

Abstract

The imminent global goal in forging a sustainable future has led to an increase in demand for efficient utilization of resources. Industrial waste heat recovery has emerged as a significant avenue to achieve proper utilization of thermal energy that is dissipated as a by-product of industrial processes. Minimizing and recovering waste heat presents a valuable opportunity to enhance efficiency, decrease energy expenses, and potentially reduce maintenance expenditures. Case New Holland aims to harness waste heat from its curing oven to heat a shipping and receiving area via an HVAC system, with the goal of curbing natural gas expenses.

Project Background

- Continuous Process cure oven is dissipating waste heat to the surrounding area in the plant
- At the exit of the oven, parts are already cured and need to cool down to go to the next assembly process.
- Heat from the oven needs to be reused to heat the nearby shipping and receiving area

Objectives/Goals

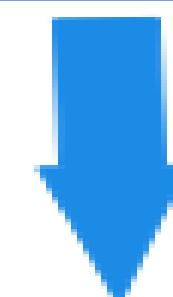
- Design an HVAC(ventilation) system of how to capture the heat that is vented from the paint line
- Analysis of system using CFD(ANSYS Fluent)
- Bill of materials
- Payback analysis

Methodology

- Sensible Heat Load calculations
- Duct sizing using equal friction method
- Duct Support Hangers
- Fan sizing
- Humidification
- Diffusers for exits
- CAD Modelling of the duct
- CFD analysis(ANSYS Fluent)

Heat Recovery process

SOURCE OF WASTE HEAT
(Hot gas from curing oven)



Recovery Technology
(HVAC/ Ventilation system)

