In [ ]:
```
# get_prop from the natural gas property package
from idaes.models_extra.power_generation.properties.natural_gas_PR import get_prop
# Property package for water and steam
from idaes.models.properties import iapws95
from idaes.models.properties.iapws95 import htpx


# Other imports necessary for add_properties function
from idaes.models.properties.modular_properties.base.generic_property import (
    GenericParameterBlock,
)

# Import Pyomo libraries
from pyomo.environ import (
    ConcreteModel,
    units as pyunits,
)

# Import IDAES core
from idaes.core import FlowsheetBlock
from idaes.core.util.model_statistics import degrees_of_freedom
import idaes.core.util.scaling as iscale

from idaes.models_extra.power_generation.unit_models.boiler_heat_exchanger import (
    HeatExchangerFlowPattern,
)
# Import standard unit models
from idaes.models.unit_models import (
    HeatExchanger,
)

from idaes.core.solvers import get_solver
```

In [ ]:
```
m = ConcreteModel()
m.fs = FlowsheetBlock(dynamic=False)
```

In [ ]:
```
def add_properties(
        fs,
        flue_species={"O2", "H2O", "CO2", "N2", "Ar"},

    ):
        """Add property parameter blocks"""

        fs.flue_species = flue_species

        fs.water_prop_params = iapws95.Iapws95ParameterBlock()

        fs.flue_prop_params = GenericParameterBlock(
            **get_prop(flue_species, ["Vap"]),
            doc="Flue gas property parameters",
        )
```

In [ ]:
```
add_properties(m.fs)
```

In [ ]:
```
m.fs.ECON = HeatExchanger(
        hot_side_name = "shell",
        cold_side_name = "tube",
        shell={"property_package": m.fs.flue_prop_params,
            "has_pressure_change":True},
```

```
        tube={"property_package": m.fs.water_prop_params,
             "has_pressure_change":True}, #need to determine steam pressure
        flow_pattern = HeatExchangerFlowPattern.countercurrent,
)
```

In [ ]:
```
def set_initial_conditions(fs):

    hp_steam_P = 70e5
    feedwater_temp = 353.15
    flow = 93.064

    def _set_steam_port(port, enth_mol, pressure, flow, fix=False):
        port.enth_mol[:].set_value(enth_mol)
        port.pressure[:].set_value(pressure)
        port.flow_mol[:].set_value(flow)
        if fix:
            port.fix()

    fs.ECON.overall_heat_transfer_coefficient.fix(1000)
    fs.ECON.hot_side.deltaP.fix(-0.01 * 1e5)
    fs.ECON.cold_side.deltaP.fix(-1.4e5)
    fs.ECON.cold_side.properties_in[0.0].enth_mol.fix(
        htpx(T=(273+75)*pyunits.K, P=(hp_steam_P+1e5*(1.4+0.68+0.12))*pyunits.Pa)
    )
    fs.ECON.cold_side.properties_in[0.0].pressure.fix(hp_steam_P+1e5*(1.4+0.68+0.12))
    fs.ECON.cold_side.properties_in[0.0].flow_mol.fix(flow)
    fs.ECON.area.fix(28.398)

    fs.ECON.hot_side.properties_in[0].temperature.fix(509.43)
    fs.ECON.hot_side.properties_in[0].pressure.fix(102000)
    fs.ECON.hot_side.properties_in[0].flow_mol.fix(344.279)
    fs.ECON.hot_side.properties_in[0].mole_frac_comp['Ar'].fix(0.008286357815539198)
    fs.ECON.hot_side.properties_in[0].mole_frac_comp['CO2'].fix(0.17544779593875964)
    fs.ECON.hot_side.properties_in[0].mole_frac_comp['H2O'].fix(0.03895060489046574)
    fs.ECON.hot_side.properties_in[0].mole_frac_comp['N2'].fix(0.6972566725224949)
    fs.ECON.hot_side.properties_in[0].mole_frac_comp['O2'].fix(0.08005856883274051)
```

