PROCEEDINGS
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May 10-12, 1982

SESSION V

COAL SLURRY PREPARATION AND STABILIZATION

WEDNESDAY, MAY 12, 1982

CHAIRPERSON: R. MANFRED

4th INTERNATIONAL SYMPOSIUM ON COAL SLURRY COMBUSTION

Hyatt Orlando, Orlando, Florida, May 10-12, 1982

TABLE OF CONTENTS

for

VOLUMES I, II, III & IV

VOLUME I

SESSION I - INTERNATIONAL OVERVIEWS
Monday, May 10, 1982
Chairperson: D. Bienstock

OVERVIEW OF BRAZILIAN COAL AND CHARCOAL-OIL MIXTURE PROGRAM
Jorge Paulo Moro

CANADIAN INITIATIVES IN COAL-LIQUID MIXTURE COMBUSTION AND DEVELOPMENT
H. Whaley

AN OVERVIEW ON CHINA'S COAL SLURRY TECHNOLOGY RESEARCH WORK
State Energy Commission of the Peoples Republic of China

OVERVIEW OF FRENCH COM PROGRAM
A. Ladurelli

INTERNATIONAL COOPERATION IN COAL/LIQUID MIXTURES
N.S. Jennings

OVERVIEW OF THE ITALIAN PROGRAM ON COAL SLURRY COMBUSTION
Assoreni

OVERVIEW OF THE R&D STATUS ON CLM IN JAPAN
Y. Nakabayashi

RESEARCH PROJECT ON COAL-OIL MIXTURE IN SPAIN
S.G. Navarro

OVERVIEW OF SWEDEN'S PROGRAM ON COAL-LIQUID MIXTURES
K.G. Borgne

(Continued)
SESSION I - INTERNATIONAL OVERVIEWS

OVERVIEW OF UNITED KINGDOM PROGRAM ON COAL SLURRY COMBUSTION
P. Gould

THE U.S. COAL-WATER MIXTURE COMBUSTION PROGRAM
C.B. Foster

VOLUME I

SESSION II - DEMONSTRATION PROJECTS
Monday, May 10, 1982
Chairperson: R.C. Kurtzrock

SUMMARY OF TEST RESULTS AT LIFE-SIZE TEST PLANT OF COM
R. Shirato, T. Kojima, Y. Hoshino, S. Iwashita, T. Sootome, T. Niwa, Y. Nakahashi, and M. Katsuta

RECENT TEST RESULT AT TAKEHARA NO. 1 UNIT, DEMONSTRATION TEST
Y. Nakabayashi, N. Suzuki, T. Shinohara, M. Nishizawa, and I. Koyama

CONVERSION OF THE 120 MW PAUL L. BARTOW PLANT UNIT 1 TO COM
M.E. Higgins

BLANZY THE FIRST COAL-OIL FRENCH INSTALLATION
J. Dreuilhe

THE COMBUSTION OF COAL IN OIL DISPERSION - DIRECT COMPARISON WITH FIRING OF RESIDUAL FUEL OIL IN A 120 MWe UTILITY BOILER
R. Conolly, K.J. Matthews, P. Gadbury, and M.T. Jacques

COAL AND OIL MIXTURE INJECTION INTO BLAST FURANCE
S. Yabe, I. Kurashige, H. Shimizu, T. Iba, and M. Kojima

COAL OIL SLURRY COMBUSTION PROGRAM FOR A BLAST FURNACE
S.G. Jansto

UTILIZATION OF A COAL-IN-OIL MIXTURE (COM) AS A REPLACEMENT FOR NO. 6 FUEL OIL AT A REPUBLIC STEEL BLAST FURNACE
R.T. Ivey, and B. Schiller

(Continued)

SESSION II - DEMONSTRATION PROJECTS

THE TEST OF COM IN A 100 t/hr. POWER STATION BOILER IN ANSHAN IRON & STEEL CO.
Xu Xiang Yu, Cen Ke-Fa, Shi Guo-Bao, and Wu Ping-Sen

