

**Operation and Maintenance of the
Lurgi Mark IV Gasifier
at Dakota Gasification Company**

90% Plant Capacity Factor Achieved



HOW?

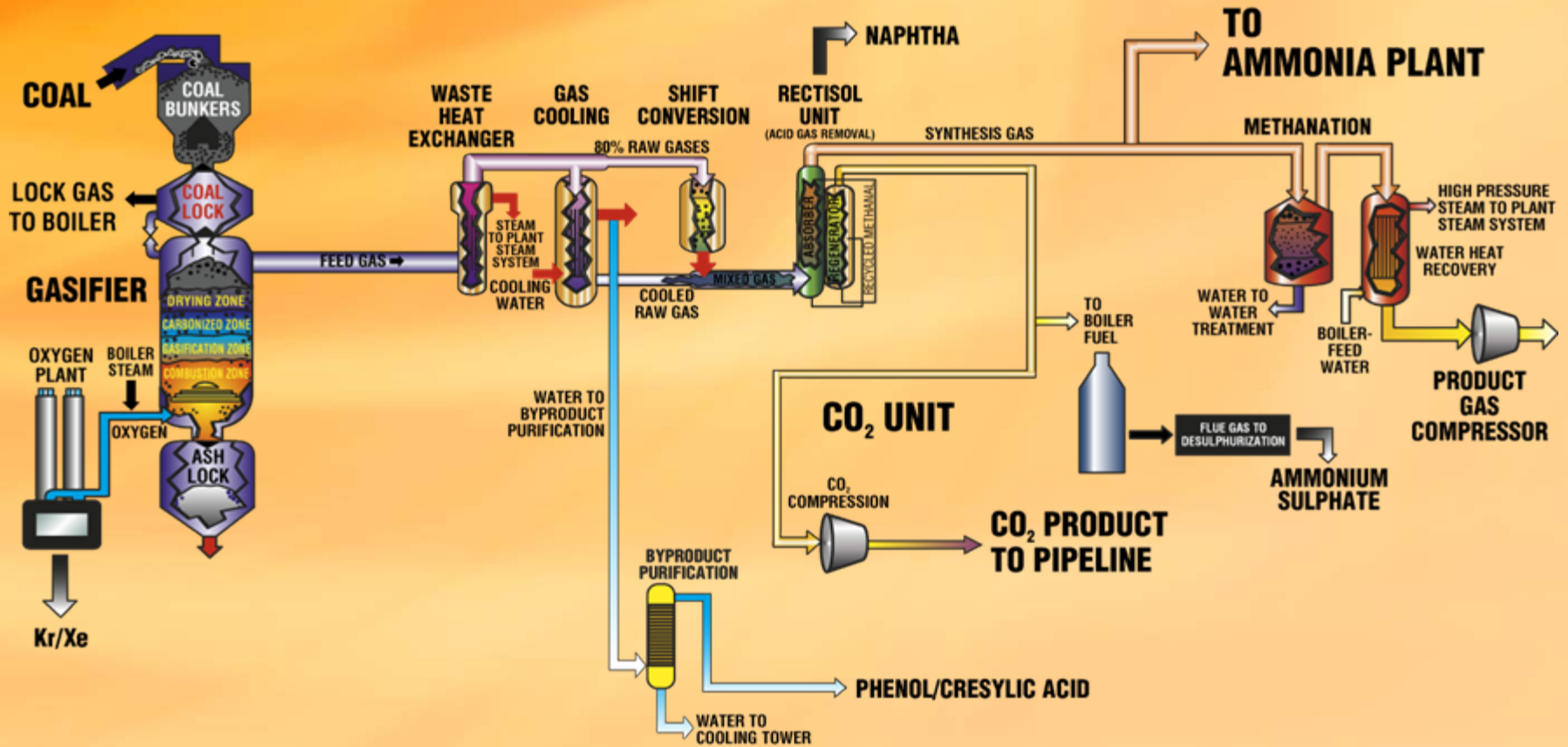
A LOOK AT THE PAST

- Plant origin: '70s energy shortages
- \$2.1 billion cost
- First SNG produced in July 1984
- DGC began operating facility in 1988 as a subsidiary of Basin Electric Power Cooperative

