* PP3 Measurements With Old Cone - used KPP9 for flow measurements: ceramic tube touching cone, exhaust ON, (+) flow in direction of exhaust flow - script run for old can proves that there is a leak in the system. Data for this can be found at directory below [redacted] - ALL thermocouple measurements with old cone were done witih the tip of the thermocouple on the surface of the orifice ~ originally we were supposed to take measurements 5mm from the orifice nose but due to leaks in the system we weren't getting any outflow and thus just read room temperature with that set up.

In [1]:

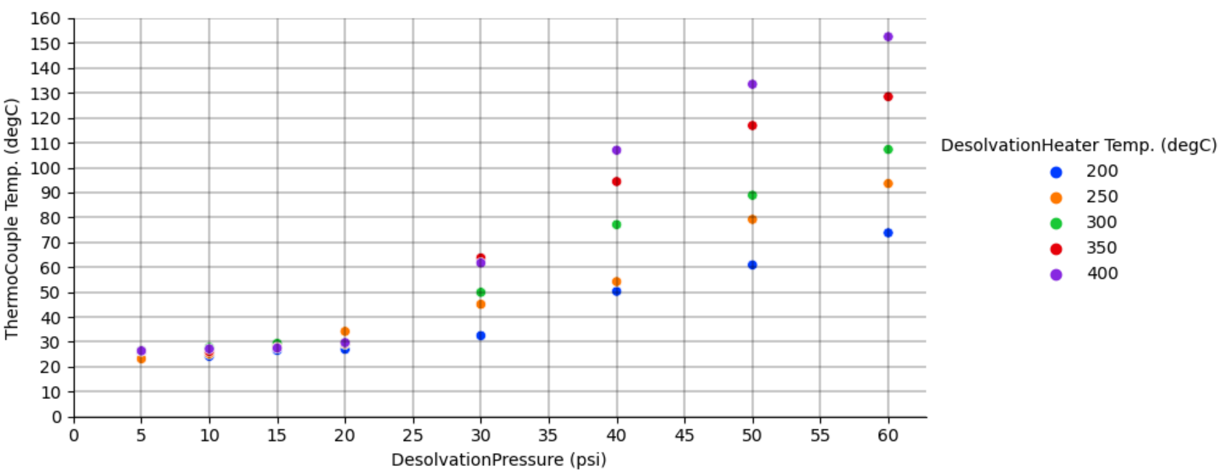
```
import seaborn as sns
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from scipy.optimize import curve_fit
import os
```

In [2]:

```
#                          Thermocouple Temperature v.s. Desolvation Pressure Plot,

fn = '[redacted]

df = pd.read_csv(fn)
oldcone = df[df['Cone Type'] == 'Old']
print(df.columns)

def func(x, a, b):
    return a * np.exp(-b * x)

fig = sns.relplot(oldcone, x = 'DesolvationPressure (psi)',y='ThermoCouple Temp. (degC
plt.suptitle('Thermocouple Measurements, PP3, Old Cone, Feb. 04, 2025',y=1.1, x=.42)

for ax in fig.axes.flatten():
    ax.grid(color = 'black', linewidth =.3)
    ax.set_xticks(np.arange(0, 61, 5))
    ax.set_yticks(np.arange(0, 170, 10))
#fig.savefig(os.path.join(os.path.split(fn)[0],"Kara Flow Measurements on LP4"),dpi=3(
```

```
Index(['DesolvationHeater Temp. (degC)', 'DesolvationPressure (psi)',
       'ThermoCouple Temp. (degC)', 'ForelinePressure(mbar)', 'Cone Type'],
      dtype='object')
```