In [ ]:
```
set_initial_conditions(m.fs)
degrees_of_freedom(m)
```

Out[ ]:
```
0
```

In [ ]:
```
m.fs.ECON.initialize()
```

```
2024-09-06 13:11:34 [INFO] idaes.init.fs.ECON.hot_side.properties_in: Starting initialization
2024-09-06 13:11:34 [INFO] idaes.init.fs.ECON.hot_side.properties_in: Property initialization: op
timal - Optimal Solution Found.
2024-09-06 13:11:34 [INFO] idaes.init.fs.ECON.hot_side.properties_out: Starting initialization
2024-09-06 13:11:35 [INFO] idaes.init.fs.ECON.hot_side.properties_out: Property initialization: o
ptimal - Optimal Solution Found.
2024-09-06 13:11:35 [INFO] idaes.init.fs.ECON.hot_side: Initialization Complete
2024-09-06 13:11:35 [INFO] idaes.init.fs.ECON.cold_side: Initialization Complete
2024-09-06 13:11:35 [INFO] idaes.init.fs.ECON: Initialization Completed, optimal - Optimal Soluti
on Found
```

In [ ]:
```
solver = get_solver()
result = solver.solve(m, tee=True)
```

```
Ipopt 3.13.2: nlp_scaling_method=gradient-based
tol=1e-06
max_iter=200


******************************************************************************
This program contains Ipopt, a library for large-scale nonlinear optimization.
 Ipopt is released as open source code under the Eclipse Public License (EPL).
         For more information visit http://projects.coin-or.org/Ipopt

This version of Ipopt was compiled from source code available at
    https://github.com/IDAES/Ipopt as part of the Institute for the Design of
    Advanced Energy Systems Process Systems Engineering Framework (IDAES PSE
    Framework) Copyright (c) 2018-2019. See https://github.com/IDAES/idaes-pse.

This version of Ipopt was compiled using HSL, a collection of Fortran codes
    for large-scale scientific computation.  All technical papers, sales and
    publicity material resulting from use of the HSL codes within IPOPT must
    contain the following acknowledgement:
        HSL, a collection of Fortran codes for large-scale scientific
        computation. See http://www.hsl.rl.ac.uk.
******************************************************************************

This is Ipopt version 3.13.2, running with linear solver ma27.

Number of nonzeros in equality constraint Jacobian...:       76
Number of nonzeros in inequality constraint Jacobian.:        0
Number of nonzeros in Lagrangian Hessian.............:       65

Total number of variables............................:       29
                     variables with only lower bounds:        2
                variables with lower and upper bounds:       22
                     variables with only upper bounds:        0
Total number of equality constraints.................:       29
Total number of inequality constraints...............:        0
        inequality constraints with only lower bounds:        0
   inequality constraints with lower and upper bounds:        0
        inequality constraints with only upper bounds:        0

iter    objective    inf_pr   inf_du lg(mu)  ||d||  lg(rg) alpha_du alpha_pr  ls
   0  0.0000000e+00 1.16e+03 1.00e+00  -1.0 0.00e+00    -  0.00e+00 0.00e+00   0
   1  0.0000000e+00 1.92e-03 1.01e-01  -1.0 1.71e-03    -  9.90e-01 1.00e+00h  1
   2  0.0000000e+00 7.80e-09 2.00e-02  -1.0 3.36e-04    -  9.90e-01 1.00e+00h  1

Number of Iterations....: 2

                                   (scaled)                 (unscaled)
Objective...............:   0.0000000000000000e+00    0.0000000000000000e+00
Dual infeasibility......:   0.0000000000000000e+00    0.0000000000000000e+00
Constraint violation....:   1.3738383713828579e-12    7.7998265624046326e-09
Complementarity.........:   0.0000000000000000e+00    0.0000000000000000e+00
Overall NLP error.......:   1.3738383713828579e-12    7.7998265624046326e-09


Number of objective function evaluations             = 3
Number of objective gradient evaluations             = 3
Number of equality constraint evaluations            = 3
Number of inequality constraint evaluations          = 0
Number of equality constraint Jacobian evaluations   = 3
Number of inequality constraint Jacobian evaluations = 0
Number of Lagrangian Hessian evaluations             = 2
Total CPU secs in IPOPT (w/o function evaluations)   =      0.053
```

```
Total CPU secs in NLP function evaluations          =      0.149

EXIT: Optimal Solution Found.
```

