Wabash River Operations Update

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Richard Payonk
Plant Manager, sgSolutions, LLC
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Refresher Course…..

- DOE CCT Program Selection; Commercial Start in late 1995
- Repowering of existing Steam Turbine for 262 MW net rating
- 2500 TPD bituminous coal feed
  2000 TPD pet coke feed
- Largest IGCC and cleanest coal plant (of any kind) at start of operations
- Seamless transition from coal to petcoke feed in 2000
Refresher Course.....

- Plant Re-Start under New Ownership in 2005 as SG Solutions, LLC
- ConocoPhillips Operations & Maintenance leadership under Services Agreement
Gas Technology at SG Solutions

- Gas Turbine
- HRSG
- Gasifier
- Oxygen Plant
- Slag & Sulfur Unloading

Steam Turbine
Wabash River Operations Update

Primary Focus.....

A new era of operations commenced under SG Solutions in 2005 after an 18-month downtime for contract restructuring & ownership change.

- Recent Review of Production & Reliability Statistics
- Recent and Continuing Technology Advancements
Wabash Historical 12-Month Trailing Averages

Gasification Technology Only

Reliability = 1 - (Forced Outage Hours / (Operating Hours + Forced Outage Hours)) * 100%
Availability = On-Stream + Product not Required * [1-(forced outage rate / 100%)]
Wabash River Reliability
Gasification Technology Only

Operating Period
Dec 2005 to Apr 2008

- On-Stream 63%
- Planned 9%
- Unplanned 9%
- Product not Required 19%
Wabash River Availability by Island
(Gas Island includes ASU)

Availability = On-Stream + Product not Required * [1-(forced outage rate / 100%)]
Wabash River Reliability by Process Area

Operating Period
Dec 2005 to Apr 2008

Reliability = 1 - (Forced Outage Hours / (Operating Hours + Forced Outage Hours)) * 100%
Since start of 2006, Wabash River has achieved 79% availability at 90% reliability over a continuous 12-Month period

- 8 of top 12 “longest continuous runs” in plant’s history are since start of 2006 (Best: 9+ weeks ended by planned outage).

Key run limiting components and leading causes of downtime:

- syngas cooler cleanout (occurs on a 10 - 15 week cycle)
- partial hot zone refractory replacement annually
- slurry mixer replacement (occurs on a 16 - 22 week cycle)
Operations & Maintenance Lessons

**Syngas Cooler:**
Understanding of ash deposition methods and means to improve; tube repair & replacement optimization; ferrule technology; inlet screen technology & optimization; less than 10% of tubes replaced after 10+ years

**Gasifier Refractory:**
Reduction in 2\textsuperscript{nd} stage deposition; optimization of 1\textsuperscript{st} stage liner (life and material costs); optimization of maintenance requirements (reduction in downtime)

**Char Filtration:**
Understanding and optimization of char transfer systems; internal gas distribution requirements; filter life optimization; filter maintenance optimization; blowback valve technology & reliability improvements; failsafe technology developed/optimized

**Slurry Mixers:**
Life optimization; understanding life limitations due to operating conditions

**General Mechanical Integrity:**
Replacement / Optimization of piping materials; Improved understanding of downtime corrosion issues;
Gasifier Refractory

- Single train plant originally designed with a spare gasifier for off-line rebircks; Spare no longer needed.
- 2007 redesign now allows hot-face liner repairs on typical 17-day spring & fall outage as demonstrated in 2008.
- Continue researching/testing new materials

Dry Particulate Filtration

- Advanced alloys & improved construction
- Candle element life improved to 10,000 hrs
- Current prototype expected to yield 2X life
- Planned element changeout takes 7-8 day outage
Advancing E-Gas™ Technology

➢ Abrasion Resistant Lined-Pipe
  • Demonstrated success in the 1990s w/ high velocity erosive particulate in small bore piping
  • Successful scale up to large bore syngas (up to 28”) piping at 800 deg F and 400 psig has eliminated erosive wear in particulate laden syngas stream.

➢ Ash Management (Gasifier Control)
  • Fluxant studies to control ash carryover
  • Dynamic modeling to optimize syngas quench media & locations
  • Developing optical sensor to monitor gasifier flame spectral characteristics (DOE, GTI)
Slurry Feed Mixers
- Typical mixer life at 2500+ hrs
- Typically run to failure – operating data gives 3-6 day notice
- Planned changeout in a 24hr window

Optimizing Plant Start-Up
- Cold start via pressurized, inert atmosphere pilot burners
- Seamless transfer from gasifier heat-up to slurry feed
- No sulfur emissions from cold start to syngas operation on CT

*E-Gas technology has never flared sour syngas as part of a normal plant start-up* in 20+ years.
Advances in materials & maintenance processes *(refractory, particulate filtration)* reducing O&M costs and downtime

- Ash management techniques improving on-line time between planned outages

- Reliability projects identified and being implemented jointly w/ ConocoPhillips

- Single train gasification plant availabilities achieving 80%