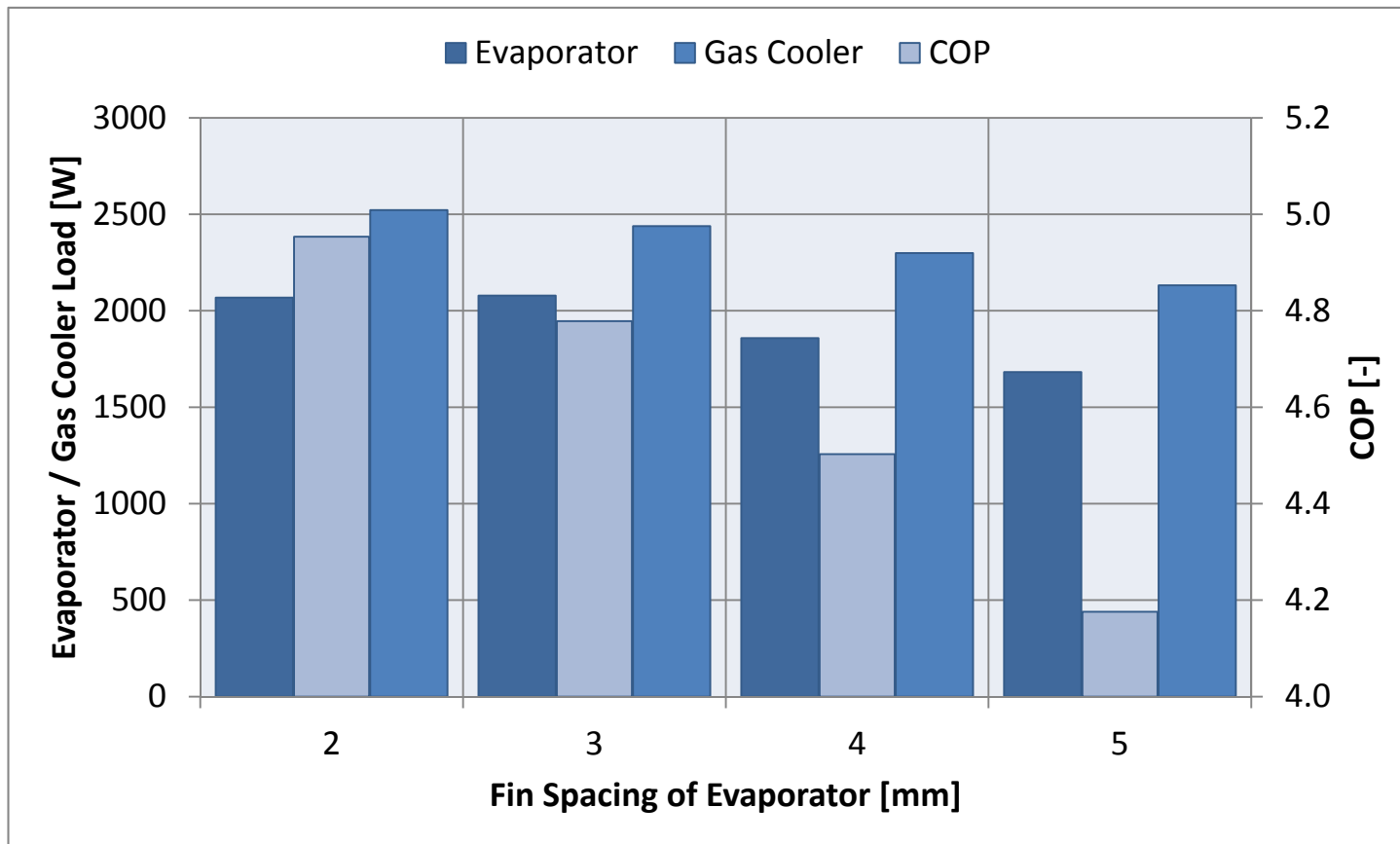
- In heat pump tumble dryers, outer geometric limitations for heat exchangers are certain because heat exchangers are installed in a fixed place. Consequently, when fin spacing increased (2–5 mm), total outside surface heat transfer area of evaporator decreased.