Thermocouple Measurements, PP3, Old Cone, Feb. 04, 2025



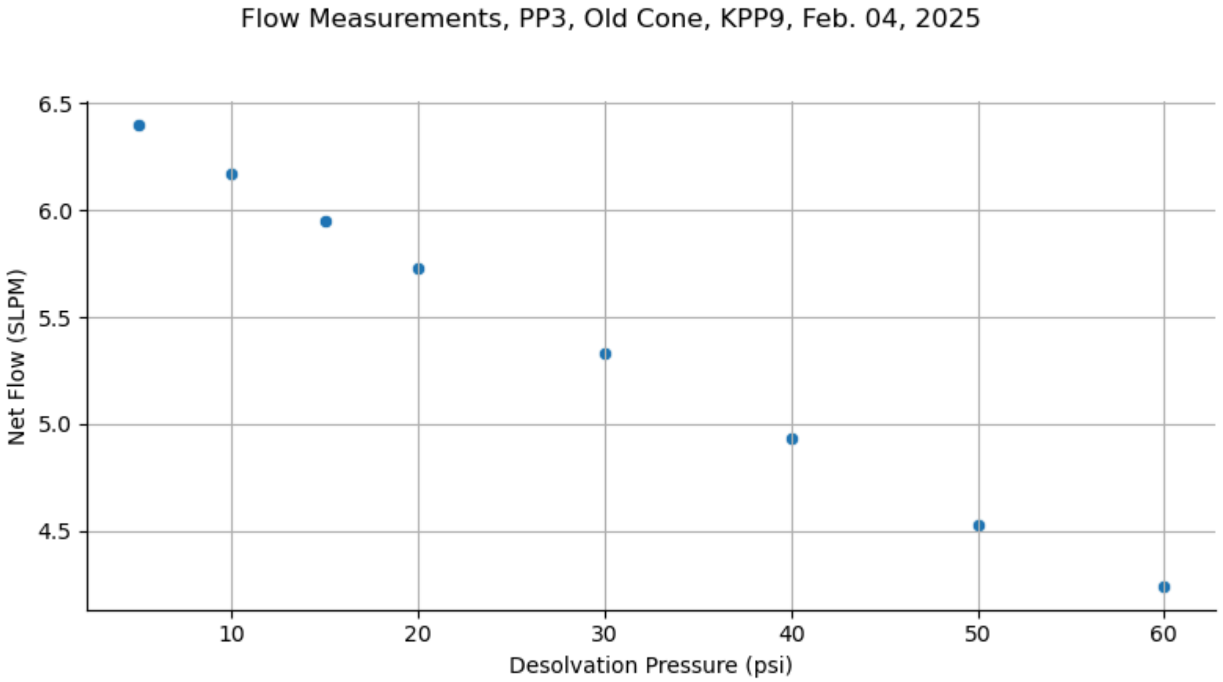
In [3]:

```
#                              Net Flow v.s. Desolvation Pressure Plot, Old Cone
```

```
fn = '[redacted]

df = pd.read_csv(fn)
print(df.columns)
dfold = df[df['Cone Type'] == 'Old']
x = dfold['Desolvation Pressure (psi)']
def func(x, a, b):
    return a * np.exp(-b * x)

fig = sns.relplot(dfold, x = 'Desolvation Pressure (psi)', y = 'Net Flow (SLPM)', pale
plt.suptitle('Flow Measurements, PP3, Old Cone, KPP9, Feb. 04, 2025',y=1.1)

for ax in fig.axes.flatten():
    ax.grid()
```

```
Index(['Desolvation Pressure (psi)', 'Net Flow (SLPM)',
       'Foreline Pressure (mbar)', 'Cone Type'],
      dtype='object')
```

```
[redacted]Us
erWarning: Ignoring `palette` because no `hue` variable has been assigned.
  fig = sns.relplot(dfold, x = 'Desolvation Pressure (psi)', y = 'Net Flow (SLPM)', p
alette = 'bright', kind = 'scatter', height = 4, aspect = 2)
```