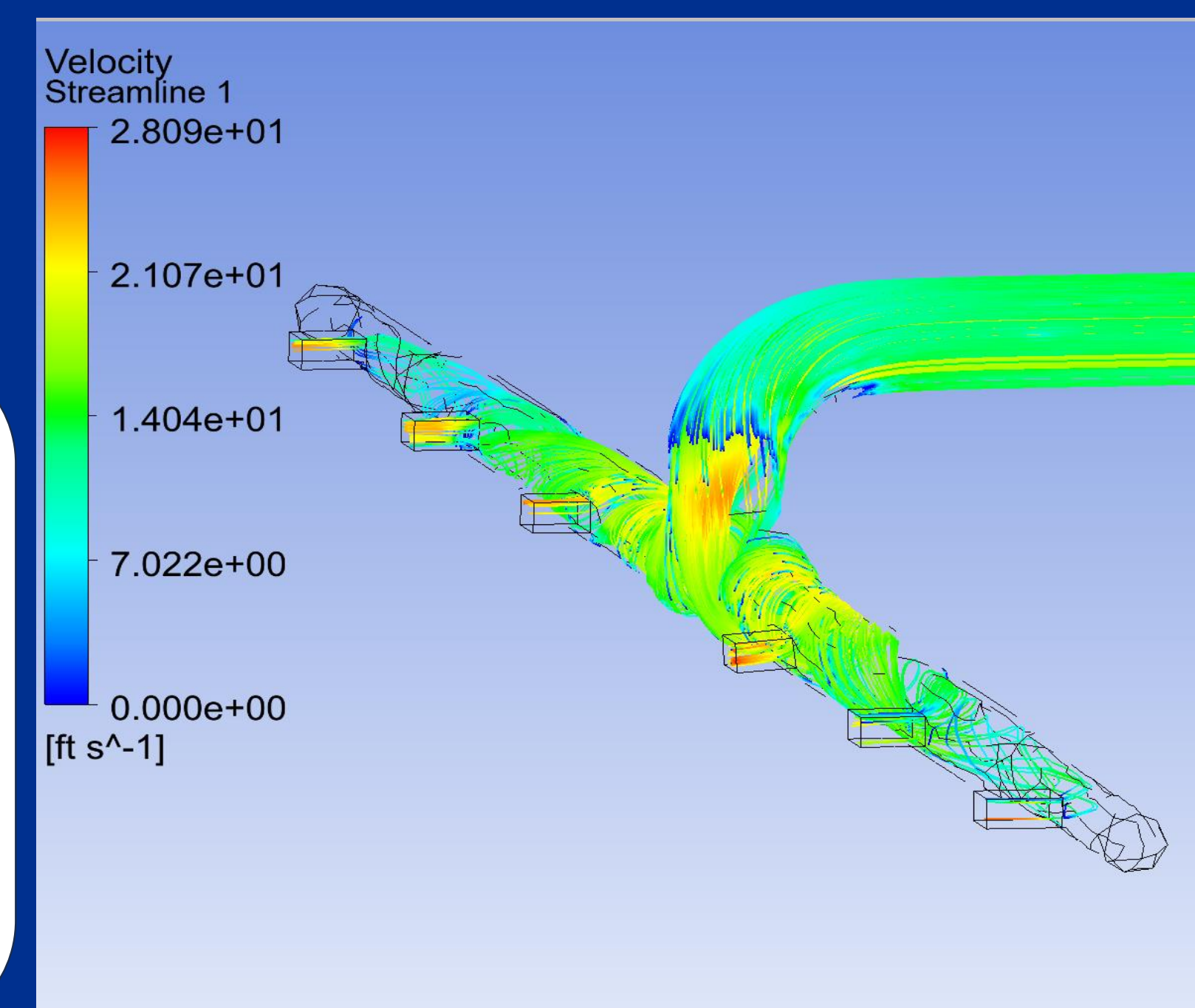
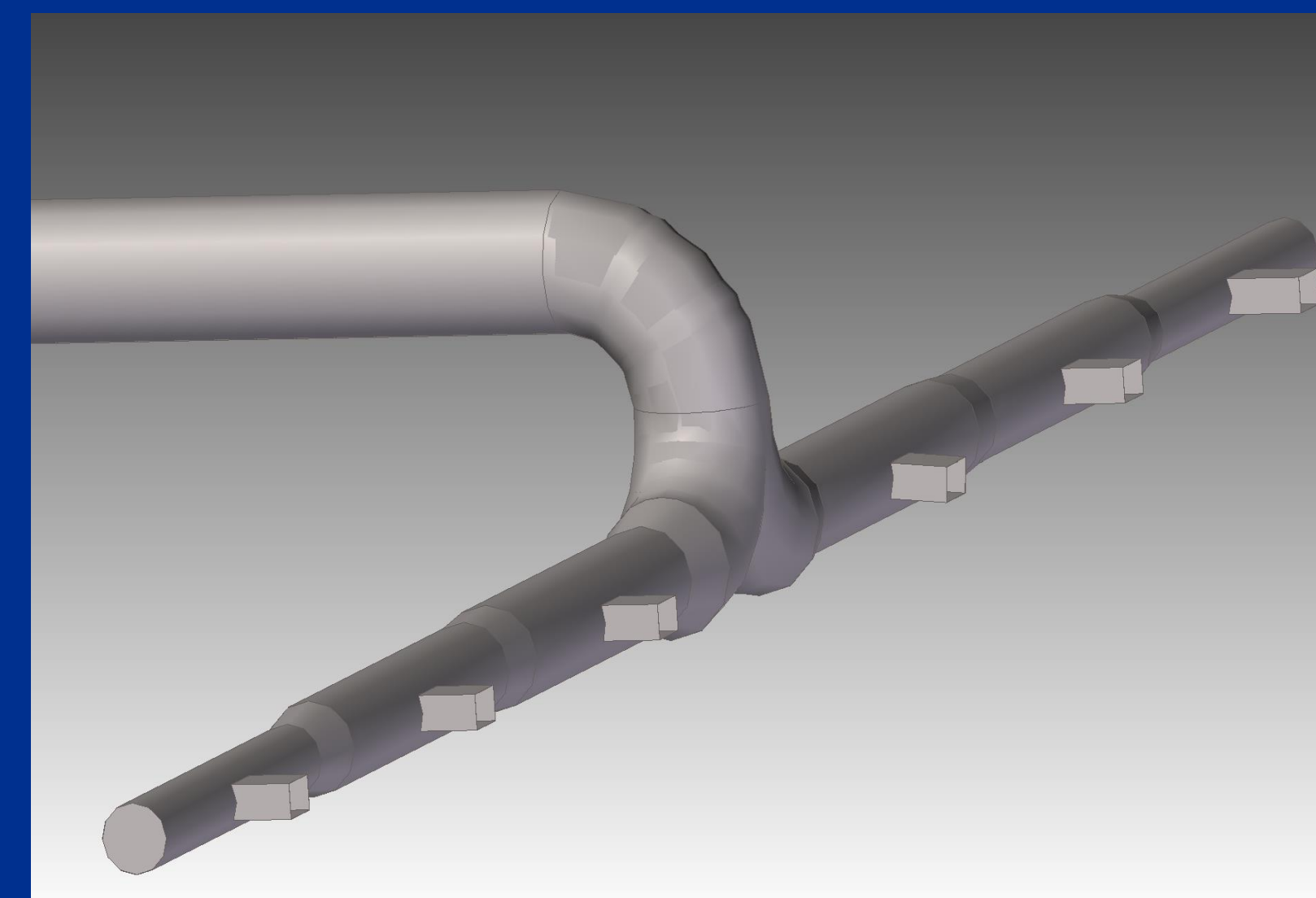
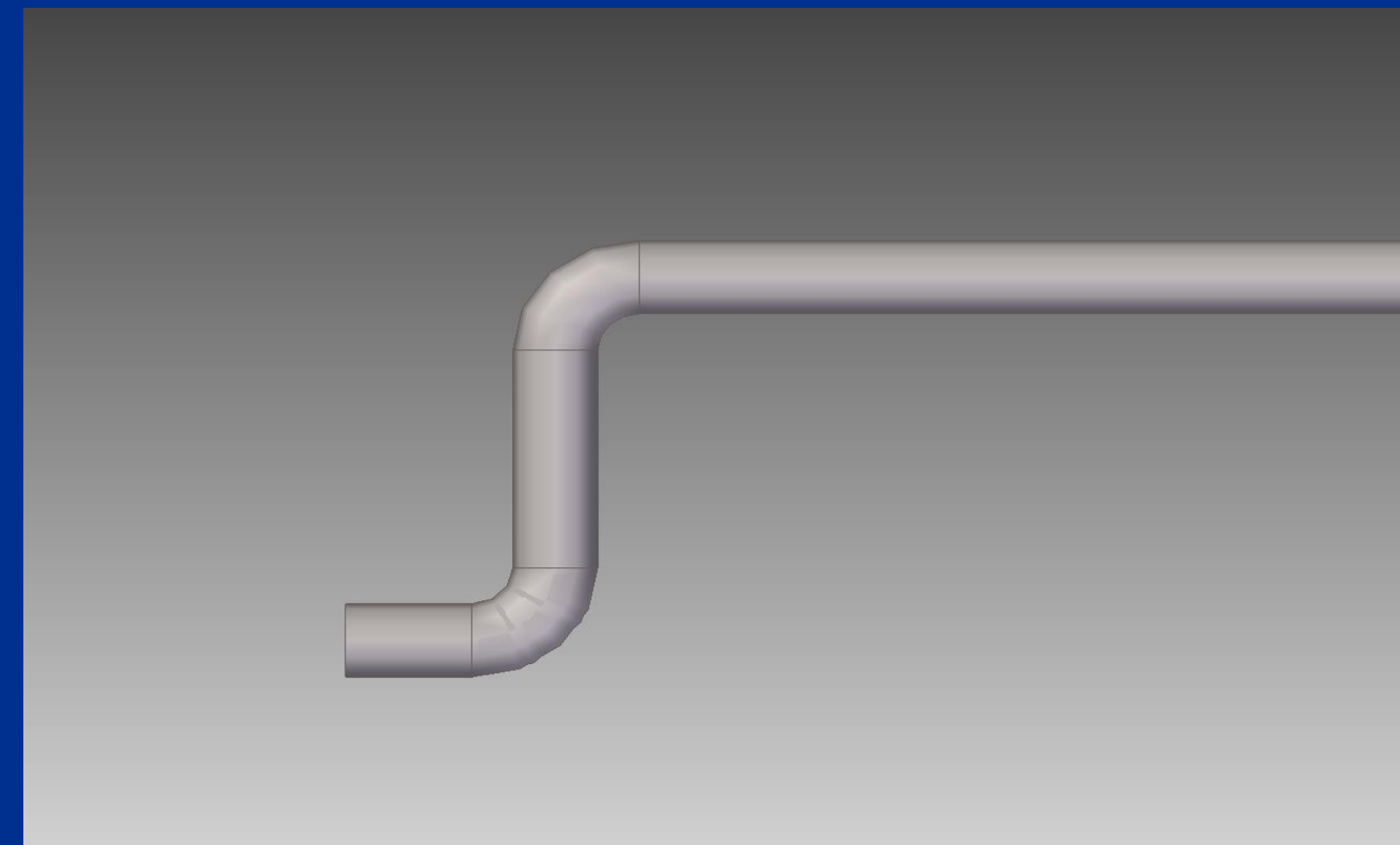


End use for Recovered Heat
Heating shipping and receiving area during winter

Contacts

Emmanuella Owusu
emmanuelao901@gmail.com
6395906219
James Theuri
jkt804@uregina.ca
Steve Githinji
stevemarsh865@gmail.com

CAD models and CFD analysis



Cost Breakdown

- \$1,962.89 worth of natural gas saved in one year
- Total cost plus labor - \$11,946
- Annual Savings - \$1,963
- Expected Payback period – 6 years

Conclusion

CNH tends to use around \$5,882 per year on natural gas for heating the shipping and receiving area in the west wing plant. The main objective of the project is to substitute two heaters with our heat recovery system that will cost \$11,946 to install and operate. This will help save on energy cost and reduce the company's carbon footprint greatly by using the already existing waste heat. A payback period of 6 years was determined. The potential to re-use the waste heat from the Paint line and replace the heaters is feasible.

Acknowledgements

- Dr Amr Henni, University of Regina
- Landon Kohle, CNH Industrial
- Conrad Smith, Rockford Engineering Works Ltd
- Dr. Robert Jones, University of Regina
- Dr Andy Aroonwilas, University of Regina