In [ ]:
```
m.fs.ECON.report()
```

```
================================================================================
Unit : fs.ECON                                                       Time: 0.0
--------------------------------------------------------------------------------
    Unit Performance

    Variables:

    Key            : Value      : Units                          : Fixed : Bounds
           HX Area :     28.398 :                    meter ** 2 :  True : (0, None)
    HX Coefficient :     1000.0 : kilogram / kelvin / second ** 3 :  True : (0, None)
         Heat Duty : 1.0420e+06 :                           watt : False : (None, None)

    Expressions:

    Key             : Value  : Units
    Delta T Driving : 36.694 : kelvin
         Delta T In : 17.197 : kelvin
        Delta T Out : 67.218 : kelvin

--------------------------------------------------------------------------------
    Stream Table
                                Units        shell Inlet shell Outlet tube Inlet tube Outlet
    Total Molar Flowrate        mole / second      344.28      344.28           -           -
    Total Mole Fraction Ar      dimensionless   0.0082864   0.0082864           -           -
    Total Mole Fraction N2      dimensionless     0.69726     0.69726           -           -
    Total Mole Fraction CO2     dimensionless     0.17545     0.17545           -           -
    Total Mole Fraction O2      dimensionless    0.080059    0.080059           -           -
    Total Mole Fraction H2O     dimensionless    0.038951    0.038951           -           -
    Temperature                        kelvin      509.43      415.22           -           -
    Pressure                           pascal  1.0200e+05  1.0100e+05           -           -
    Molar Flow                  mole / second           -           -      93.064      93.064
    Mass Flow                kilogram / second           -           -      1.6766      1.6766
    T                                  kelvin           -           -      348.00      492.23
    P                                  pascal           -           -  7.2200e+06  7.0800e+06
    Vapor Fraction              dimensionless           -           -      0.0000      0.0000
    Molar Enthalpy               joule / mole           -           -      5750.4      16947.
================================================================================
                                Units        shell Inlet shell Outlet tube Inlet tube Outlet
    Total Molar Flowrate        mole / second      344.28      344.28           -           -
    Total Mole Fraction Ar      dimensionless   0.0082864   0.0082864           -           -
    Total Mole Fraction N2      dimensionless     0.69726     0.69726           -           -
    Total Mole Fraction CO2     dimensionless     0.17545     0.17545           -           -
    Total Mole Fraction O2      dimensionless    0.080059    0.080059           -           -
    Total Mole Fraction H2O     dimensionless    0.038951    0.038951           -           -
    Temperature                        kelvin      509.43      415.22           -           -
    Pressure                           pascal  1.0200e+05  1.0100e+05           -           -
    Molar Flow                  mole / second           -           -      93.064      93.064
    Mass Flow                kilogram / second           -           -      1.6766      1.6766
    T                                  kelvin           -           -      348.00      492.23
    P                                  pascal           -           -  7.2200e+06  7.0800e+06
    Vapor Fraction              dimensionless           -           -      0.0000      0.0000
    Molar Enthalpy               joule / mole           -           -      5750.4      16947.
================================================================================
```

Very simple, 1 unit flowsheet initialized and solved without scaling. Conditons are fixed based on solved conditions of full model

Now, I will implement the same scaling process used which led to the errors

In [ ]:
```
unscaled_vars=iscale.list_unscaled_variables(m,include_fixed=True)
print(len(unscaled_vars))
```

```
142
```

In [ ]:
```
iscale.set_variable_scaling_from_current_value(m)
```

```
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[Ar,
Ar] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[Ar,
N2] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[Ar,
CO2] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[Ar,
N2] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[Ar,
CO2] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[Ar,
O2] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[Ar,
H2O] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[N2,
Ar] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[N2,
N2] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[N2,
CO2] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[N2,
O2] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[N2,
H2O] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[CO
2,Ar] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[CO
2,N2] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[CO
2,CO2] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[CO
2,O2] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[CO
2,H2O] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[O2,
Ar] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[O2,
N2] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[O2,
CO2] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[O2,
O2] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[O2,
H2O] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[H2
O,Ar] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[H2
O,N2] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[H2
O,CO2] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[H2
O,O2] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.PR_kappa[H2
O,H2O] currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.Ar.cp_mol_ig
_comp_coeff_H currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.N2.cp_mol_ig
_comp_coeff_H currently has a value of 0; no scaling factor assigned.
2024-09-06 13:11:37 [WARNING] idaes.core.util.scaling: Component fs.flue_prop_params.O2.cp_mol_ig
_comp_coeff_H currently has a value of 0; no scaling factor assigned.
```

In [ ]:
```
unscaled_vars=iscale.list_unscaled_variables(m,include_fixed=True)
print(len(unscaled_vars))
```

```
28
```

In [ ]:
```
for var in unscaled_vars:
    iscale.set_scaling_factor(var, 1)
```

In [ ]:
```
unscaled_vars=iscale.list_unscaled_variables(m,include_fixed=True)
print(len(unscaled_vars))
```

```
0
```