# The Effects of Fin Spacing of Evaporator



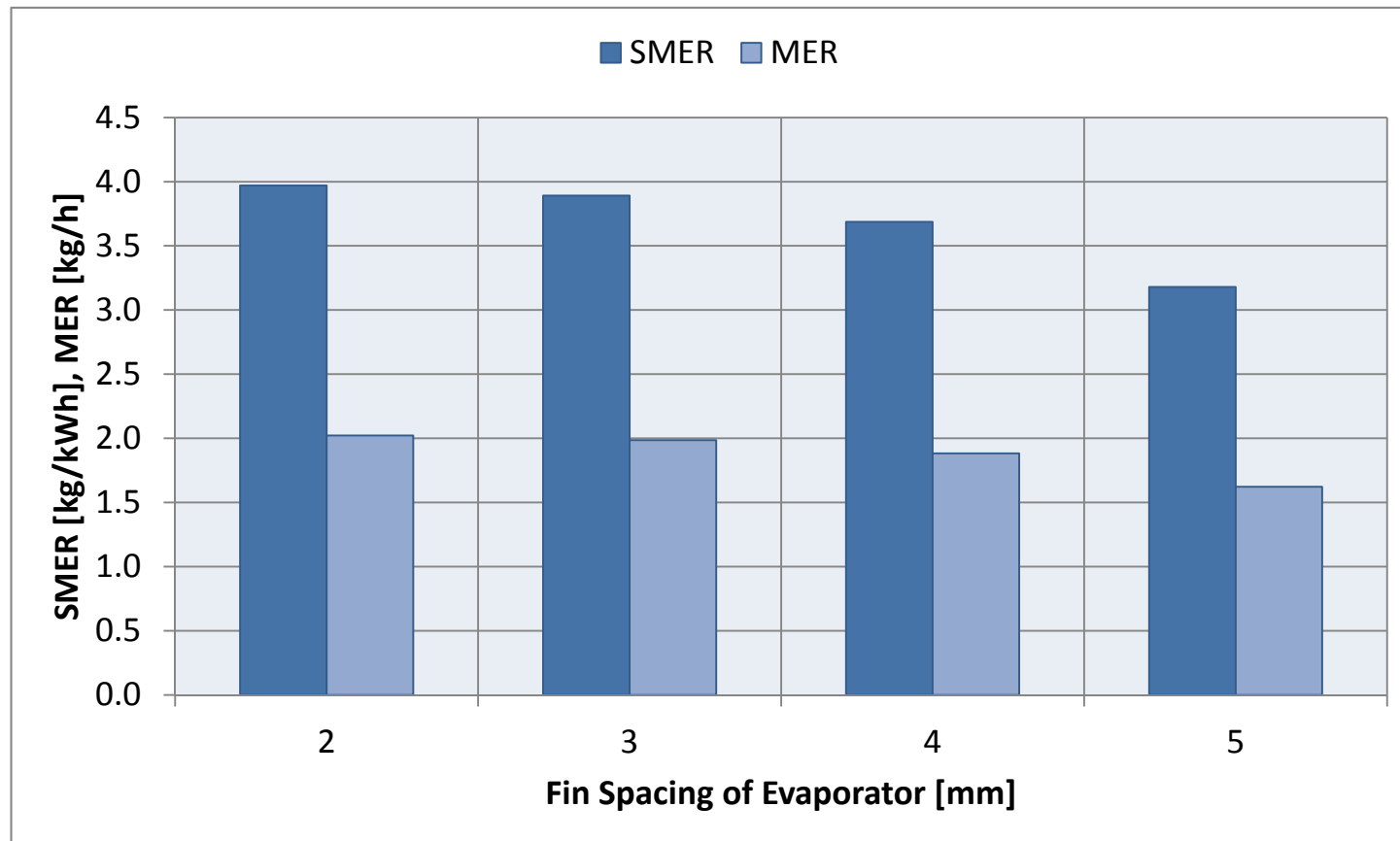
Total outside surface heat transfer area of evaporator depending on fin spacing of evaporator

# The Effects of Fin Spacing of Evaporator



Evaporator / gas cooler load and COP of heat pump dryer depending on fin spacing of evaporator

