## COMTRUUOUS IEVALUATION OF CORRUGATNG MEDBUM

(Data for November and December, 1969)
Projed 2694-2

Report Seventeen

## A Progress Report

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FOURDRINIER KRAFY BOARD INSTITUTE, INC.

This material is intended only for the iniernal use of authorized persons within Fourdrinier Kraff Board Instifute member companies

January 23, 1970

THE INSTITUTE OF PAPER CHEMISTRY
Appleton, Wisconsin

CONTINUOUS EVALUATION OF CORRUGATING MEDIUM
(Data.for November and December, 1969)
Project 2694-2

Report Seventeen
A Progress Report
to
FOURDRINIER KRAFT BOARD INSTITUTE, INC.

This material is intended only for the internal use of authorized persons within Fourdrinier Kraft Board Institute member companies
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SUMMARY OF TEST RESULTS FOR INDIVIDUAL MACHINES ..... 8
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## Appleton, Wisconsin

## CONTINUOUS EVALUATION OF CORRUGATING MEDIUM (Data for November and December, 1969)

SUMMARY

PART I. GENERAL
A. Participation Data:

|  | Previous Period | Current Period |
| :--- | :---: | :---: |
| Period | Sept.-Oct., 1969 | Nov.-Dec., 1969 |
| Number of machines | 29 | 28 |
| Number of rolls | 103 | 95 |

B. Distribution of Mediums by Type:

Semichemical $29 \quad 28$
Bogus 0
0
Kraft 0
C. New Participants:

None
D. Nonparticipants:

|  | Chesapeake (West Point No. 1) | 1. | Chesapeake (West Point) |
| :---: | :---: | :---: | :---: |
| 2. | Container Corp. <br> (Circleville No. 5) | 2. | Container Corp. (Circleville No. 5) |
| 3. | Continental Can (Hodge No. I) | 3. | Continental Can (Hodge No. 1 and Hopewell No. 1) |
| 4. | Crown Zellerbach <br> (Baltimore Nos. 1 \& 2) | 4. | Crown Zellerbach <br> (Baltimore Nos. 1 \& 2) |
| 5. | Olinkraft, Inc. <br> (W. Monroe Nos. 1 \& 3 ) | 5. | Olinkraft, Inc. <br> (W. Monroe Nos. 1 \& 3) |
| 6. | Owens-Ill., Inc. <br> (Big Island Nos. $1 \& 3$ ) | 6. | The Mead Corp. <br> (Lynchburg No. 2) |
| 7. | St. Joe Paper Co. (Port St. Joe No. I) | 7. | St. Joe Paper Co. <br> (Port St. Joe No. 1) |
| 8. | St. Regis Paper Co. (Coshocton No. 1) | 8. | St. Regis Paper Co. (Coshocton No. 1) |
| 9. | Union Camp Corp. (Monroe No. 2) | 9. | Union Camp Corp. (Monroe No. 2) |

10. Weyerhaeuser
(Longview No. 4)

PART II. QUALITY DATA
A. Summary of Physical Test Data

| Test |  | Machine Averages |  | F.K.I. Averages |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | Report | Mex. | Min. | Current | Cumulative |
| Basis weịght | cur. | 28.1 | 25.3 | 26.8 | 26.8 |
| lb./1000 ft. ${ }^{2}$ | Prev. | 28.1 | 25.5 | 26.8 | 26.8 |
| Caliper, pt. | Cur. | 11.7 | 9.3 | 10.3 | 10.3 |
|  | Prev. | 11.6 | 8.9 | 10.2 | 10.4 |
| Concora flat | Cur. | 47.2 | 31.8 | 40.8 | 42.9 |
| crush, p.s.i. | Prev. | 49.9 | 35.2 | 42.5 | 42.9 |
| Single-face flat | Cur. | 34.7 | 24.7 | 30.3 | 32.1 |
| crush, p.s.i. | Prev. | 37.4 | 26.3 | 32.2 | 32.2 |

B. Summary of Runnability Data

| Runnability |  | Previous Period |  |  | Current Period |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Speed, | Tension, | No. | \% of ${ }^{\text {" }}$ | Cum., | No. | \% of | Cum., |
| f.p.m. | lb./in. | of Rolls | Total | \% | of Rolls | Total | \% |
| <600 | Min. | 6 | 5.8 | 100.0 | 4 | 4.2 | 100.0 |
| 600 | Min. | 7 | 6.8 | 94.2 | 12 | 12.6 | 95.8 |
| 600 | 1/2 | 10 | 9.7 | 87.4 | 10 | 10.5 | 83.2 |
| 600 | 1 | 14 | 13.6 | 77.7 | 17 | 17.9 | 72.7 |
| 600 | 1-1/2 | 66 | 64.1 | 64.1 | 52 | 54.7 | 54.7 |

C. Trends in Quality Data in Current Report with Reference to Data from Previous Report

Physical Tests:

| Basis weight: | Same as previous report |
| :--- | :--- |
| Caliper: | Increased from 10.2 to 10.3 pt. |
| Concora flat crush: | Decreased from 42.5 to $40.8 \mathrm{p.s.i}$ |
| Single-face flat crush: | Decreased from 32.2 to $30.3 \mathrm{p} . \mathrm{s.i}$. |

Runnability:

| 00 f.p.m. at minimum tension: | Decreased from 5.8 to $4.2 \%$ |
| :---: | :---: |
| 600 f.p.m. at minimum tension: | -Increased from 6.8 to $12.6 \%$ |
| $600 \mathrm{f.p.m}$. at $\mathrm{l} / 2 \mathrm{lb}$./in. tension: | Increased from 9.7 to $10.5 \%$ |
| $600 \mathrm{f.p.m}$. at l lb./in. tension: | Increased from 13.6 to $17.9 \%$ |
| 600 f.p.m. at l-l/2 lb./in. tension: | Decreased from 64.1 to $54.7 \%$ |

Comment: The increase at min. and $1.0 \mathrm{lb} . / \mathrm{in}$. accounts for the slight decrease at 1.5 lb . $/ \mathrm{in}$.

PART III. CONCORA CALIBRATION DATA
A. Summary of Data (Number and Percentage of Machines Included Within the Indicated Ranges)

| $\begin{gathered} \text { Range, } \\ \% \end{gathered}$ | Previous Period |  | Current Period |  |
| :---: | :---: | :---: | :---: | :---: |
|  | No. of | \% of | No. of | \% of |
|  | Machines | Total | Machines | Total |
| $\pm 1.0$ | 2 | 9.5 | 4 | 17.4 |
| $\pm 2.5$ | 7 | 33.3 | 8 | 34.8 |
| $\pm 5.0$ | 15 | 71.4 | 14 | 60.9 |
| $\pm 10.0$ | 21 | 100.0 | 22 | 95.7 |
| Max. | 21 | $100.0^{\text {a }}$ | 23 | $100.0^{\text {b }}$ |

B. Significance of Calibration Data The current level of agreement between Institute and mill Concora flat crush data compares favorably with the previous report.

[^0]
## INTRODUCTION

As requested by the Technical Division of the Fourdrinier Kraft Board Institute, Inc., the" reports pertinent-to the continuous evaluation of corrugating medium have been prepared by The Institute of Paper Chemistry on a bimonthly instead of monthly basis since August, 1961. The current report summarizes the data obtained during November and December, 1969, on"95"rolls of corrugating medium submitted for evaluation from twenty-eight machines.

Each roll was evaluated at the Institute for basis weight; caliper, Concora flat crush (tested immediately after fluting), H, and D. flat crush on single-faced board, and runnability. The reader's attention is directed to the fact that. the current base-line report is the tenth one in which Concora flat crush results were obtained on specimens tested immediately after fluting, Runnability"was evaluated by corrugating each roll under standardized'conditions on the Institute's singlefacer into A-flute board at 600 feet per minute with minimum tension and recording the draw factor at this speed and tension if the roll ran satisfactorily. If unsatisfactory runnability occurred at this speed and tension, the single-facer was slowed down in increments of 25 f.p.m. using minimum tension until satisfactory runnability was obtained, i:e., until there'was no visual evidence of fractured flutes. In this latter case the draw factor was recorded for the highest speed below 600 f.p.m. (with minimum tension) at which the roll ran satisfactorily. On . the other hand, if initial fabrication of the roll was satisfactory at 600 f.p.m. with minimum tension; further runs were made at-600 f.pim. using higher tension to determine the maximum tension at 600 f.p.m. which the medium could sustain without. visual evidence of fracturing, The higher tensions used at 600 f.p.m. were 0.5, l.0, and $1.5 \mathrm{lb} . /$ inch. For each roll, flat crush was determined on the single-faced board obtained at a speed of $600 \mathrm{f} . \mathrm{p} . \mathrm{m}$. with minimum tension, or if the roll could not be
corrugated satisfactorily at 600 f.p.m: with minimum tension; flat crush was determined on the single-faced board obtained at the highest speed below 600 f.p.m. at which the medium could be corrugated with minimum tension. "The flat crush results on the single-faced board, in addition to supplying information about quality, also provide data which may be useful to each participant as a means of evaluating the nature of the quantitative relationship between Concora flat-crush and combined board flat crush for his medium.

For each participating machine, test data for the current period are shown in Table I. A tabulation of the number of rolls and type of medium evaluated is also given in Table I for each machine. The current machine test averages given in Table I are the means for each test property of the averages obtained on all rolls of corrugating medium evaluated from a given machine during the current period. In addition to the current machine test averages, Table I also presents current F.K.I. averages, cumulative F.K.I. averages, and F.K.I. indexes. The current F.K.I. average for each test property is the mean of the current machine averages for the same property for all machines participating in the study during a given period: The cumulative F.K.I. average for a given test property is the mean of the current F.K.I. averages for the same property for the previous twelve-month period excluding the average for the current period. The F.K.I. index for each test property is obtained as follows:

$$
\frac{\text { current F.K.I. average }}{\text { cumulative F.K.I. average }} \times 100=\text { F:K.I. index }(\%)
$$

The F.K.I. index for each test property provides a convenient means of comparing current average quality with corresponding average quality for the previous six periods. An index greater than $100 \%$ indicates, of course, that current average quality is higher than the corresponding average quality for the previous six periods; similarly an index below $100 \%$ indicates that current average quality is lower than the corresponding average quality for the previous six periods.


The test results obtained on the rolls submitted from the production of individual machines during the current period are shown in Tables II through XXIX for Machines $A$ through $Z$ and Machines $A A$, and $B B$, respectively: For each machine, the maximum, minimum, and average results obtained on each roll are shown for all test properties except basis weight for which only the average is shown; in addition, the overall average result for all rolls submitted from a given machine is shown for each test property. The latter overall averages are reported as "current machine averages." A cumulative machine average for each test property is also shown and represents the mean of the current machine averages for the same property for the previous six periods (excluding the current period). Also shown for each machine and for each test property in Tables II to XXIX are a machine factor and machine index which are defined as follows:

$$
\begin{aligned}
& \frac{\text { current machine average }}{\text { cumulative machine average. }} \times 100=\text { machine factor }(\%) \\
& \frac{\text { current machine average }}{\text { cumulative F.K.I. average }} \times 100=\text { machine index }(\%)
\end{aligned}
$$

The machine factor and machine index provide a convenient means for comparing the current machine average for each test property with either the previous results obtained on the same machine for the same test property or with the cumulative result for all machines - i.e., the cumulative F.K.I. average for the same test property.
TABLE II
SUMMARY OF TEST RESULTS FOR MACHINE
NOV. AND DEC. 1969
TYPE OF MEDIUM- SEMICHEMICAL
MARY OF TEST RESULTS FOR MACHINE
NOV. AND DEC. 1969
TYPE OF MEDIUM- SEMICHEMICAL

table III

B YY OF TEST RESULTS FOR MACHINE
NOV. AND DEC. 1969


TYPE OF MEDIUM- SEMICHEMICAL
CONCORA FLAT CRUSH,
P.SOI $\begin{array}{lll}\text { MAX. } & \text { MIN. } & \text { AV. } \\ & & \\ 42.0 & 39.0 & 40.3 \\ 44.4 & 37.8 & 41.2 \\ 42.0 & 36.6 & 39.5 \\ 40.2 & 37.2 & 39.0\end{array}$
$\rightarrow \dot{\square} \rightarrow \infty \quad$ movo

cIM SISV8
LB./M.
SQ. FT.





TABLE SUMMARY OF TEST RESULTS FOR MACHINE C
NOV. AND DEC. 1969

TYPE OF MEDIUM- SEMICHEMICAL TABLE•IV TYPE OF MEDIUM- SEMICHEMICAL
 25.5
26.0

25.8
25.8
100.0
96.3
 MACHINE FACTOR, PERCENT
MACHINE INDEX, PERCENT
N
TABLE VI
$\boldsymbol{\omega}$
SUMmARY OF TEST RESULTS FOR MACHINE
NOV．AND DEC．， 1969
TYPE OF MEDIUM－SEMICHEMICAL

| RUNNABILITY |  |
| :---: | :---: |
| ORAW |  |
| LB．／IN．\＃A |  |
|  |  |
| 1.5 | 1.566 |
| 1.5 | 1.562 |
| 1.5 | 1.574 |
| 1.5 | 1.574 |
|  |  |
|  |  |
|  |  |

1.569

| SINGLE－FACE FLAT |  |  |
| :---: | :---: | :---: |
| CRUSH，P．S．I． |  |  |
| MAX．MIN． | AV． |  |
|  |  |  |
| 33.6 | 32.0 | 32.9 |
| 32.4 | 29.8 | 31.2 |
| 36.0 | 34.4 | 35.1 |
| 35.8 | 33.6 | 34.8 |
|  |  |  |
|  |  | 33.5 |
|  |  | 33.5 |
|  | 100.0 |  |
|  |  |  |
|  |  |  |

F

##  <br> TYPE OF MEDIUM－SEMICHEMICAL



|  | $\sim \infty \rightarrow N$ | Mn No |
| :---: | :---: | :---: |
|  | $\dot{\sim} \dot{m} \dot{j}$ |  |
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| ¢0：O＊＊ |  |  |
| U． |  |  |
| İE mmmm |  |  |
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| す。 | ＋$\sim \infty$ |  |
| 2以× | min ${ }^{\text {c }}$ |  |
| い $\mathbf{x}$ | mmmm |  |



| I | $\sim \rightarrow 0 \infty$ |  |
| :---: | :---: | :---: |
| の， | べが | $\ddot{0} 0 \dot{0}$ |
| $\infty$ | NNN | N ${ }^{\circ}$ |
|  |  |  |
| － |  |  |


|  | －XBONI $\exists \mathrm{NIH} \mathrm{H}$ V －yOIJV」 $3 N I H כ \nabla W$ HכVW ヨAIIV7กWกכ ЭNIHJVW INJyy כ |  |
| :---: | :---: | :---: |
| E62E | 69－EI－01 |  |
| 290¢ | 69－\％－01 | E－J |
| 9力62 | 69－2－01 | 2－J |
| LIEて | 69－11－6 | 1－3 |
| －ON | 30マW | 3005 |
| \％ | 31マ0 |  |
| 711\％ |  |  |



| SINGLE-FACE FLAT CRUSH, P.S.I. |  |  | RUNNABILITY |  |
| :---: | :---: | :---: | :---: | :---: |
| MAX. | MIN. | AV. | LB./IN.*A | FACTOR*B |
| 30.8 | 28.8 | 29.6 | MIN. | 1.562 |
|  |  | 29.6 |  | 1.562 |
|  |  | 31.4 |  |  |
|  |  | 94.3 |  |  |
|  |  | 92.2 |  |  |



H
ARY OF TEST RESULTS FOR MACHINE
NOY. AND DEC., 1969
TYPE OF MEDIUM- SEMICHEMICAL
CONGORA FLAT CRUSH,
P.S.I.
MAX. MIN. AV.
38.8

38.8
40.3
96.3
90.4
37.8
table vill
tABLE IX
SUMMARY OF TEST RESULTS FOR MACHINE
NOV. AND DEC., 1969
TYPE OF MEDIUM- SEMICHEMICAL
CONCORA FLAT CRUSH, MAX. MIN. AV.
$\begin{array}{ll}0 & 0 \\ \infty & \vdots \\ m & y \\ n & \infty \\ \vdots & 0 \\ m & j \\ 0 & \infty \\ \vdots & n \\ j & 0\end{array}$
$n+$
0
0
4
$\begin{array}{ll}0 & \sigma \\ 0 & \dot{0} \\ 0 & 0\end{array}$
$\begin{array}{ll}M+ & +0-0 \\ 00 & 000-0 \\ -0 & 0\end{array}$ $\begin{array}{lrr}\text { CALIPER, PT. } \\ \text { MAX. MIN. AV. } \\ & & \\ 12.0 & 11.1 & 11.7 \\ & & \\ & & 11.7 \\ & 11.1 \\ & & 105.4 \\ & & \end{array}$
BÁSIS WT.,
LB./M.
27.5
27.5
27.3
100.7
102.6
102.6

TABLE VIII
TABLE XII

table xiv

a

$$
\begin{aligned}
& \text { LB./M. } \\
& \text { SQ. FT. } \\
& \\
& 26.8 \\
& 27.0 \\
& 27.9 \\
& 27.9 \\
& \\
& 27.4 \\
& 27.8 \\
& 98.6 \\
& 102.2
\end{aligned}
$$

$$
\begin{gathered}
\text { BASIS WT.. } \\
\text { LB./M. }
\end{gathered}
$$

‘HSO8S IV7s マyOJNOS

$$
\begin{array}{rrr} 
& \text { OATE } & \text { MILL } \\
\text { COOE } & \text { MADE } & \text { NOLL }
\end{array}
$$

| $P-1 \quad 10-30-69$ |
| :--- |
| $P-2$ |
| $P-3$ |
| $10-31-69$ |
| $P-4$ |
| $12-4-69$ |
| CURRENT MACHINE AVERAGE |
| CUMULATIVE MACHINE AVERAGE |
| MACHINE FACTOR，PERCENT |
| MACHINE INDEX，PERCENT |

[^1]\[

$$
\begin{aligned}
& \text { BASIS WT. } \\
& \text { LB. } / \text { M. } \\
& \text { SQ. FT. } \\
& \\
& 26.5 \\
& 26.8 \\
& 26.3 \\
& 26.5 . \\
& \\
& 26.5 \\
& 26.8 \\
& 98.9 \\
& 98.9
\end{aligned}
$$
\]

\[

\]



## NOV．AND DEC． 1969 ， <br> TABLE XVII <br> TABLE XVII SUMmARY OF TEST RESULTS FOR MACHINE

| $\begin{aligned} & \text { 1N3JYGd } \\ & \text { 1NGJYGd } \\ & \text { ヨ9VYヨAV ヨNII } \\ & \text { ヨ9V8ヨAV } \end{aligned}$ | －XヨONI ヨNIHJVW －४OIJV」 ヨNIHכマW HכVW ヨヘII甘ากWกว ヨNIHJVW INヨyyก3 |  |
| :---: | :---: | :---: |
| L1L | 69－を2－01 | ヶ－0 |
| 912 | 69－51－01 | E－0 |
| 512 | 69－52－6 | 2－0 |
| $\rightarrow 12$ | 69－2－6 | I－0 |
| ${ }^{-} \mathrm{ON}$ | Эロロ＊ | 3003 |
| 7708 | ヨ1＊O． |  |
| 711\％ |  |  |

TYPE OF MEDIUM- SEMICHEMICAL
TABLE XVIII


R


RUNNABILITY
ORAW
LB./IN.*A FACIOR*B





Fee Table II for Notes $A$ and $B$.
TABLE XX
SUMMARY OF TEST RESUULTS FOR MACHINE $S$
TABLE XXI

$$
\text { SUMMARY OF TEST RESULTS FOR MACHINE } T \text {. }
$$

SINGLE-FACE FLAT

CRUSH, P.S.I. $\quad$\begin{tabular}{c}
RUNNABILITY <br>
MAX. MIN. AV.

 LB./IN.\#A 

FRAW <br>
FACTOR\#B.
\end{tabular}

## NOV. AND DEC. 1969

TYPE OF MEDIUM- SEMICHEMICAL


BASIS WT..
LB./M.
SQ.FT.

26.7
27.1
27.2
26.8

27.0
27.1
99.6
100.7

$$
\begin{aligned}
& \text { MILL } \\
& \text { ROLL } \\
& \text { NO. }
\end{aligned}
$$

CURRENT MACHINE AVERAGE CUMULATIVE MACHINE AVERAG
MACHINE FACTOR; PERCENT MACHINE FACIOR; PERCENT
MACHINE INDEX; PERCENT

Fee Table II for Notes $A$ and $B$.
TABLE XXII

*See Table II for Notes $A$ and $B$.

$$
\begin{aligned}
& \text { BASIS WT. } \\
& \text { LB./M. } \\
& \text { SO. FT. }
\end{aligned}
$$

TABLE XXIV
SUMMARY OF TEST RESULTS FOR MACHINE $W$

|  |  |  | - |  |
| :---: | :---: | :---: | :---: | :---: |
| SINGLE-FACECRUSH, P.S |  | FLAT | RUNNABILITY |  |
|  |  | S.I. |  | DRAW |
| MAX. | MIN. | AV. | LB./IN.*A | FACTOR*B |
| 29.2 | 27.0 | 28.0 | 1.5 | 1.572 |
| 32.6 | 29.2 | 30.6 | 0.5 | 1.568 |
| 27.6 | 25.2 | 26.6 | 0.5 | 1.571 |
| 31.4 | 28.8 | 30.2 | 1.5 | 1.569 |
|  |  | 28.8 |  | 1.570 |
|  |  | 30.4 |  |  |
|  |  | 94.7 |  |  |
|  |  | 89.7 |  |  |

[^2]TYPE OF MEDIUM- SEMICHEMICAL

| CALIPER, PT. |  |  | CONCORA FLAT |  | CRUSH, |
| :---: | :---: | :---: | :---: | :---: | :---: |
| MAX. | MIN. | AV. | MAX. | MIN. | $A V$. |
| 11.0 | 10.0 | 10.6 | 40.8 | 38.4 | 39.8 |
| 11.0 | 10.2 | 10.7 | 42.0 | 38.4 | 40.4 |
| 10.1 | 10.0 | 10.0 | 42.6 | 37.2 | 39.5 |
| 10.9 | 9.8 | 10.1 | 41.4 | 37.8 | 39.7 |
|  |  | 10.4 | . |  | 39.8 |
|  |  | 9.8 |  |  | 41.3 |
|  |  | 106.1 |  |  | 96.4 |
|  |  | 101.0 |  |  | 92.8 |


TABLE XXV
TYPE DF MEDIUM- SEMICHEMICAL



*See Table II for Notes $A$ and $B$.
TABLE XXVI
SUMMARY OF TEST RESULTS FOR MACHINE $Y$
NOV. ANO DEC.. 1969


[^3]