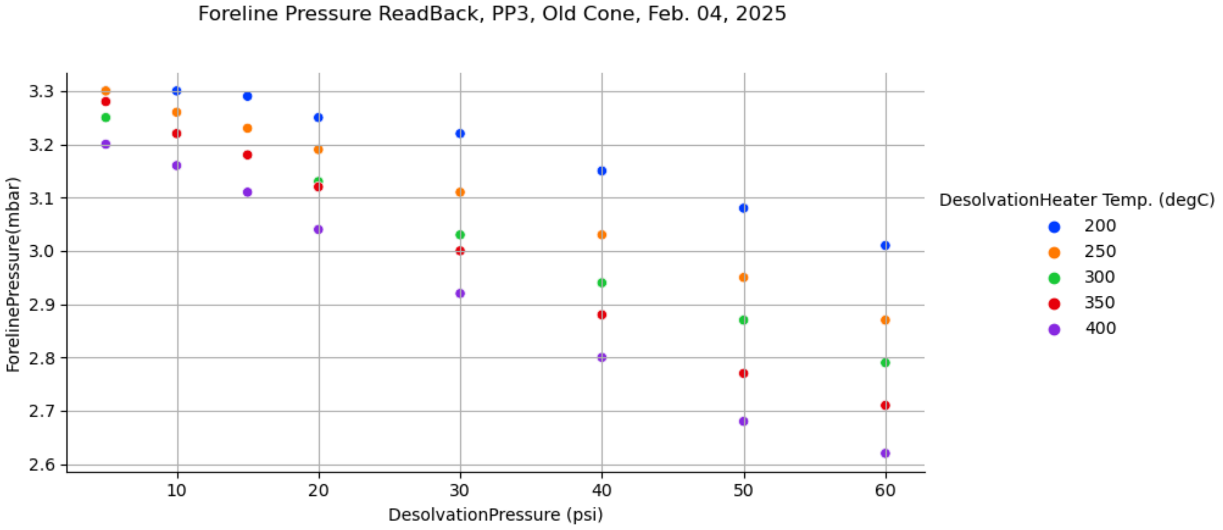
Tried to fit a curve with 'curve_fit' from scipy. - resulting slope yielded not accurate enough so I left out. - below is the code #200 data fit curve df200 = df[df['DesolvationHeater Temp. (degC)'] == 200] xdata = (df200['DesolvationPressure (psi)']) ydata = (df200['ThermoCouple Temp. (degC)']) popt,pcov = curve_fit(func, xdata, ydata) plt.plot(xdata, func(xdata, *popt), color = 'blue')

In [4]:

```
#                         ForelinePressure v.s. Desolvation Pressure Plot, Old Cor

fn = '[redacted]

df = pd.read_csv(fn)
oldfore = df[df['Cone Type'] == 'Old']
print(df.columns)

def func(x, a, b):
    return a * np.exp(-b * x)
```

```
fig = sns.relplot(oldfore,x = 'DesolvationPressure (psi)',y='ForelinePressure(mbar)',
plt.suptitle('Foreline Pressure ReadBack, PP3, Old Cone, Feb. 04, 2025',y=1.1, x=.42)

for ax in fig.axes.flatten():
    ax.grid()
```

```
Index(['DesolvationHeater Temp. (degC)', 'DesolvationPressure (psi)',
       'ThermoCouple Temp. (degC)', 'ForelinePressure(mbar)', 'Cone Type'],
      dtype='object')
```