In [ ]:
```
iscale.set_constraint_scaling_harmonic_magnitude(m)
```

```
Component: fs.ECON.delta_temperature_in_equation[0.0]
        1
        1000
        0.001
        1
        0.001
        0.018015268
        1
        1000
        0.001
        1
        H2O
        940.7273476710421
        7080.0
        c:\Users\17707\anaconda3\envs\idaes-tea\lib\site-packages\idaes\models\properties\general
_helmholtz\components\parameters\
ERROR: evaluating object as numeric value: t_hp_func(0, 940.7273476710421,
7080.0, 0)
        (object: <class
        'pyomo.core.expr.numeric_expr.ExternalFunctionExpression'>)
    [WinError -1073741784] Windows Error 0xc0000028
```

```
---------------------------------------------------------------------------
OSError                                   Traceback (most recent call last)
Cell In[17], line 1
----> 1 iscale.set_constraint_scaling_harmonic_magnitude(m)

File c:\Users\17707\anaconda3\envs\idaes-tea\lib\site-packages\idaes\core\util\scaling.py:1662, i
n set_constraint_scaling_harmonic_magnitude(component, warning, overwrite, descend_into)
   1657 if isinstance(component, pyo.Block):
   1658     # Iterate over all constraint datas and call this method on each
   1659     for c in component.component_data_objects(
   1660         pyo.Constraint, descend_into=descend_into
   1661     ):
-> 1662         set_constraint_scaling_harmonic_magnitude(
   1663             c, warning=warning, overwrite=overwrite
   1664         )
   1666 elif component.is_indexed():
   1667     for i in component:

File c:\Users\17707\anaconda3\envs\idaes-tea\lib\site-packages\idaes\core\util\scaling.py:1671, i
n set_constraint_scaling_harmonic_magnitude(component, warning, overwrite, descend_into)
   1669         scaled_counter += 1
   1670 else:
-> 1671     _set_sf_har_mag(component)
   1672     scaled_counter += 1
   1673 print(f'{scaled_counter} constraints rescaled')

File c:\Users\17707\anaconda3\envs\idaes-tea\lib\site-packages\idaes\core\util\scaling.py:1650, i
n set_constraint_scaling_harmonic_magnitude.<locals>._set_sf_har_mag(c)
   1647 def _set_sf_har_mag(c):
   1648     print(f"Component: {c.name}")
-> 1650     nominal = NominalValueExtractionVisitor(warning=warning).walk_expression(c.expr)
   1651     # Ignore any 0 terms - we will assume they do not contribute to scaling
   1652     harm_sum = sum(1 / abs(i) for i in [j for j in nominal if j != 0])

File c:\Users\17707\anaconda3\envs\idaes-tea\lib\site-packages\pyomo\core\expr\visitor.py:268, in
StreamBasedExpressionVisitor.walk_expression(self, expr)
    265     root = expr
    267 try:
--> 268     result = self._process_node(root, RECURSION_LIMIT)
    269     _nonrecursive = None
    270 except RevertToNonrecursive:

File c:\Users\17707\anaconda3\envs\idaes-tea\lib\site-packages\pyomo\core\expr\visitor.py:351, in
StreamBasedExpressionVisitor._process_node_general(self, node, recursion_limit)
    348         descend, child_result = tmp
    350 if descend:
--> 351     child_result = self._process_node(child, recursion_limit)
    353 if self.acceptChildResult is not None:
    354     data = self.acceptChildResult(node, data, child_result, child_idx)

File c:\Users\17707\anaconda3\envs\idaes-tea\lib\site-packages\pyomo\core\expr\visitor.py:351, in
StreamBasedExpressionVisitor._process_node_general(self, node, recursion_limit)
    348         descend, child_result = tmp
    350 if descend:
--> 351     child_result = self._process_node(child, recursion_limit)
    353 if self.acceptChildResult is not None:
    354     data = self.acceptChildResult(node, data, child_result, child_idx)

    [... skipping similar frames: StreamBasedExpressionVisitor._process_node_general at line 351
(1 times)]
```

```
File c:\Users\17707\anaconda3\envs\idaes-tea\lib\site-packages\pyomo\core\expr\visitor.py:351, in StreamBasedExpressionVisitor._process_node_general(self, node, recursion_limit)
    348         descend, child_result = tmp
    350 if descend:
--> 351     child_result = self._process_node(child, recursion_limit)
    353 if self.acceptChildResult is not None:
    354     data = self.acceptChildResult(node, data, child_result, child_idx)