VOLUME II

SESSION III - BENCH SCALE AND PILOT TESTING
Tuesday, May 11, 1982
Chairperson: J. Ravensborg

RHEOLOGY, STABILITY, AND COMBUSTION OF COAL-OIL MIXTURES
S. Meli, N. Passarini, L. Pellegrini, and L. Pistone

BENCH SCALE AND PILOT COMBUSTION TESTS OF COM
A. Feugier, and J.L. Merry

COAL/OIL SLURRY COMBUSTION AND TRIBOLOGY - A CANADIAN EXPERIENCE L. Bruno, A.S. Deshpande, and H. Whaley

COM TEST PROGRAM - ALMERIA POWER PLANT
J.P. Forte, R.H. Hickman, and R.S. Folgueras

COAL OIL MIXTURE UTILIZATION IN SMALL INDUSTRIAL AND COMMERCIAL BOILERS
R.L. Savage, W.R. Warfield, S.N. Singh, G.D. Craig, W.E. Krauss, and J.E. Ross

EXPLORATORY COAL-WATER MIXTURE COMBUSTION STUDIES IN OIL-DESIGNED BOILERS
Y.S. Pan, G.T. Bellas, R.B. Snedden, D.E. Wieczenski, G.F. Walbert, and J.I. Joubert

COLLOIL: THE SHELL APPROACH TO STABLE COAL-OIL MIXTURES
E.J. Clayfield, and J. van Klinken

COAL-WATER MIXTURE COMBUSTION STUDIES IN A LABORATORY CYLINDRICAL COMBUSTOR
G.J. Germane, L.D. Smoot, S.P. Diehl, K.H. Richardson, and S.N. Peterson

(Continued)

SESSION III - BENCH SCALE AND PILOT TESTING

RHEOLOGY AND COMBUSTION CHARACTERISTICS OF COAL-WATER MIXTURES
M.R. Ghassemzadeh, T.M. Sommer, G.A. Farthing, and S.J. Vecci

COM RESEARCH AT YANG SHU PU POWER STATION
Li Jin-Shiang, Zhao Xiao, Xu Fang-Jie, Hou En-Hai, and Guan Bi-Sheng

THE COMBUSTION CHARACTERISTICS OF COAL-OIL MIXTURE AND COAL-WATER SLURRY UNDER LOW HEATING RATE
Lin Hao

THE STABILITY AND RHEOLOGICAL PROPERTIES OF TYPICAL CHINESE COAL-OIL MIXTURE
Ma Run-Tian

MEASUREMENT OF COAL CONCENTRATION IN COAL-OIL MIXTURE BY DIFFERENCE OF DIELECTRIC PROPERTIES
Han Guang-Ming

VOLUME II

SESSION IV - COMMERCIALIZATION AND ECONOMICS
Tuesday, May 11, 1982
Chairperson: E. Chao

COMMERCIAL PRODUCTION AND USE OF COAL-OIL MIXTURES
E. Knell, G. Short, D. Adams, T. Gresham, and L. Dirickson

COAL-OIL MIXTURE AND COAL-WATER MIXTURE FUELS FOR STEAM GENERATORS
R.W. Borio, and M.J. Hargrove

COALIQUID COAL SLURRY FUEL PROGRAM - 1982
G.T. Hawkins, T. Capes, and M. Copple

COAL AND OIL MIXTURES MARKETING PROJECT
L.G. Hill, and J.E. Mogk

(Continued)

SESSION IV - COMMERCIALIZATION AND ECONOMICS

CoAl AND THE JAPANESE MARKET
D.D. Dunlop

POWER PLANT CONVERSIONS TO COAL, COAL-OIL MIXTURES, AND COAL-WATER SLURRIES
R.C. Furman

AN ASSESSMENT OF PACKAGED BOILERS FOR INDUSTRIAL COAL LIQUID MIXTURE APPLICATIONS
O.K. Foo, G.A. Malone, and E.M. Jamgochian