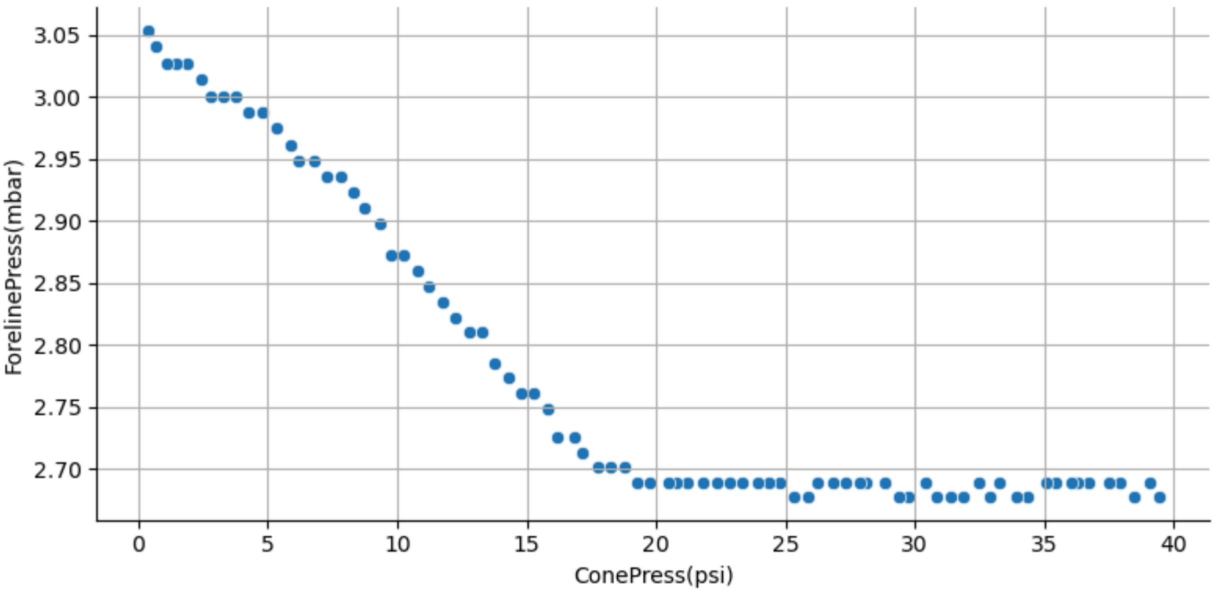
* PP3 measurements with new cone - 'Test cone flow script' data yields that system is now mostly leak free (for some set desol. pressure between 0-60 we will get a positive flow) and we can continue with the rest of our measurements

```
In [5]: #                                       TEST CONE FLOW SCRIPT PP3, New Cone
        #                              Foreline Stabilized at 350c and 40psi before running sc

        fn = 'C:[redacted]

        df = pd.read_csv(fn)
        print(df.columns)

        def func(x, a, b):
            return a * np.exp(-b * x)

        fig = sns.relplot(df,x = 'ConePress(psi)',y='ForelinePress(mbar)', palette = 'bright',
        plt.suptitle('Test Cone Flow Script, PP3, New Cone, Feb. 04, 2025',y=1.1)

        for ax in fig.axes.flatten():
            ax.grid()
```

```
Index(['ConePress(psi)', 'ForelinePress(mbar)', 'Instr[redacted]
       'ConeTemp:350C '],
      dtype='object')
```

```
[redacted]2: Us
erWarning: Ignoring `palette` because no `hue` variable has been assigned.
  fig = sns.relplot(df,x = 'ConePress(psi)',y='ForelinePress(mbar)', palette = 'brigh
t', kind = 'scatter', height = 4, aspect = 2)
```