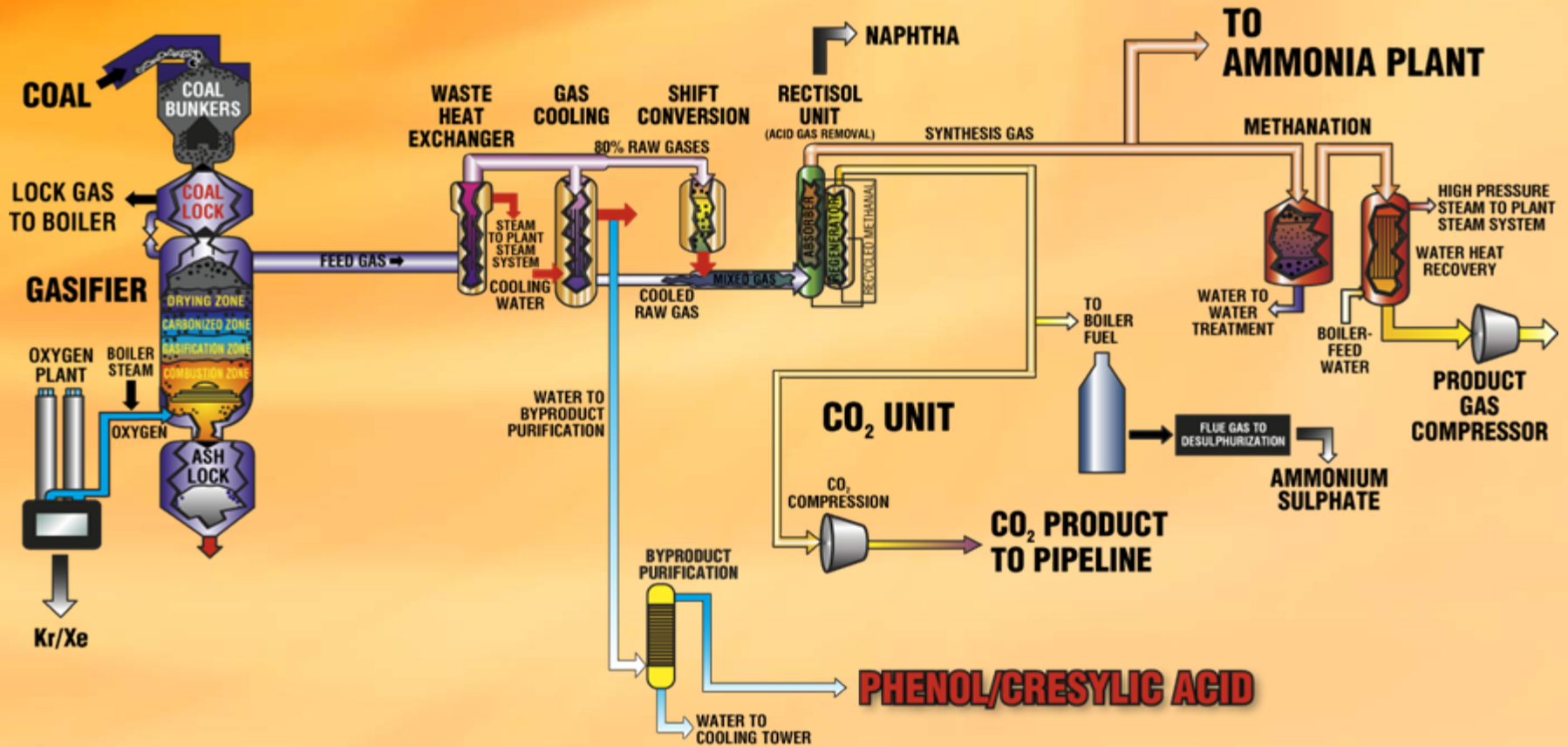
SYNFUELS PLANT TODAY

- Work Force: more than 700 people
- Daily Production Capacity:
170 mmscfd SNG, along with
many by-products
- Annual Plant Capacity Factor: 90-92%