REPORT ON THE MASSACHUSETTS PROGRAM FOR THE IMPLEMENTATION OF COAL-OIL MIXTURE CONVERSION OF MAJOR FUEL BURNING INSTALLATIONS IN MASSACHUSETTS
L.L. Sutliff, J. Pecararo, and I. Sacks

THE U.S. MILITARY ACADEMY COAL-OIL MIXTURE CONVERSION STUDY
J.F. Thompson, Jr., and A.M. Vesey

CONCEPTUAL DESIGN AND ECONOMIC ANALYSIS FOR COAL/WATER MIXTURE UTILIZATION IN AN OIL-DESIGNED UTILITY BOILER
D.L. deLesdernier, S.A. Johnson, and V.S. Engleman

BUSINESS PLAN FOR JAPAN COM COMPANY, LTD
J. Inoue

COAL-OIL MIXTURE COMBUSTION TECHNOLOGY, TRANSFER AND ADAPTATION TO DEVELOPING COUNTRIES
E.A. Kimel, and C. Bliss

VOLUME III

SESSION V - COAL SLURRY PREPARATION AND STABILIZATION
Wednesday, May 12, 1982
Chairperson: R. Manfred

COM: THE FRENCH PROGRAM, PREPARATION, STABILIZATION, AND HANDLING OF COM
D. Bouchez, A. Faure, G. Scherer, L.A. Tranie, and G. Antonini

(Continued)

SESSION V - COAL SLURRY PREPARATION AND STABILIZATION

AN ACCELERATED METHOD FOR TESTING COM STABILITY
A.M. Al Taweel, H. Farag, and K. Langille

STUDIES ON ADDITIVES FOR CWS
M. Yamamura, S. Watanabe, T. Ukigai, and Y. Kiyonaga

DEVELOPMENT OF ADDITIVES FOR HIGH-CONTENT COAL-WATER SLURRY
A. Naka, S. Honjo, T. Imamura, and Y. Mizuno

THE STABILIZATION OF COAL-WATER SLURRIES
R.W. Sparks, and E.W. Sawyer, Jr.

STABILITY OF COAL WATER SLURRY: Co-Al
D.R. Dinger, D.F. Funk, and J.E. Funk, Sr.

PREPARATION OF A HIGHLY LOADED COAL WATER MIXTURE: Co-Al
J.E. Funk, Jr., D.R. Dinger, and J.E. Funk, Sr.

PRETREATMENT OF COAL FOR COAL WATER SLURRIES
K. Aoki, K. Shinano, and S. Kita

DEASHING OF COAL BY OIL AGGLOMERATION
M. Kurihara, Y. Nakamura, M. Yamamura, Y. Kiyonaga, A. Naka, and Y. Ogura

PRELIMINARY TEST OF HIGH CONCENTRATION COAL-WATER SLURRY
M. Kamao, N. Sato, N. Suzuki, K. Nagata, and T. Yano

STABILITY AND RHEOLOGY OF THE COAL-OIL-WATER MIXTURES PREPARED IN A COMPLETE COMBUSTION INTEGRATOR
S.K. Batra, and A. O'Toole

CONTINUOUS PREPARATION EQUIPMENT OF HIGHLY LOADED SLURRY AND ITS RHEOLOGY
M. Iwako, S. Ando, A. Hayashi, M. Koishi, and H. Takebayashi

(Continued)

SESSION V - COAL SLURRY PREPARATION AND STABILIZATION

COAL/NO. 2 OIL MIXTURE - EFFECT OF ADDITIVES ON STABILITY AND RHEOLOGICAL PROPERTIES
V.P. Singh

THE CRITICAL SOLIDS CONCENTRATION (CSC) AS A PROPERTY OF COAL SLURRIES
R.L. Rowell, Y. Wei, and B.J. Marlow

THE STUDY ON THE ADDITIVES OF COM FUEL
Hu Changming, Zeng Yuhua, Qian Liuging, and Zhang Honggen