Test Cone Flow Script, PP3, New Cone, Feb. 04, 2025

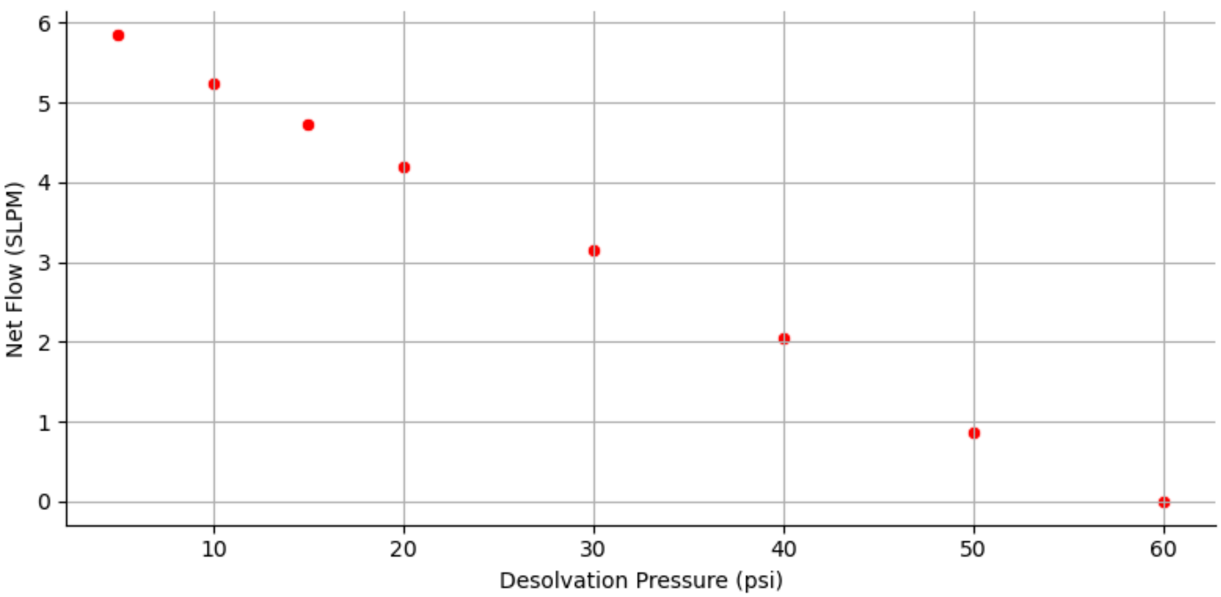


In [6]:

```
#                                    Net Flow v.s. Desolvation Pressure Plot, New Cone

fn = 'C:[redacted]

df = pd.read_csv(fn)
print(df.columns)
dfnew = df[df['Cone Type'] == 'New']

def func(x, a, b):
    return a * np.exp(-b * x)

fig = sns.relplot(dfnew, x = (dfnew['Desolvation Pressure (psi)']), y = (dfnew['Net F
plt.suptitle('Flow Measurements, PP3, New Cone, KPP9, Feb. 05, 2025',y=1.1)

for ax in fig.axes.flatten():
    ax.grid()
```

```
Index(['Desolvation Pressure (psi)', 'Net Flow (SLPM)',
       'Foreline Pressure (mbar)', 'Cone Type'],
      dtype='object')
```

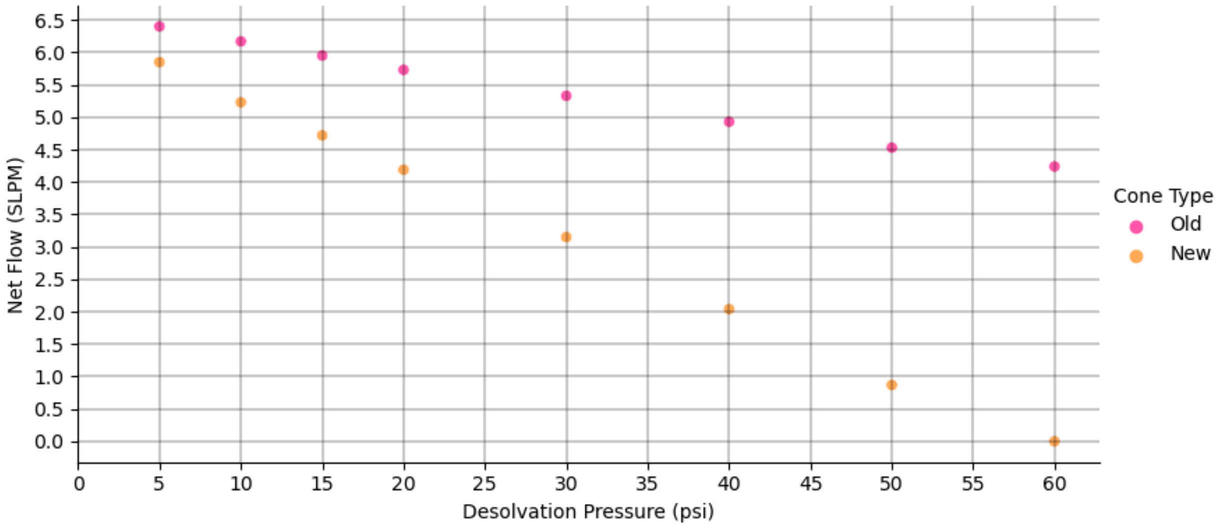
Flow Measurements, PP3, New Cone, KPP9, Feb. 05, 2025



```
In [7]:
#                                  Net Flow v.s. Desolvation Pressure Plot, Both Cones

fn = '[redacted]

df = pd.read_csv(fn)
print(df.columns)

def func(x, a, b):
    return a * np.exp(-b * x)

fig = sns.relplot(df,x = 'Desolvation Pressure (psi)',y='Net Flow (SLPM)', palette = '
plt.suptitle('Flow Measurements, PP3, Both Cones, KPP9, Feb. 05, 2025',y=1.1)


for ax in fig.axes.flatten():
    ax.grid(color = 'black', linewidth =.3)
    ax.set_xticks(np.arange(0, 61, 5))
    ax.set_yticks(np.arange(0, 7, .5))
```

