SYSTEMS ANALYSIS PROJECT ADVISORY COMMITTEE

and

MAPPS USERS GROUP

Institute of Paper Science and Technology
Central Files

SLIDE MATERIAL

October 24-25, 1985
STATUS

VERSION 2.0 ISSUED IN SEPTEMBER
INCLUDES C, E, AND D BLEACH MODULES
IMPLEMENTED IMPROVED FILE HANDLING

VERSION 2.0 AVAILABLE FOR SEVERAL SYSTEMS:
IBM MAINFRAMES
DEC 11/7xx SERIES MACHINES
MASSCOMP
IBM PERSONAL COMPUTERS
IBM PC COMPATIBLES
    COMPAQ
    HP 150 AND VECTRA
    ZENITH
    TANDY

14 USERS
8 PULP AND PAPER COMPANIES
1 CONSULTING ENGINEERING FIRM
5 UNIVERSITIES
GOOD PROSPECTS

3 PULP AND PAPER COMPANIES
2 CONSULTING ENGINEERING FIRMS
3 UNIVERSITIES

COURSE UTILIZATION

PROCESS DESIGN
Dr. Dave Clay

PULPING AND BLEACHING
Dr. Earl Malcolm

SYSTEMS ENGINEERING
Dr. Peter Parker

STUDENT WORK

BROWN STOCK WASHER
Frank Harper

DISC SAVEALL
Doug Crane

RECOVERY FURNACE CHAR BED
Dan Sumnicht

FLUIDIZED BED CLACINER
Nancy Sell
MARKETING STRATEGIES

NEED TO REACH SMALLER COMPANIES
NEED TO REACH MILL SITES

MARKETING STRATEGIES

NEW BROCHURE
TECHNICAL PRESENTATIONS
MARKET HARDWARE/SOFTWARE PACKAGE
MORE "DIRECT" SALES APPROACH

MARKETING STRATEGIES

PRICING STRUCTURE
DEMONSTRATION PROGRAM
TIME-SHARING SERVICE

MICRO CUSTOMIZATION

USERS DESIRE "MENU" ORIENTED DISPLAYS
VIRTUALLY ALL MICRO USERS HAVE MS DOS MACHINES
MENU DATA ALREADY AVAILABLE IN MAPPS
INCREASED EASE OF USE
MICRO CUSTOMIZATION

MAINFRAME AND MICRO CODES WOULD REQUIRE SEPARATE MAINTENANCE
TRANSPORTABILITY DECREASED
DOCUMENTATION DIFFICULTIES
EXTRA COST OPTION?

QUALITY MODELING

GOAL IS TO RELATE QUALITY PARAMETERS TO PROCESSING CONDITIONS

QUALITY MODELING

BROWN PULP
BLEACHED PULP
PAPER

BROWN PULP QUALITY

VISCOSITY
KAPPA
SHIVES
BLEACHED PULP QUALITY

VISCOSITY
BRIGHTNESS
SHIVES
DIRT

PAPER QUALITY

END PRODUCT DEMANDS SUCH AS:
STRENGTH (MD, CD, ZD)
OPACITY
BRIGHTNESS

MODELING PRIORITIES

BREADTH VS. DEPTH
IMMEDIATE VS. FUTURE NEEDS
MODELS FOR BROADER COVERAGE

MECHANICAL PULPING

TMP
CTMP
PGW

CHEMICAL PULPING

HIGH YIELD KRAFT
SODA
SULFITE
SOLVENT

BLEACHING

C/D AND D/C SUBSTITUTIONS

OXYGEN
PEROXIDE
OZONE
E(0)
RECOVERY

PRECIPITATOR
SCRUBBER
FLUID BED COMBUSTERS

PAPERMAKING

IMPROVED COVERAGE NEEDED
IN ALL AREAS

MORE DETAILED MODELS

EVAPORATORS
DIGESTERS
BROWN STOCK WASHERS
LIME KILN
RECOVERY FURNACE
SLÄKER/CAUSTICIZER
EVAPORATOR DEVELOPMENT FOR MAPPS

G. L. JONES

BACKGROUND

• EXISTING MAPPS MULTIEFFECT MODEL (EVAP01)
  - SIMPLE AND USEFUL
  - LACKS CAPABILITIES FOR DESIGN AND PREDICTION

• SINGLE EFFECT MODELS IN LITERATURE
  - COMPREHENSIVE
  - CUMBERSOME OR UNREALISTIC

• MULTIEFFECT ALGORITHMS LIMIT PIPING ARRANGEMENTS

OBJECTIVE

• IMPROVE MAPPS CAPABILITY IN SIMULATING SINGLE AND MULTIEFFECT UNITS

REQUIREMENTS

• FLEXIBLE AND EASY TO USE
  - PARAMETER SPECIFICATIONS
  - PIPING ARRANGEMENTS
REQUIREMENTS

- PREDICTIVE AND REALISTIC
  - HEAT TRANSFER COEFFICIENT
  - SCALING AND PRECIPITATION
  - LIQUOR ENTRAINMENT
  - LIQUOR SIDE PHYSICAL
    PROPERTIES AND FLOW