VOLUME III

SESSION VI - COMBUSTION AND EMISSIONS
Wednesday, May 12, 1982
Chairperson: J. Beér

FURTHER DEVELOPMENT AND EVALUATION OF COAL-WATER MIXTURE TECHNOLOGY
R.S. Scheffe, E.G. Skolnik, N.P. Rossmeissl, H.L. Heaton, and E.T. McHale

THE HANDLING AND COMBUSTION CHARACTERISTICS OF STABLE COAL/FUEL OIL DISPERSIONS
D. Wall

COMBUSTION, HEAT TRANSFER, ASH DEPOSITION AND POLLUTION EMISSION CHARACTERISTICS OF COAL-OIL MIXTURES
J.M. Beér, W.F. Farmayan, C. Gabriel, M. Toqan, S. Srinvaschar, and L. Monroe

CONTROL OF EMISSIONS FROM COAL-OIL MIXTURE FIRED BOILERS
R.M. Parks, and M.E. Kelly

RESULTS OF COMBUSTION OF COAL-OIL MIXTURE IN A UTILITY BOILER
S.K. Batra

(Continued)
SESSION VI - COMBUSTION AND EMISSIONS

STUDIES TO EVALUATE THE IMPACT OF CONVERSION FROM FUEL OIL TO COAL-OIL MIXTURES ON THERMAL PERFORMANCE AND POLLUTANT EMISSIONS
G.C. England, Y. Kwan, W. Richter, and K. Fujimura

COMBUSTION RATES OF COAL-OIL SLURRIES
R.P. Cossee, and A.B. Hedley

PETROLEUM COKE OIL SLURRIES
R.C. Nunn, W.L. Richardson, and W.M. Bollen

THE FUEL USE ACT AND ELECTRIC UTILITIES - AN UPDATE
S.A. Frank, and L.E. Farrar

HANDLING, COMBUSTION AND EMISSIONS FROM VARIOUS COAL-OIL DISPERSIONS
J.S. Alabaf

EXPERIMENTAL STUDY OF COMBUSTION PROCESS OF SINGLE COM DROPLET AND COM SPRAY
Chyi-Fwu Kang, Yun-Sien Chen, Xiang Zhao, Chyi-Fioro, and You-Zhong Ren

EXPERIMENTAL STUDY ON COMBUSTION PROPERTY OF COAL-WATER SLURRY
Ke-Fa Cen, Xin-Yu Cao, Ji-Yu Hong, Ming-Jiang Ni, Shui-Yuan Kong, and Yun-Sien Chen

VOLUME IV

SESSION VII - EQUIPMENT
Wednesday, May 12, 1982
Chairperson: E.T. McHale

FACTORS AFFECTING PUMP SELECTION FOR TRANSFERRING AND METERING SLURRY-TYPE FUELS
M. Dillon, W. Donahue, and J.D. Bourke

EROSION IN COAL/LIQUID/MIXTURES HANDLING SYSTEMS
A.M. Al Taweel, G. Murphy, and D. Covill

(Continued)

SESSION VII - EQUIPMENT

TRANSPORT AND HANDLING CHARACTERISTICS OF COAL-WATER MIXTURES
J.M. Ekmann

RECIRCULATION MIXING OF COAL SLURRY STORAGE TANKS
T. Butcher, C. Krishna, and J. Saunders

PERFORMANCE EVALUATION OF A PULSE JET FABRIC FILTER ON A PACKAGE INDUSTRIAL BOILER FIRING COAL-OIL-WATER MIXTURE
J.P. Dooher, T. Kanabrocki, D. Albert, N. Chuisano, B. Gilmartin, D. Wright, J.H. Brummer, and W.J. Morris