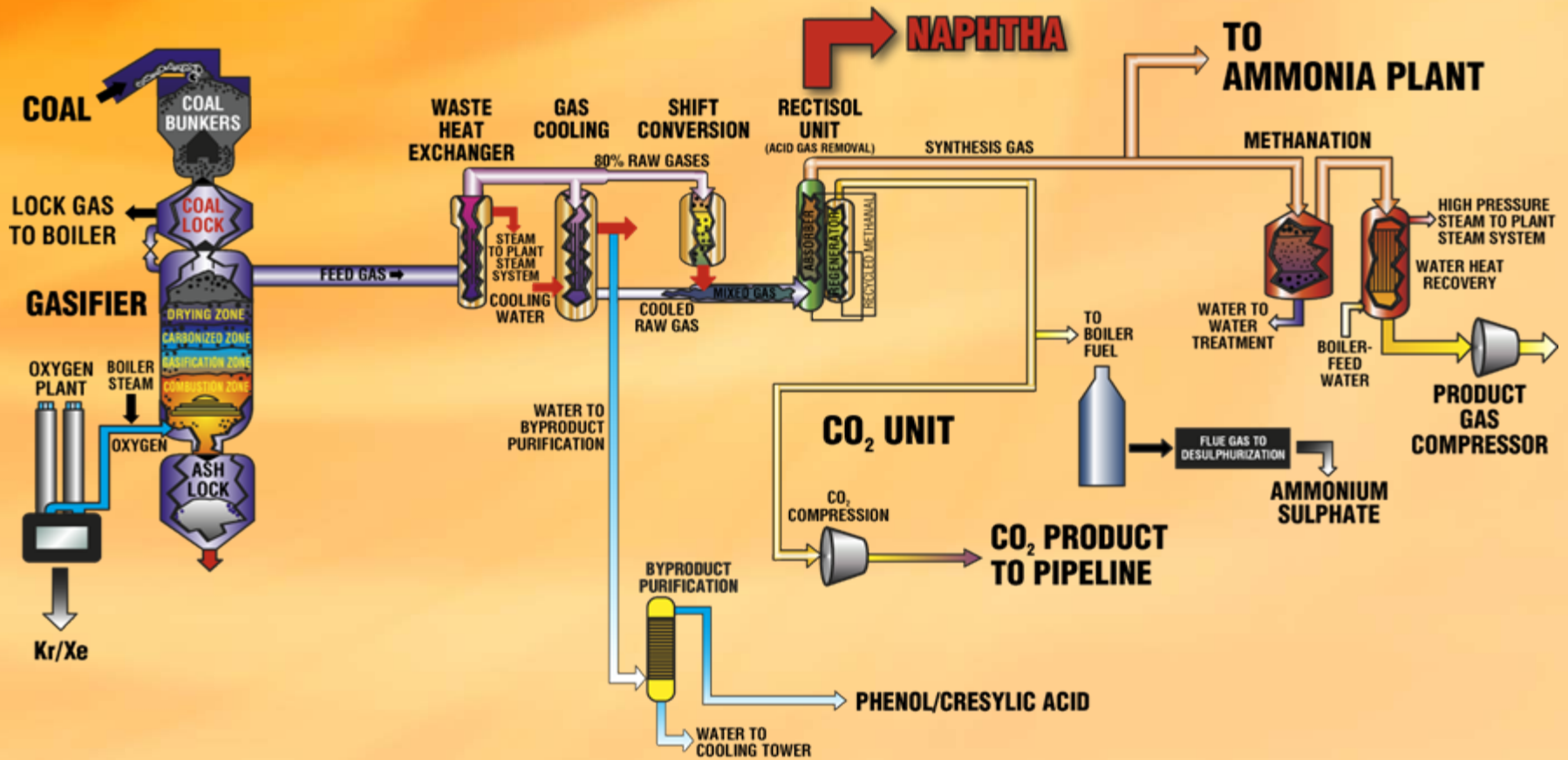
DAKOTA GASIFICATION PROCESS FLOW



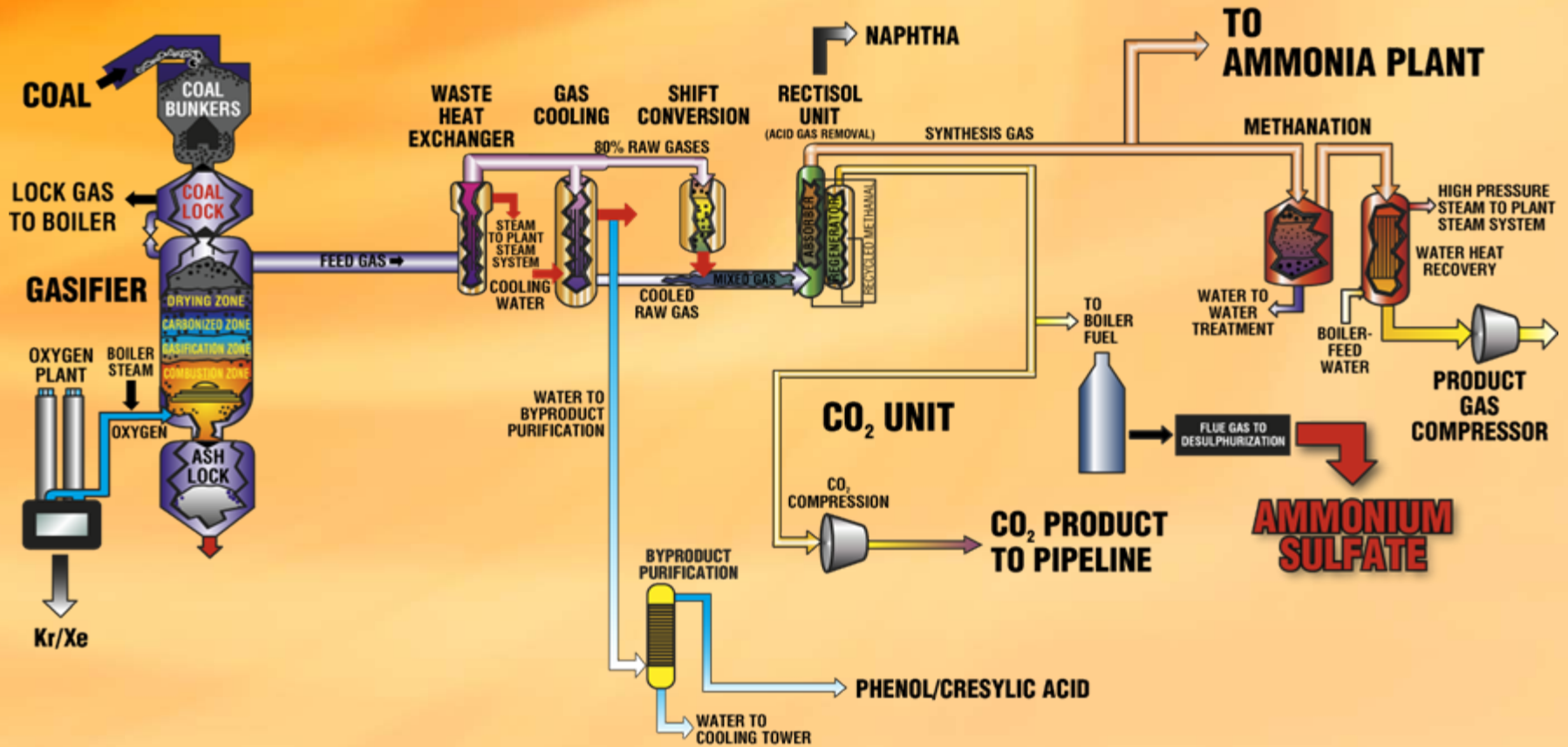
DAKOTA GASIFICATION PROCESS FLOW



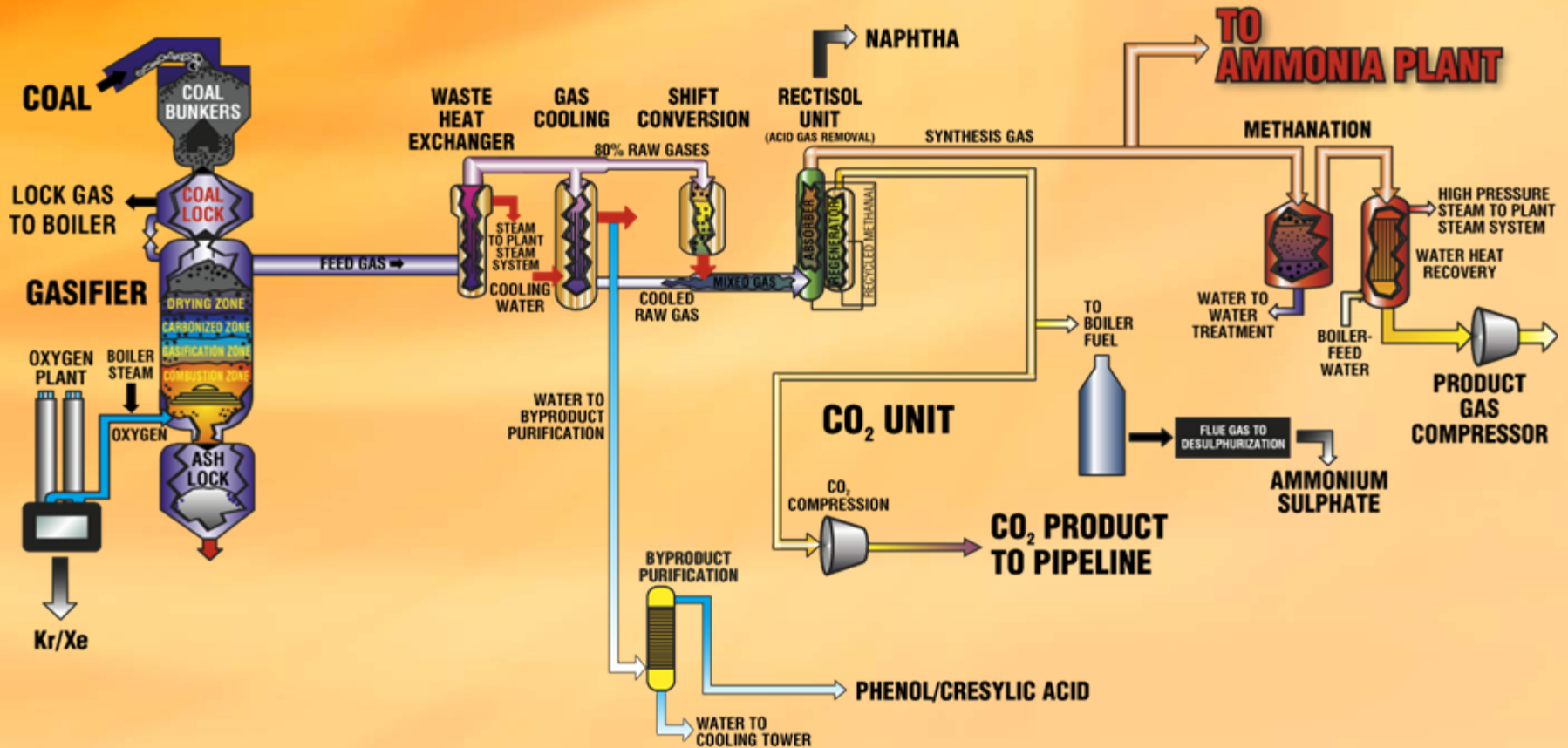
