Originally constructed as a joint venture project with SaskPower, Sask Government, and three oil companies in the summer of 1987.

One objective was to test two different solvents from both Union Carbide and Dow Chemicals (now Fluor).

Other objective was to test the effectiveness of removing SO$_2$ with the Anderson 2000 SO$_2$ Scrubber unit.
CO₂ Capture Plant Details

- 0.5 MMSCFD Flue Gas (15% CO₂, 5% O₂, 15% H₂O, 380ppm SO₂, 350 ppm NOx)
- 4 tonnes/day CO₂
- Major Equipment
  Absorber-18”-64’ high
  Stripper 16”-59’ high
  Anderson 2000 SO₂ removal Unit
  2 million Btu/hr boiler
Re-commissioning commenced summer of 2000

Install baghouse

Various upgraded instrumentation, new control system, data acquisition, and equipment added.

Initial startup and shakedown of equipment in summer of 2001
UR CO$_2$ Capture Plant Details

- 4.8 $10^3$ m$^3$/day (170 mscfd) feed gas – 11.6% CO$_2$, 1.1% O$_2$, 87.3% N$_2$

- 1 tonne/day CO$_2$ production

- Absorber and stripper columns 305 mm (12”) dia x 10 m (32.8 ft) high

- Steam supply to reboiler from boiler skid package
Heat Rate vs. CO$_2$ Production & Absorber Efficiency

**Heat Rate vs. CO$_2$ Production**

- **Axis Labels:**
  - **X-axis:** Heat Rate (Btu/lbmole)
  - **Y-axis:** CO$_2$ Produced (tonnes/day)

**Legend:**
- **Black Line:** CO$_2$ Prod tonnes/day
- **Pink Line:** Absorber eff %

**Graph Data Range:**
- Heat Rate (X-axis): 50000 to 110000 Btu/lbmole
- CO$_2$ Produced (Y-axis): 0 to 2.5 tonnes/day
MEA 5 Molar Base (Heat Duty & CO₂ Production)

- **Reboiler heat duty (BTU/lb-mole CO₂)**
- **CO₂ production rate (Ton/day)**

- Liquid flow = 8 L/min
- Liquid flow = 14 L/min

- BD Plant
- UR Plant

- Pilot plant at BDPS
Effect of CO$_2$ Loading (UR Plant)

![Graph showing the effect of CO$_2$ loading on reboiler heat duty.](graph.png)

- CO$_2$ loading (mole/mole)
- Reboiler heat duty (BTU/lb-mole CO$_2$)

Legend:
- Lean amine
- Rich amine
Baseline conditions with 5M MEA: Effect of Circulation Rate

- Liquid flow = 8 L/min
- Liquid flow = 14 L/min

Graph showing CO₂ production rate (Ton/day) vs. Reboiler heat duty (BTU/lb-mole CO₂) with different liquid flow rates.
Absorber Column Temperature Profile (UR Plant) Baseline Conditions

Temperature profiles

Column Height

Temperature (deg. C)

Case-1
Case-2
Case-3
Case-4
Case-5
Case-6
Summary of Test Results

- Successful use of UR pilot plant for amine-based tests

- Reboiler heat duty range: 35,000 to 90,000 BTU/lb-mole CO₂

- Low heat duty (35,000) could provide 75% removal

- Higher MEA concentration (> 5 Molar) : on-going
Phase 2 Test Program

- Testing of increased concentration
- Mixed amine testing to continue
- Affirm results of changing heat duty
- Comparative testing of "custom amines"
- Look at lower temperature systems
- Economic modeling
- Continued fundamental research
- Training program development