COMBUSTION OF COAL-WATER SLURRY IN PRESSURIZED FLUIDIZED BED COMBINED CYCLE POWER PLANT
H.R. Hoy, A.G. Roberts, and K.K. Pillai

GRINDING OF COAL-OIL SLURRIES WITH THE SZEGO MILL - EFFECTS OF SOLIDS CONCENTRATION
O. Trass, V.R. Koka, G. Papachristodoulou, and E.R. Vasquez

THE COAL-CONTENT MEASURING AND MONITORING EQUIPMENT FOR COM
Sun Yao-qiu, and Yuan Wen-chang

ATOMIZATION CHARACTERISTICS OF COAL-WATER MIXTURES
C.R. Krishna, P. Marnell, and T.A. Butcher

EXPERIMENTAL STUDY OF THE CHARACTERISTICS OF THE SWIRL-TYPE NOZZLE FOR COAL SLURRIES
Ming-Hu Xie, and De-Shou Lu

VOLUME IV

SESSION VIII - COAL SLURRY RHEOLOGY

Wednesday, May 12, 1982
Chairperson: P. Gould

RHEOLOGICAL PROPERTIES OF COAL-OIL MIXTURES - EFFECT OF PARTICLE SIZE DISTRIBUTION
G. Papachristodoulou, H. Boghossian, and O. Trass

(Continued)

SESSION VIII - COAL SLURRY RHEOLOGY

LABORATORY STUDIES OF THE GRINDING AND RHEOLOGY OF COAL/WATER SLURRIES
R. Klimpel

RHEOLOGY OF A HIGH SOLIDS COAL-WATER MIXTURE: Co-Al
D.R. Dinger, J.E. Funk, Jr., and J.E. Funk, Sr.

CONTROL PARAMETERS FOR A 75 WT % COAL-WATER SLURRY: Co-Al
J.E. Funk, Jr., D.R. Dinger, and J.E. Funk, Sr.

RHEOLOGICAL PROPERTIES OF COAL/WATER AND COAL/OIL/WATER MIXTURES
A.M. Al Taweel, W. McKee, O. Fadaly, G.D.M. MacKay, and J. Kwak

THE EFFECT OF COAL PARTICLE AGGREGATION ON THE BEHAVIOR OF A COM UNDER STATIC AND DYNAMIC CONDITIONS
M. Adams-Viola, G.D. Botsaris, W.G. Filmyer, Y.M. Glazman, and K. King

IGNITION CHARACTERISTICS OF COAL SLURRIES IN ETHANOL BLENDED FUEL OIL NO. 6 AND THEIR STABILITY AND RHEOLOGICAL PROPERTIES
K.C. Adiga, R. Rangneker, B. Moudgil, and D.O. Shah

CHARACTERIZATION OF CHARCOAL-OIL MIXTURES: EVALUATION OF STABILITY AND RHEOLOGY PROPERTIES
R. Kunert, W.B. Peres, and M.L. Cotrim

RHEOLOGY, STABILITY AND IGNITION CHARACTERISTICS OF COAL SLURRIES IN FUEL OIL NO. 2 IN PRESENCE OF ETHANOL AND WATER
K.C. Adiga, Y. Pithapurwala, S. Najmy, B. Moudgil, and D.O. Shah

PUMP STARTUP OF A STABILIZED HIGH SOLIDS COAL-WATER SLURRY: Co-Al
D.F. Funk, and J.E. Funk, Sr.

INVESTIGATION OF FLOW PROPERTIES AND HEAT TRANSFER PROCESS OF COAL SLURRY INSIDE PIPE LINE
Ke-fa Cen, Zhen-Fu Yuan, Xin-Yu Cao, Chong-Qing Lu, and Ji-Yu Hong

COM : THE FRENCH PROGRAM

PREPARATION, STABILIZATION AND HANDLING OF COM

Authors : D. BOUCHEZ[x], A. FAURE[x], G. SCHERER[xx], L.A. TRANIE[xx], G. ANTONINI[xxx]

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France has been involved in R and D activities in COM within these last two years.