DAKOTA GASIFICATION PROCESS FLOW



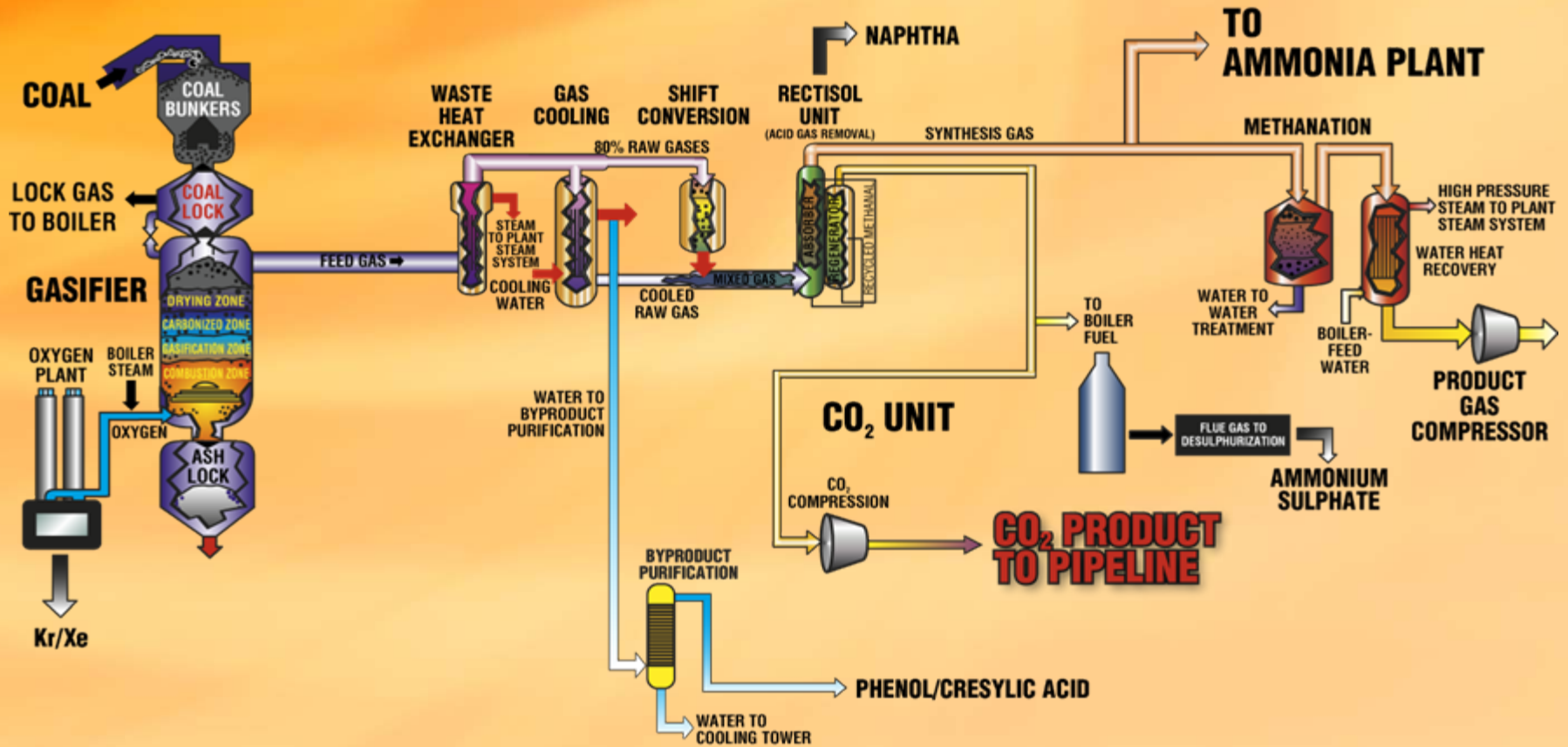
DAKOTA GASIFICATION PROCESS FLOW

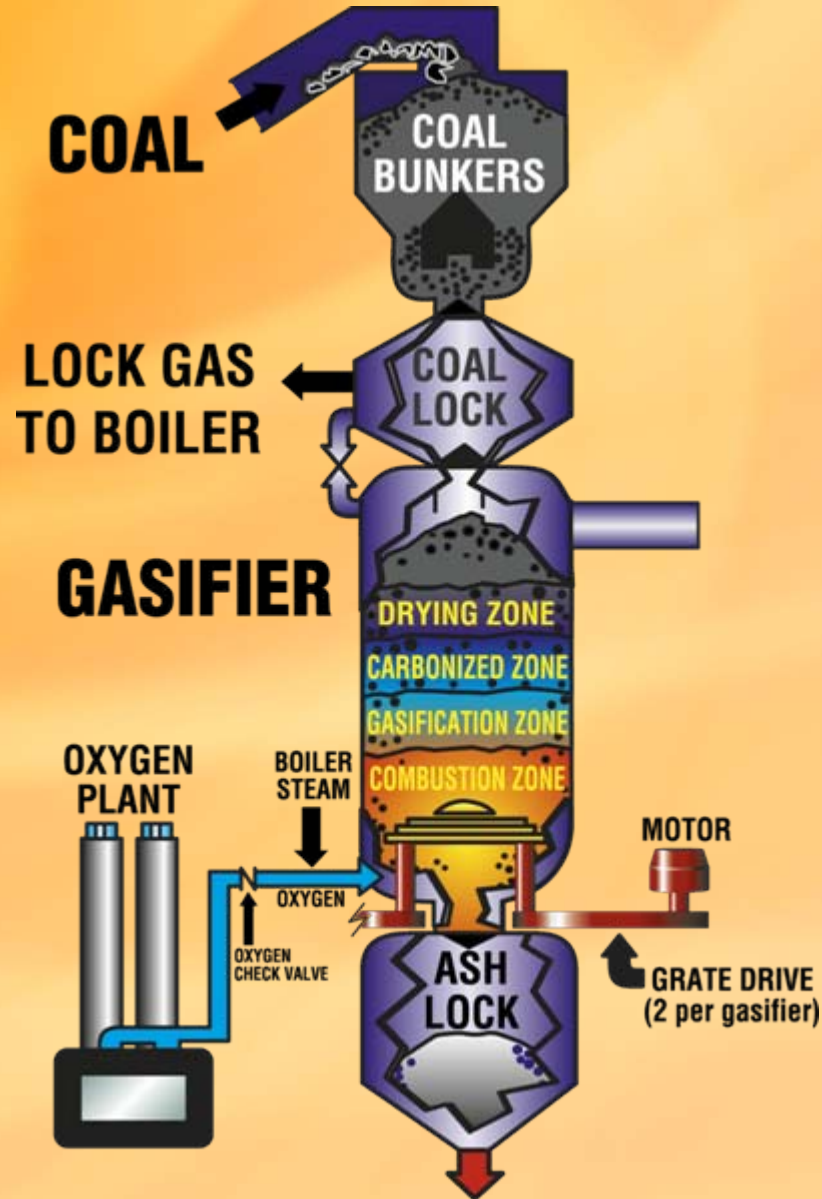


DAKOTA GASIFICATION PROCESS FLOW



DAKOTA GASIFICATION PROCESS FLOW





Lurgi Mark IV Gasifier

GASIFIER OUTAGES

- Time frame between outages have been increased from 18 to 24 months
 - Metallurgy upgrades
 - Hard surfacing of various components
 - Lubrication modifications
 - Design changes
- Four levels of planned outages

2006 GASIFIER OUTAGES

Gasifier Planned Outages	56 days
Gasifier Unplanned Outages	78 days
"A" Train Planned Outages	67 days
"B" Train Planned Outages	103 days

Gasifier Performance

Coal Quality

- Sodium Content
- Percent Fines
- Percent Water

Gasifier Performance Monitored Parameters

- Carbon Dioxide Content
- Outlet Temperature
- Ash Lock Temperature
- Grate Drive Torque

Gasifier Performance Controllable Parameters

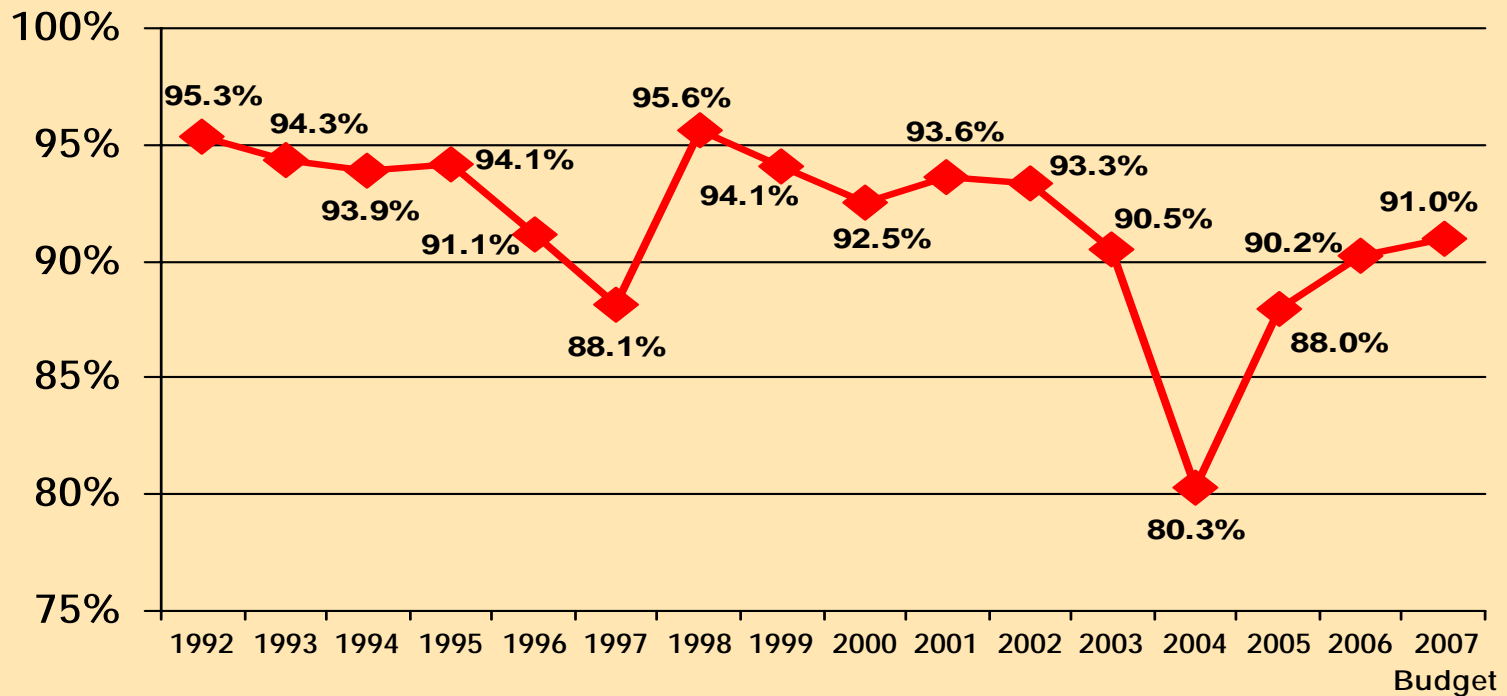
- Steam/Oxygen Ratio
- Grate Drive Speed
- Gasifier Rate

Facility Efficiency

- Based on 170 MMSCGD equivalent production
- Original design was 137.5 MMSCFD
- Goal 91%

Dakota Gasification Company

Production as a Percentage of Plant Capacity



SUMMARY

- Lurgi Mark IV proven technology for North Dakota lignite
- Gasifier availability 94%
- Overall plant capacity factor 90%
- Continually seeking modifications to improve efficiency