File c:\Users\17707\anaconda3\envs\idaes-tea\lib\site-packages\pyomo\core\expr\visitor.py:371, in StreamBasedExpressionVisitor._process_node_general(self, node, recursion_limit)
    368 # We are done with this node.  Call exitNode to compute
    369 # any result
    370 if self.exitNode is not None:
--> 371     return self.exitNode(node, data)
    372 else:
    373     return data

File c:\Users\17707\anaconda3\envs\idaes-tea\lib\site-packages\idaes\core\util\scaling.py:1525, in NominalValueExtractionVisitor.exitNode(self, node, data)
   1523 node_func = self.node_type_method_map.get(nodetype, None)
   1524 if node_func is not None:
-> 1525     return node_func(self, node, data)
   1527 elif not node.is_expression_type():
   1528     # this is a leaf, but not a native type
   1529     if nodetype is _PyomoUnit:

File c:\Users\17707\anaconda3\envs\idaes-tea\lib\site-packages\idaes\core\util\scaling.py:1486, in NominalValueExtractionVisitor._get_nominal_value_external_function(self, node, child_nominal_values)
   1483 newfunc = node.create_node_with_local_data(input_mag)
   1485 # Evaluate new function and return the absolute value
-> 1486 return [pyo.value(newfunc)]

File c:\Users\17707\anaconda3\envs\idaes-tea\lib\site-packages\pyomo\common\numeric_types.py:245, in value(obj, exception)
    240 if exception:
    241     #
    242     # Here, we try to catch the exception
    243     #
    244     try:
--> 245         tmp = obj(exception=True)
    246         if tmp is None:
    247             raise ValueError(
    248                 "No value for uninitialized NumericValue object %s" % (obj.name,)
    249             )

File c:\Users\17707\anaconda3\envs\idaes-tea\lib\site-packages\pyomo\core\expr\base.py:118, in ExpressionBase.__call__(self, exception)
    103 def __call__(self, exception=True):
    104     """Evaluate the value of the expression tree.
    105
    106     Parameters
   (...)
    116
    117     """
--> 118     return visitor.evaluate_expression(self, exception)

File c:\Users\17707\anaconda3\envs\idaes-tea\lib\site-packages\pyomo\core\expr\visitor.py:1283, in evaluate_expression(exp, exception, constant)
   1280         clear_active = True
   1282 try:
-> 1283     ans = visitor.dfs_postorder_stack(exp)
```

```
   1284 except (
   1285     TemplateExpressionError,
   1286     ValueError,
   (...)
   1299     #   TypeError: This can be raised in Python3 when evaluating a
   1300     #      operation returns a complex number (e.g., sqrt(-1))
   1301     if exception:

File c:\Users\17707\anaconda3\envs\idaes-tea\lib\site-packages\pyomo\core\expr\visitor.py:923, in
ExpressionValueVisitor.dfs_postorder_stack(self, node)
    919         _result = []
    920 #
    921 # Process the current node
    922 #
--> 923 ans = self.visit(_obj, _result)
    924 if _stack:
    925     #
    926     # "return" the recursion by putting the return value on the end of the results stack
    927     #
    928     _stack[-1][-1].append(ans)

File c:\Users\17707\anaconda3\envs\idaes-tea\lib\site-packages\pyomo\core\expr\visitor.py:1173, i
n _EvaluationVisitor.visit(self, node, values)
   1171 def visit(self, node, values):
   1172     """Visit nodes that have been expanded"""
-> 1173     return node._apply_operation(values)

File pyomo\\core\\expr\\numeric_expr.pyx:919, in pyomo.core.expr.numeric_expr.ExternalFunctionExp
ression._apply_operation()

File c:\Users\17707\anaconda3\envs\idaes-tea\lib\site-packages\pyomo\core\base\external.py:233, i
n ExternalFunction.evaluate(self, args)
    218 """Return the value of the function given the specified arguments
    219
    220 Parameters
   (...)
    230     The return value of the function evaluated at `args`
    231 """
    232 args_ = [arg if arg.__class__ in native_types else value(arg) for arg in args]
--> 233 return self._evaluate(args_, None, 0)[0]

File c:\Users\17707\anaconda3\envs\idaes-tea\lib\site-packages\pyomo\core\base\external.py:384, i
n AMPLExternalFunction._evaluate(self, args, fixed, fgh)
    382 arglist = _ARGLIST(args, fgh, fixed)
    383 fcn = self._known_functions[self._function][0]
--> 384 f = fcn(byref(arglist))
    385 if fgh >= 1:
    386     g = [nan] * N

OSError: [WinError -1073741784] Windows Error 0xc0000028
```

In [ ]: