Model and Experimental Thermo Review

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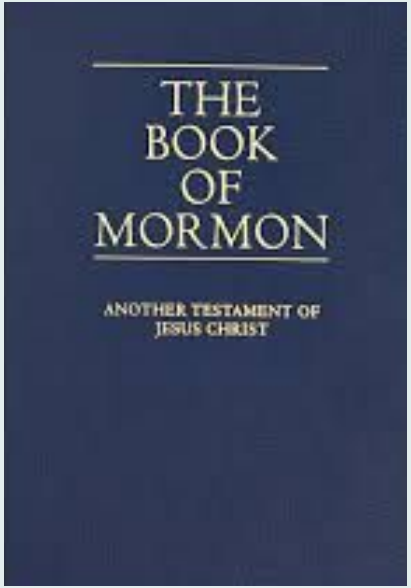


And moreover, I would desire that ye should consider on the blessed and happy state of those that keep the commandments of God. For behold, they are blessed in all things, both temporal and spiritual; and if they hold out faithful to the end they are received into heaven, that thereby they may dwell with God in a state of never-ending happiness. O remember, remember that these things are true; for the Lord God hath spoken it.

-Mosiah 2:41, King Benjamin

Spiritual Message

What Makes a Great Engineer?

01

CHRISTLIKE COVENANT KEEPER

02

CRITICAL THINKING

03

VERIFY MULTIPLE WAYS

04

SEE POSSIBILITIES

05

MASTER FUNDAMENTALS

(Interdisciplinary)

06

CONTINUAL LEARNING

(Free Time)

05

Master Fundamentals: Thermodynamics

Energy Balance
Mass Balance

Emptying a Compressed Gas Cylinder

01

Complete the Model

Predict the pressure and temperature as a function of time

02

Compare to Experiment

Compare the model result to the experimental result

difluoroethane

01 Complete the Model

Write on the board the **energy and mole balances** for the transient system (assume adiabatic can and ideal gas)

01 Complete the Model

Manipulate the equations so that the we have expressions of the **derivatives** of moles and temperature

List the **property data** we need

01 Complete the Model

Generate a prediction: use python and an integrator to plot temperature and pressure as a function of time

Found here:
https://github.com/clint-bg/ventingVapor

Emptying a Compressed Gas Cylinder

01

Complete the Model

Predict the pressure and temperature as a function of time

02

Compare to Experiment

Compare the model result to the experimental result

02 Compare to Experiment

Discharge some of the CleanDr. contents and measure the temperature

02 Compare to Experiment

Safety Concerns?

Before you do anything physically (or spiritually), you should ask yourself this important question.

Safety Concerns?

How much would need to be dispensed to reach the flammability limit (3.5%)?

How much would need to be dispensed to reach the LC50 value of 977 gm/m3?

Flammability Limit

What is the flammable range?
Where would the flammability limit be reached?
If I assume immediate dispersion, how much needs to be dispensed to reach the lower flammability limit?

What would happen if the flammability limit were reached inside the room and it were to be ignited? How could it be ignited?

Toxicity Limit

What is the LC50?

What does LC50 mean?

See Google Colab Sheet

Also found here:
https://github.com/clint-bg/ventingVapor

02 Compare to Experiment

02 Compare to Experiment

How does the model compare to the experimental result?

02 Compare to Experiment

What conclusions can you draw from the **comparison** of the **experimental** results and the **model** results?

01 Modify the Model

Add in additional behavior

Manipulate the equations so that the we have expressions of the **derivatives** of moles and temperature for each phase and include heat transfer

02 Compare to Experiment

How does the model compare to the experimental result now?

How could it be improved further?

What did you learn?

02 Compare to Experiment

How does the model compare to the experimental result now?

How could it be improved further?

What did you learn?

Would someone like to add in the mass data?