# The Effects of Fin Spacing of Evaporator

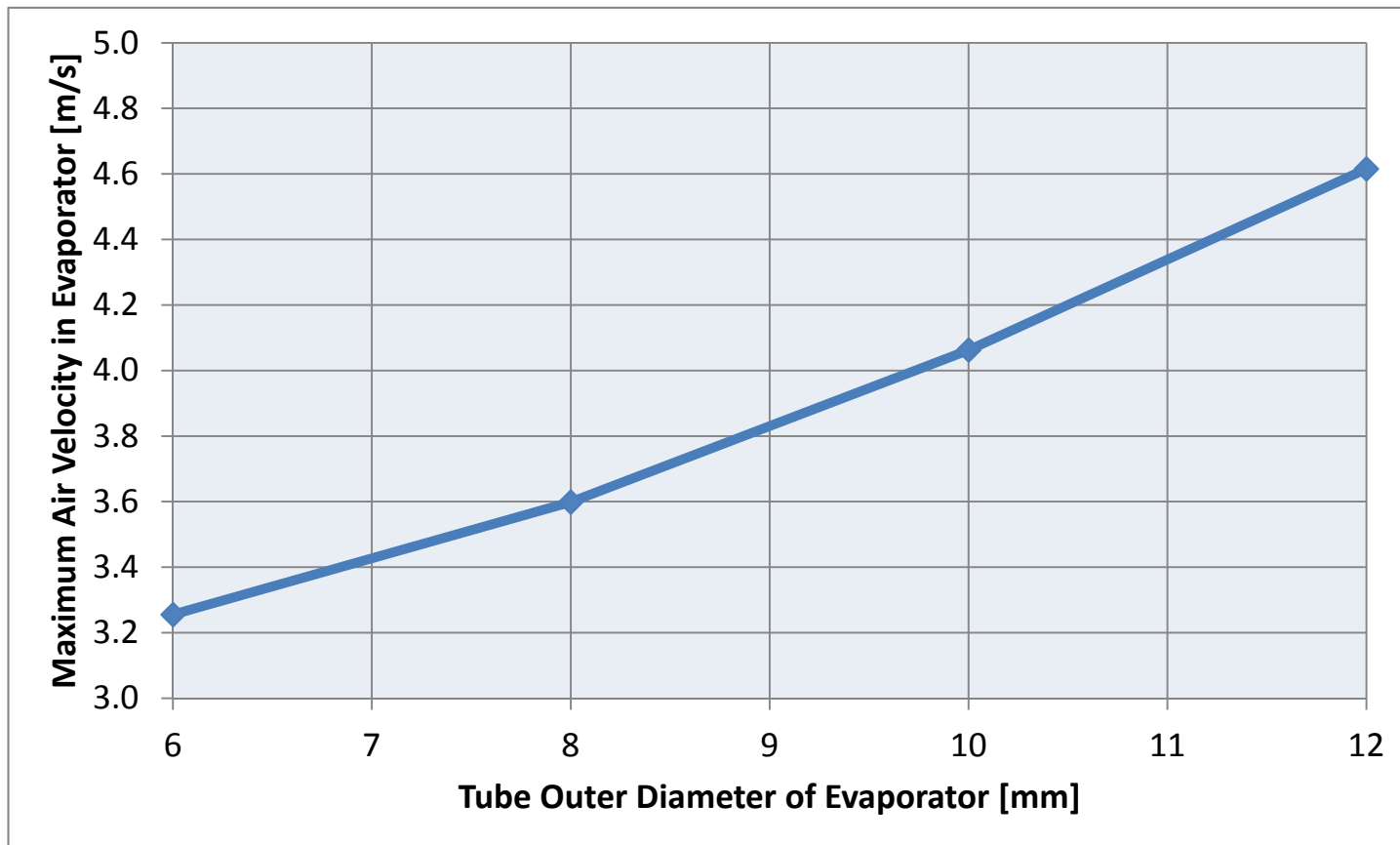


SMER and MER of heat pump dryer depending on fin spacing of evaporator

# The Effects of Tube Outer Diameter of Evaporator

- The cross-sectional area that air passes through is decreasing with increasing tube outer diameter in fin-and-tube heat exchangers. This contraction, which occurs in area, yields increase in maximum air velocity.