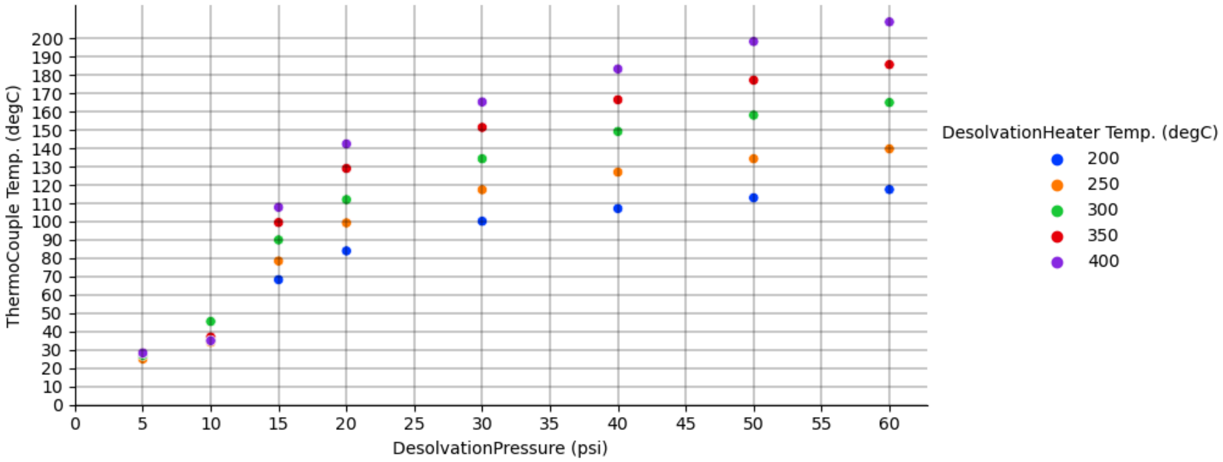
```
Index(['Desolvation Pressure (psi)', 'Net Flow (SLPM)',
       'Foreline Pressure (mbar)', 'Cone Type'],
      dtype='object')
```

Flow Measurements, PP3, Both Cones, KPP9, Feb. 05, 2025



In [8]:
```
#                           Thermocouple Temperature v.s. Desolvation Pressure Plot, N

fn = '[redacted]

df = pd.read_csv(fn)
newcone = df[df['Cone Type'] == 'New']

fig = sns.relplot(newcone, x = 'DesolvationPressure (psi)',y='ThermoCouple Temp. (degC
plt.suptitle('Thermocouple Measurements, PP3, New Cone, Feb. 07, 2025',y=1.1, x = .42)

for ax in fig.axes.flatten():
    ax.grid(color = 'black', linewidth =.3)
    ax.set_xticks(np.arange(0, 61, 5))
    ax.set_yticks(np.arange(0, 210, 10))
```