REQUIREMENTS

- STABLE, READILY CONVERGED
- COMPATIBLE WITH EXISTING MAPPS MODELS

STATUS

- PRELIMINARY SINGLE EFFECT MODEL
  - FLEXIBLE PARAMETER AND FEED SPECS
  - COMPUTES OUTLET STREAMS, STEAM
    ECONOMY, HEAT LOSS, DUTY AND
    COMBINATIONS OF U, A, UA, OR PVAP

STATUS

- PRELIMINARY MODEL EQUATIONS FOR MULTIEFFECT
  SYSTEM
  - SIMULTANEOUS EQUATIONS SOLVED INTERNALLY
  - VARIETY OF PIPING AND FEED ARRANGEMENTS
STATUS

- HEAT TRANSFER COEFFICIENT MODEL
  - PHYSICAL PROPERTIES
  - FLOW REGIME
  - ELECTROLYTE EQUILIBRIUM (SCALING)
  - ENTRAINMENT

E(O) BLEACHING

Use of Oxygen in the First Alkaline Extraction Stage

van Lierop, B.; Liebergott, N.; Teodorescu, G.; Kubes, G. J.
"Using oxygen in the first extraction stage of a bleaching sequence."

STOICHIOMETRIC MODEL

\[
\frac{d(PK)}{d(X)} = A1 \cdot (PK - PKMIN)
\]

\[
PKI - PK = (PKI - PKMIN) \cdot [1 - \exp(-A1.X)]
\]
\[ DK = DK_{MAX} \left[ 1 - \exp(-A1 \cdot X) \right] \]
\[ DK = PKI - PK \]
\[ DK_{MAX} = PKI - PK_{MIN} \]

**FIGURE 1**
Softwood Kraft
\( X = 0.2 \text{ kg/o.d. pulp} \)

**FIGURE 2**
Hardwood Kraft
\( X = 0.4 \text{ kg/o.d. pulp} \)
FIGURE 3
Softwood Kraft
*Data of Van Lierop et al

\[ DK = PK_1 - PK \]

\[ DK = 2.1 \left[ 1 - \exp(-0.225 \times X) \right] \]

\( X = O_2 \text{ kg/o.d. pulp} \)

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<thead>
<tr>
<th>SYMBOL</th>
<th>SPECIE</th>
<th>REF</th>
<th>A1</th>
<th>DKMAX</th>
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<tr>
<td></td>
<td>SOFTWOOD</td>
<td>WEYRICK (2)</td>
<td>5.0</td>
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<tr>
<td>▲</td>
<td>HARDWOOD</td>
<td>WEYRICK (2)</td>
<td>4.0</td>
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<td>SOFTWOOD</td>
<td>VAN LIEROP (1) ETAL</td>
<td>2.2</td>
<td>2.10</td>
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ALKALI CONSUMED

ALKALI CONSUMED, % OD PULP = B1 . X

CHLORINE DIOXIDE SAVED

<table>
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<tr>
<th>REFERENCE</th>
<th>C102 (kg/o.d. pulp)/O2 (kg/o.d. pulp)</th>
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<td>SOFTWOOD</td>
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<tr>
<td>van Lierop et al. (3)</td>
<td>0.80</td>
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<tr>
<td>Weyrick, H. W. (4)</td>
<td>0.56</td>
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<td>Kortelainen et al. (5)</td>
<td>1.00</td>
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<td>Robitaille, M. A. (6)</td>
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<td>Lindstrom et al. (7)</td>
<td>0.86</td>
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<td>Schleinkofer, R.W. (8)</td>
<td>0.40</td>
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<tr>
<td>Enz &amp; Hallenbeck (9)</td>
<td>0.70</td>
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<tr>
<td>AVERAGE (std.)</td>
<td>0.72 (0.22)</td>
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PHYSICAL PROPERTIES

EXPANDED PHYSICAL PROPERTY DATABASE REQUIRED

LIQUID DENSITY = F(T,C)

GAS DENSITY = F(T,P,C,Z)

ATOMIC COMPOSITION OF COMPOUNDS

FIBER PROPERTIES

RAW MATERIAL PROPERTIES

IMPLEMENTATION QUESTIONS

ASPEN "PLEX" TYPE STRUCTURE

TABLE LOOKUP

TRUE DATABASE

LANGUAGE STRUCTURE

COMPATIBILITY