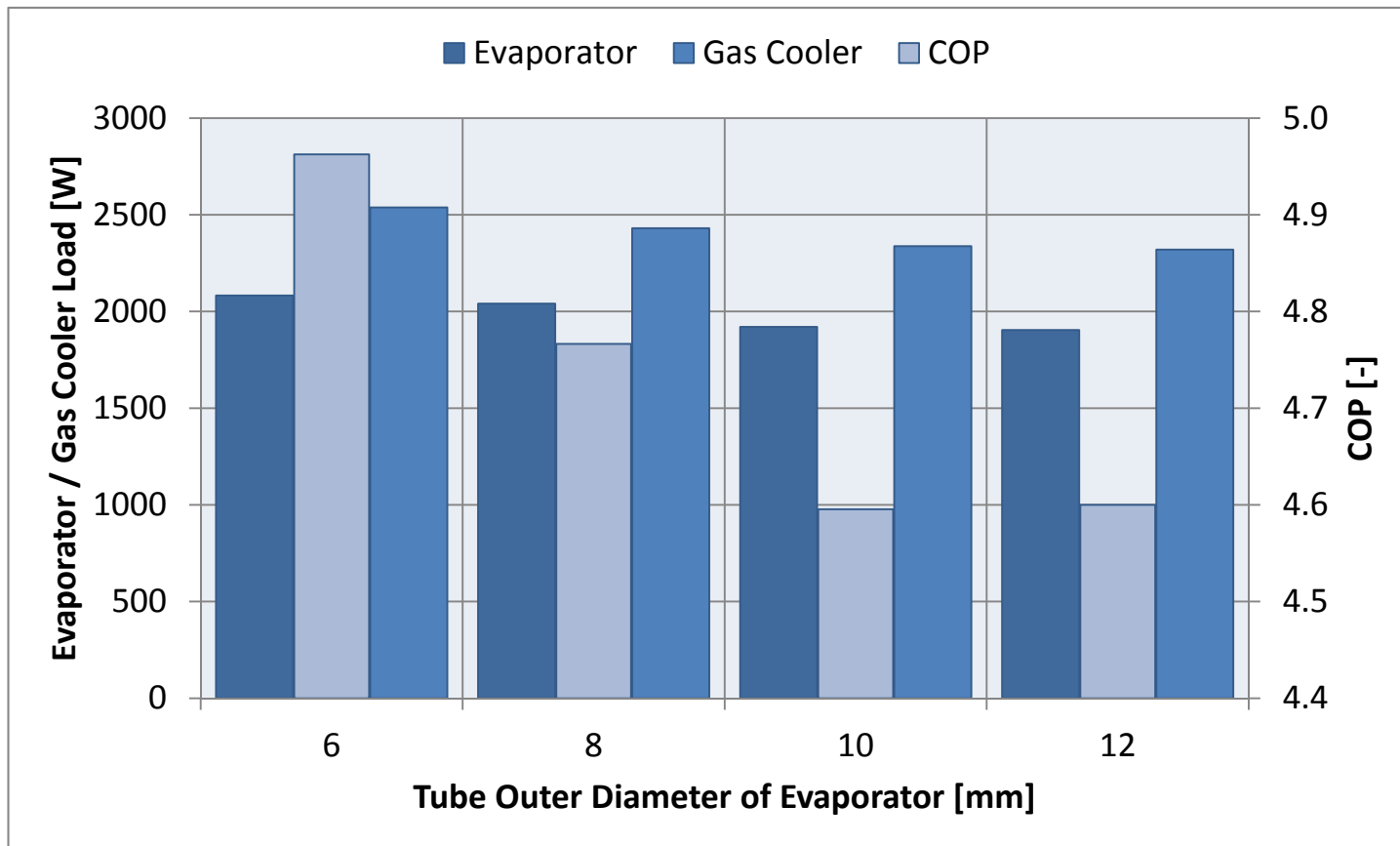
# The Effects of Tube Outer Diameter of Evaporator



Change of maximum air velocity in evaporator depending on tube outer diameter of evaporator