In particular, C.O.M. formulation studies have been carried out with different kinds of fuel oils.

These studies had two main objectives :

- determination of a method of preparation from bench scale tests to give to the partners of the french program the know-how of making the C.O.M. for using it in combustion and circulation tests.
- choice of an additive based on good proporties of the COM, i.e., stability and rheology.

This paper deals with the results on stability and rheology of COM according to :

- Nature of the coal
- Nature of the oil
- % coal
- % water
- Nature of the additive
- % additive
- Method of preparation
- The stability is characterized by the sedimentation rate ; it is expressed by the rate it takes to reach a maximum bottom concentration of coal.

COM are compared according to three parameters :

- . sedimentation rate
- . maximum concentration
- . consistency of deposits

Sedimentation is measured with an automatic apparatus based on γ densimetry.

- Rheology is measured with a rotating viscosimeter ; the lab measurements are compared with results of a circulation test loop giving head losses versus flowrates.

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COM : THE FRENCH PROGRAM

PREPARATION, STABILIZATION AND HANDLING OF COM

1. INTRODUCTION

C.O.M. (Coal Oil Mixture) is a short term solution to enable users to reduce their oil consumption.

This new product would be used for :

- the substitution of heavy fuel oil ## 6 in existing oil-fired installations without high retrofitting costs
- new installations specially designed for COM

Before commercialization it is necessary to demonstrate that COM has satisfactory stability and viscosity, as well as good handling and combustion properties.

In addition to these technical point, COM needs to be economically competitive.

This paper will deal only with the results of tests carried out on the stability and rheology of COM.

D. BOUCHEZ

2. CHARACTERISTICS OF COM COMPONENTS

The studies were carried out mainly on COM made from 3 types of coal and 3 heavy fuel oils. Analyses are shown in tables 1 and 2.

2.1. COAL

2.1.1. Nature

The three coals come from :

- France (Lorraine, Freyming)
- South Africa (Ermelo)
- USA

2.1.2. Particle size distribution

The results concern only coal ground to industrial size (70 % minus 200 mesh)

2.2. HEAVY FUEL OIL

French heavy fuel oil ## 2 is similar to American heavy fuel oil ## 6.
The 3 oils selected for tests are representative of the 3 major heavy fuel oils processed in refineries :

- Visbroken fuel oils (RVB)
- Oils made from residues of vacuum distillation (RSV)
- Oils with a low sulfur content (BTS)

2.3. ADDITIVES

COM were stabilized with chemical additives. Preliminary tests were made for screening and selection of the two additives giving the best results.

3. METHODS

3.1. STABILITY

Stability measurements were carried out in laboratory tests with 1 kg samples and in pilot tests with 1.7 m3 tanks.

3.1.1. Laboratory tests

Settlement rate is measured with a special device base on γ densimetry (figure 1).

3.1.1.1. Principle

Coal particle settlement rate is assessed by measuring the evolution of the density of the mixture at different levels of the sample.

γ beam attenuation through a medium is related to density according to :

$$I = I_o e^{-\mu\rho x}$$

- x = depht crossed by the beam
- I = emerging beam
- I_o = entering beam
- μ = mass absorption coefficient
- ρ = density

μm for the different components crossed by the beam are nearly the same (i.e. coal, fuel oil, water, glass).

3.1.1.2. Method

1 kg samples of the mixtures to be tested are placed inside a thermostated bath. Records at different level of beam attenuation of the signal coming from a Cesium 137 source are correlated to coal concentration with the help of a calibration.

3.1.2. Pilot tests

Four 1.7 m3 tanks are equipped with external heating to maintain a constant temperature (60°C).

Each tank is fitted with a retrodiffusion probe moving inside a coaxial aluminum tube. This probe enables COM density variation measurement inside the tanks without any physical contact with the mixtures.
The probe is composed of :

- a C_s 137 source
- a Geiger - Muller detector
- electronics