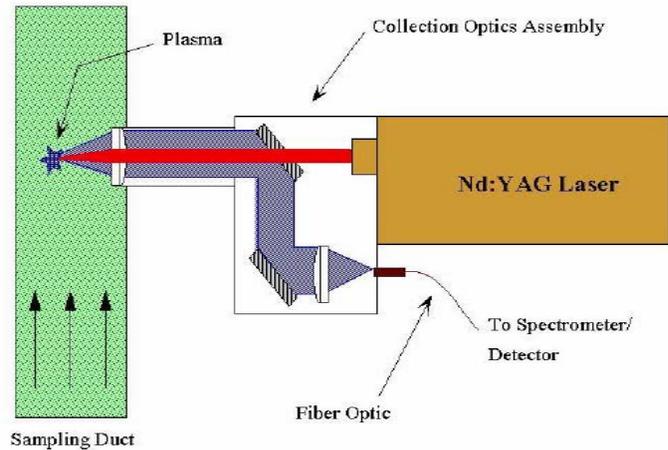


USING LASER-INDUCED BREAKDOWN SPECTROSCOPY (LIBS) MEASUREMENTS FOR COAL QUALITY MONITORING AND UPGRADED POWER PLANT CONTROL

PROJECT DESCRIPTION

- Simulated coal tests were run in a custom-built LIBS analyzer to determine the capability of the LIBS technology to detect the major elements present in the coal that are likely to have an impact on slagging.
- A coal inventory was assembled and tested for fuels used at utility boilers, with a range of slagging propensities.
- Artificial Neural Networks (ANNs) were created to correlate the LIBS spectral signals to ash fusion temperature.
- Parametric tests will be carried out at a 650 MW utility boiler to create a Database to be used by an advisory expert system.
- An on-line advisory expert software will be deployed at the 650 MW Unit to work along with signals from the LIBS system and plant DCS, to recommend actions for slagging mitigation.

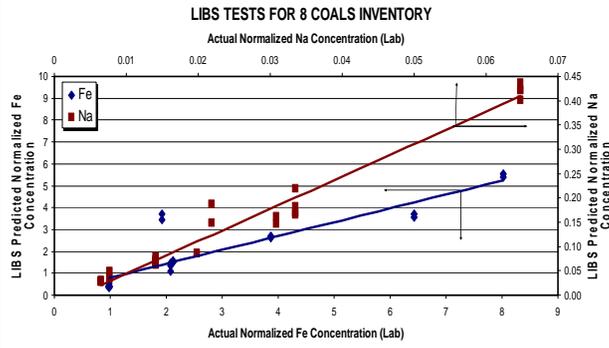
LASER-INDUCED BREAKDOWN SPECTROSCOPY (LIBS) CONCEPT



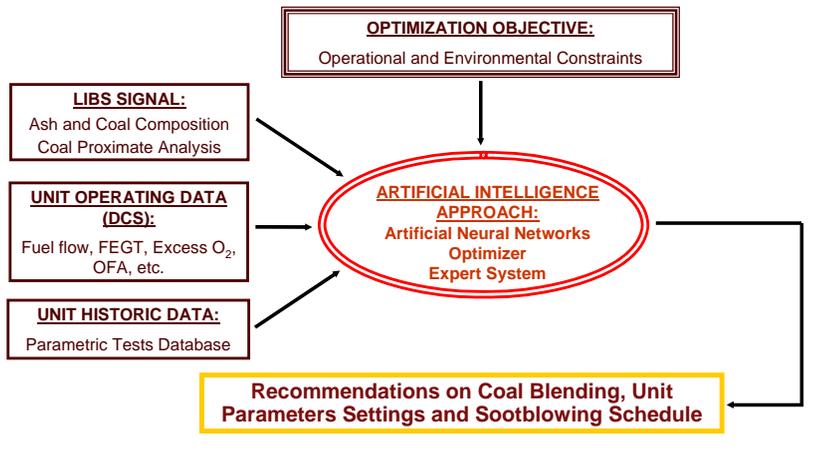
COAL TESTING CORRELATION RESULTS

Coal Inventory Tested:

Oxbow (Colorado)	Bit - Pleasants (Appalachian)
Drummond (Colombia)	Bit - Hatfield Ferry (West Virginia)
Cucuta (Colombia)	Bit - Logan (West Virginia)
Calenturitas (Colombia)	DECS - 18 (PSU Sample Bank)



LIBS+ANN COAL ANALYZER CONCEPT



Coal Analyzer – Slagging Mitigation Advisory



ENERGY RESEARCH COMPANY



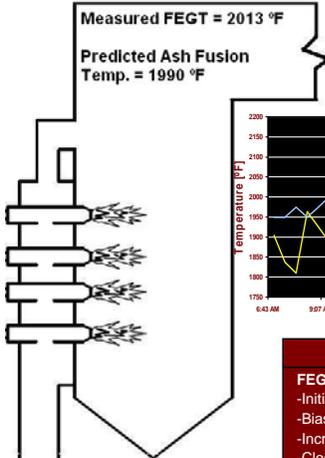
LEHIGH UNIVERSITY

Energy Research Center
Bethlehem, PA

COAL PROPERTIES

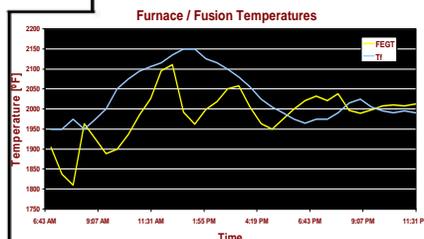
Al	0.05 % Wt.
Ca	0.20 % Wt.
Fe	0.27 % Wt.
Mg	0.05 % Wt.
Na	0.05 % Wt.
Si	0.98 % Wt.
Ti	0.02 % Wt.
C	77.26 % Wt.
S	0.68 % Wt.
K	0.11 % Wt.
H.V.	11,633 BTU/lb
B/A Ratio	0.30
Slagging Index	0.16
Ash Fusion Temp.	1,990 °F

UNIT 3 FURNACE TEMPERATURE



LOAD

GROSS LOAD	638.3 MW
NET LOAD	605.3 MW



Advisory Screen

FEGT Exceeding Ash Fusion Temperature:
 -Initialize Sootblowing sequences 7,8,12
 -Bias Mills 34, 35 coal flow rate down
 -Increase excess O₂ to 3.5%
 -Close OFA to 75%

ANALYZER STATUS

ONLINE

Carlos E. Romero, Ph.D.
Shen Yao
Ricardo X. Moreno



LEHIGH UNIVERSITY

Energy Research Center
Bethlehem, PA

Arel Weisberg, Ph.D.
Joseph Craparo, Ph.D.
Lawrence Mulligan, Ph.D.
Robert De Saro



ENERGY RESEARCH COMPANY