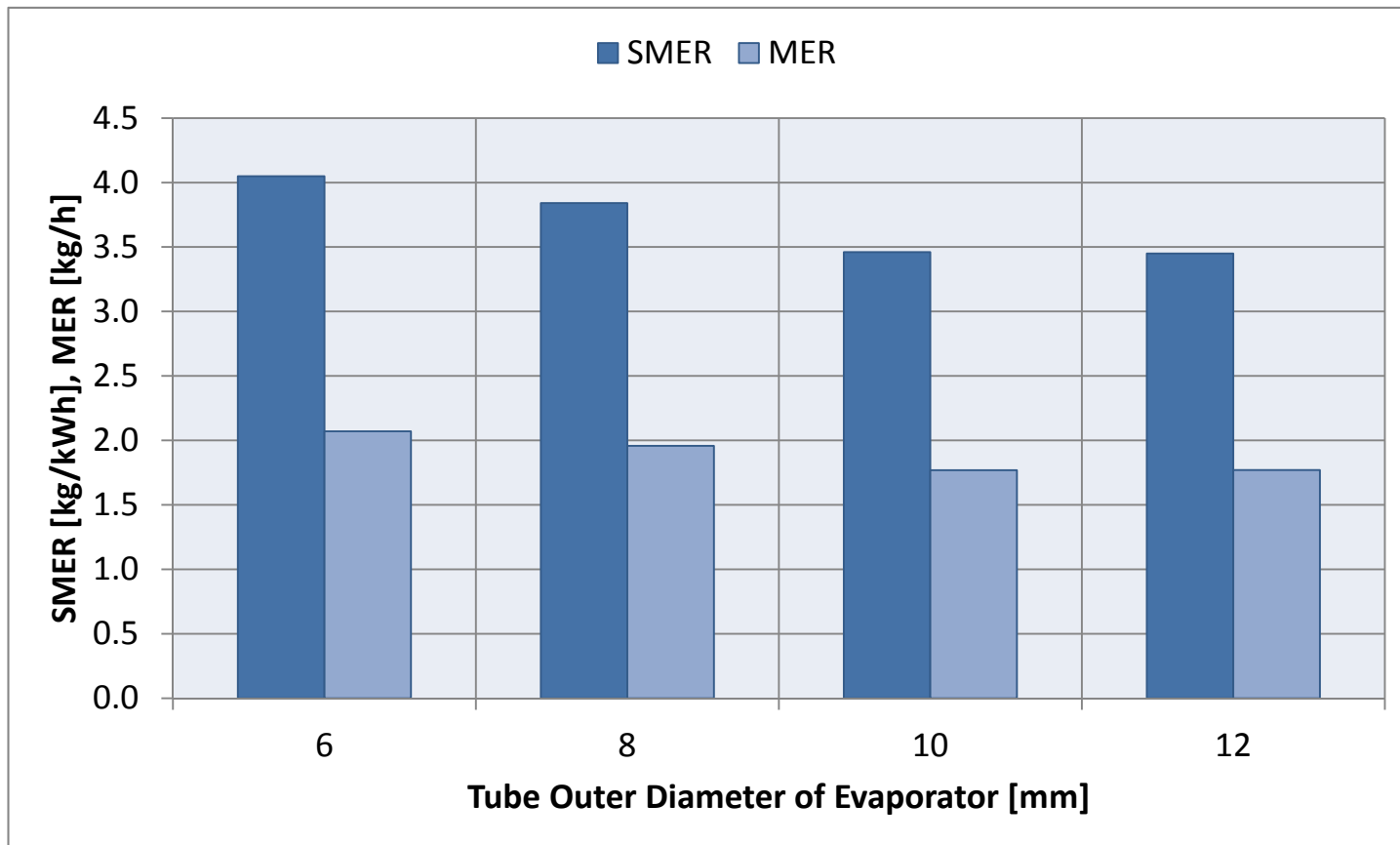


# The Effects of Tube Outer Diameter of Evaporator



Evaporator / gas cooler load and COP of heat pump dryer depending on tube outer diameter of evaporator

# The Effects of Tube Outer Diameter of Evaporator



SMER and MER of heat pump dryer depending on tube outer diameter of evaporator

## Conclusions

- Evaporator geometry is highly related with energy consumption and drying time in heat pump tumble dryers.
- Effects of fin spacing (2–5 mm) and tube outer diameter (6–12 mm) of evaporator were determined.
  - COP increased 16% when fin spacing of evaporator decreased from 5 mm to 2 mm.
  - SMER and MER increased 20% when fin spacing of evaporator decreased from 5 mm to 2 mm.
  - COP increased 7% when tube outer diameter of evaporator decreased from 12 mm to 6 mm.
  - SMER and MER increased 15% when tube outer diameter of evaporator decreased from 12 mm to 6 mm.

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- **THANK YOU...**