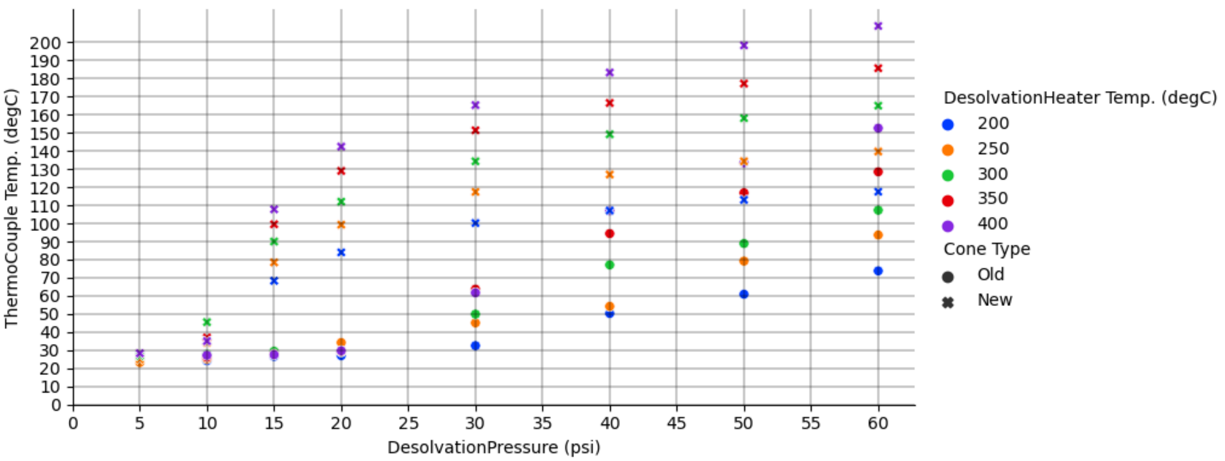
Thermocouple Measurements, PP3, New Cone, Feb. 07, 2025



In [9]:
```
#                           Thermocouple Temperature v.s. Desolvation Pressure Plot, E

fn = '[redacted]

df = pd.read_csv(fn)
fig = sns.relplot(df, x = 'DesolvationPressure (psi)',y='ThermoCouple Temp. (degC)', h
plt.suptitle('Thermocouple Measurements, PP3, Both Cones, Feb. 07, 2025',y=1.1, x=.42)
```

```
for ax in fig.axes.flatten():
    ax.grid(color = 'black', linewidth =.3)
    ax.set_xticks(np.arange(0, 61, 5))
    ax.set_yticks(np.arange(0, 210, 10))
```

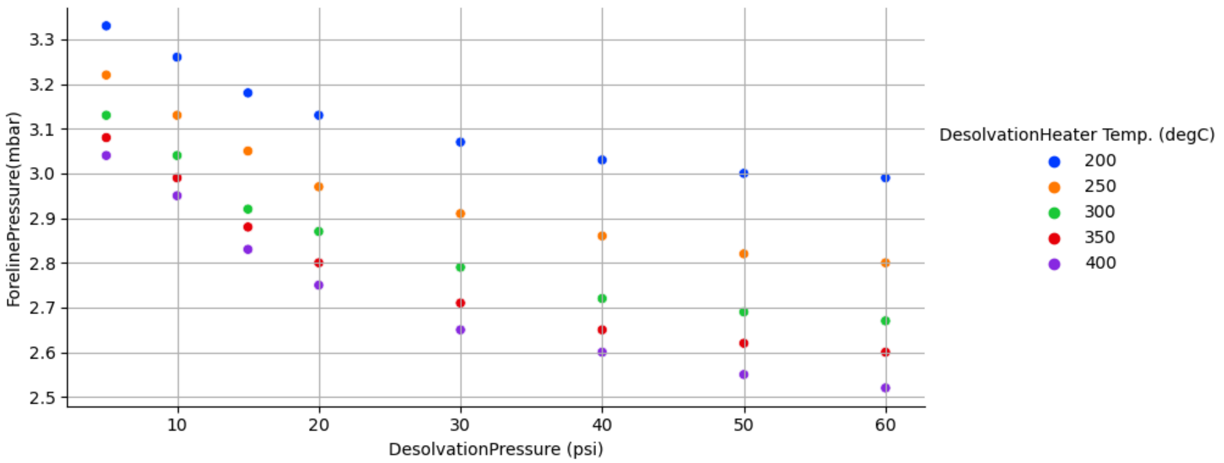
Thermocouple Measurements, PP3, Both Cones, Feb. 07, 2025