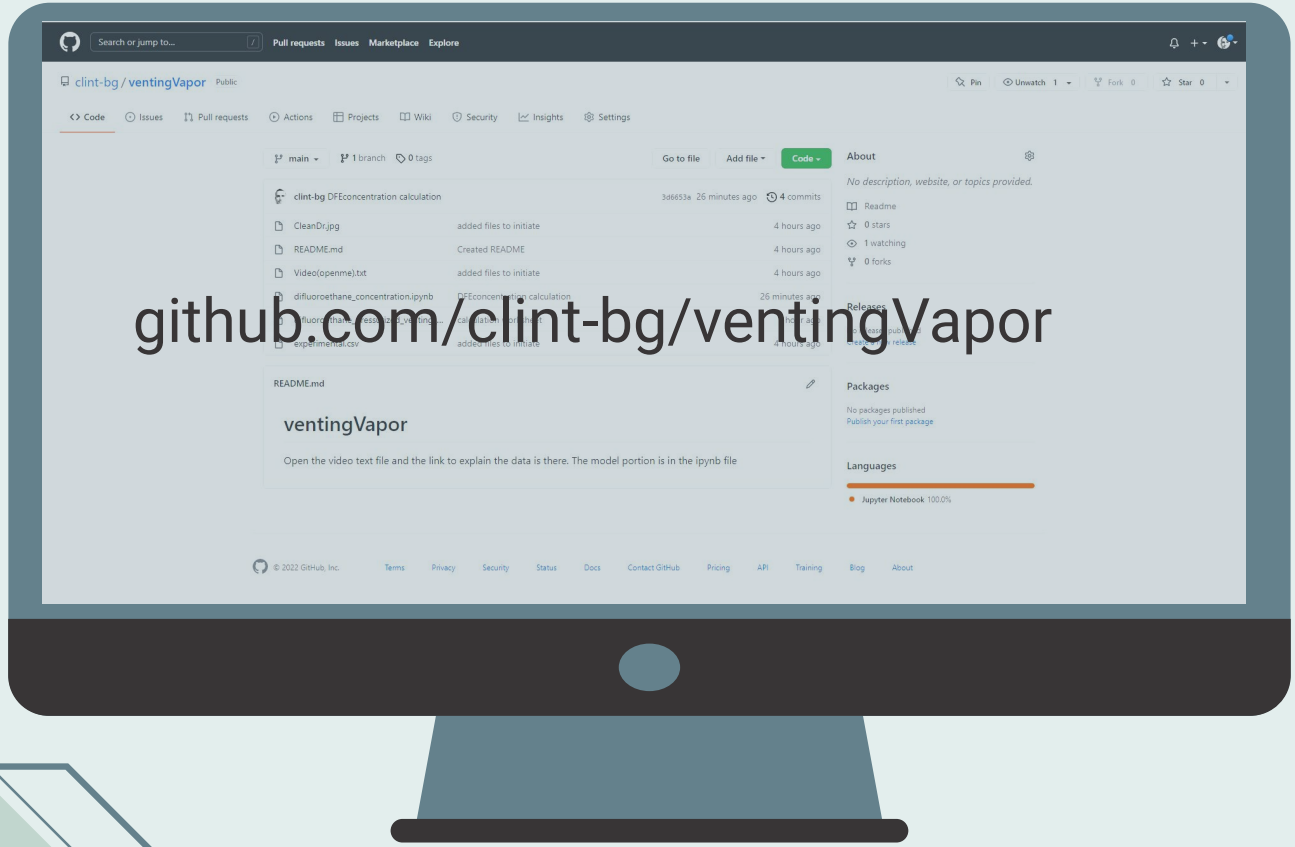
05

Master Fundamentals: Thermodynamics

Understanding fundamental principles (with lots of practice) will help you and I be better engineers

Coupling models with experiment can help tremendously in understanding processes

PUBLISHED RESULTS



github.com/clint-bg/ventingVapor

THANKS!

Do you have any questions?

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