In [10]:

```
#                           ForelinePressure v.s. Desolvation Pressure Plot, New Cor

fn = '[redacted]

df = pd.read_csv(fn)
newfore = df[df['Cone Type'] == 'New']


fig = sns.relplot(newfore,x = 'DesolvationPressure (psi)',y='ForelinePressure(mbar)',
plt.suptitle('Foreline Pressure ReadBack, PP3, New Cone, Feb. 07, 2025',y=1.1, x=.42)

for ax in fig.axes.flatten():
    ax.grid()
```

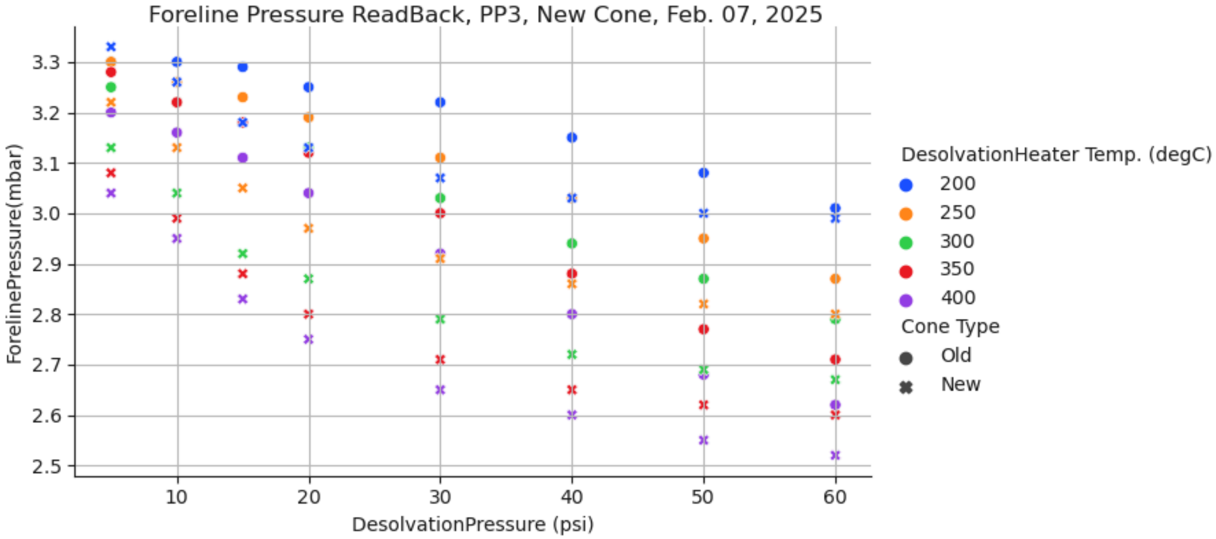
Foreline Pressure ReadBack, PP3, New Cone, Feb. 07, 2025



In [11]:

```
#                           ForelinePressure v.s. Desolvation Pressure Plot, Both Cc

fn = '[redacted]
```

```
df = pd.read_csv(fn)

fig = sns.relplot(df,x = 'DesolvationPressure (psi)',y='ForelinePressure(mbar)', hue='
plt.suptitle('Foreline Pressure ReadBack, PP3, New Cone, Feb. 07, 2025',y=1, x = .42)

for ax in fig.axes.flatten():
    ax.grid()
```


Foreline Pressure ReadBack, PP3, New Cone, Feb. 07, 2025
ForelinePressure(mbar)
DesolvationPressure (psi)
DesolvationHeater Temp. (degC)
Cone Type
Old
New