TABLE XXIX
SUMMARY OF TEST RESULTS FOR MACHINE BB
NOV. AND DEC. 1969
IYPE OF MEDIUM- SEMICHEMICAL

$0 q i n$
000
$m$
0
0
0


| $\begin{aligned} & s^{\bullet} 101 \\ & 8^{\circ} \varepsilon 01 \\ & z^{\circ} 92 \\ & z^{\bullet} / 2 z \end{aligned}$ |  | $\begin{aligned} & 6 \times 30 N I \\ & \text { CYOIJVS } 31 \\ & \text { HJVW } \exists \text { AII! } \\ & \text { BNIHOVW } \end{aligned}$ | HつVW HJVW INWกJ <br>  |
| :---: | :---: | :---: | :---: |
| 2•12 | 951 | 69-E1-01 | T-98 |
| $\begin{aligned} & .1 \pm \circ 0 S \\ & \cdot w / \circ g 7 \end{aligned}$ | $\begin{array}{r} \bullet \text { ON } \\ \hline \text { צO } \end{array}$ | $\begin{aligned} & 30 \forall W \\ & \exists 1 \forall 0 \end{aligned}$ | 3003 |
| $\cdots \cdot 1$ S S SV8 | 171 W |  |  |

*See Table II for Notes $A$ and $B$.

## DISCUSSION OF RESULTS

Shown on page 2, Part II; Section "A" of the Summary"are the maximum and minimum current machine averages obtained for each test property during the current period and the previous period. Also shown for each test property is the current F.K.I. average which represents the mean of the current machine averages and hence is indicative of the test level being maintained"by the industry as a whole for each test property to the extent that the industry is represented by the participating machines. Also given for each test property is the cumulative-F.K.I. average which represents the mean of the current F.K.I. averages for the previous six periods.

The runnability data for the 95 rolls evaluated during the current period and the 103 rolls evaluated during the previous period are summarized on page 2 , Part II, Section " $B$ " of the Summary.

Supplementary to the"runnability data; draw factors"were determined for each roll of medium at 600 f.p.m. with minimum tension (or, for rolls with poor runnability, at the maximum speed runnable with minimum tension) and are given in Tables II through XXIX for Machines A through $Z$ and Machines $A A$ and $B B$; respectively.

In Table XXX; an effort has been made to compare Institute and mill Concora flat crush test results for each machine for the current period. The following information is presented in this table: (1) Current machine average based on Institute data, (2). current machine average based on mill data; (3) the average difference - that is, the difference between the current machine average based on Insti.tute data and the current machine average based on mill data, and (4) the average differences expressed as percentage differences, along with the percent differences of the previous two-month period. In those cases where mill Concora flat crush data are still obtained on specimens conditioned after fluting, no average differences between

I'ABLE XXX
A COMPARATIVE SUMMARY FOR EACH MACHINE OF THE CONCORA FLAT CRUSH AVERAGES BASED ON INSTITUTE DATA AND MILL DATA

| Machine Code | No. of Rolls Compared | Concora Flat Crush, p.s.1. |  |  | Av. Diff., $\%^{\text {c }}$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | I.P.C. | Mill | Av. |  |  |
|  |  | Av. ${ }^{\text {a }}$ | Av. ${ }^{\text {a }}$ | Diff. | Current | Previous |
| A | 4 | 42.7 | 41.7 | -1.0 | -2.3 | -1.6 |
| B | 4 | 40.0 | 40.3 | +0.3 | +0.8 | -- |
| C | 2 | 38.0 | 41.2 | +3.2 | +8.4 | +3.3 |
| D | 0 | 41.0 | $33.0{ }^{\text {d }}$ | + | -- | + |
| E | 4 | 43.3 | 44.3 | +1.0 | +2.3 | -1. 4 |
| F | 4 | 45.5 | 42.0 | -3.5 | -7.7 | -5.8 |
| G | 1. | 38.8 | 41.4 | +2.6 | +6.7 | +8.2 |
| H | 2 | 40.3 | 39.8 | -0.5 | -1.2 | -4.0 |
| I | 4 | 44.8 | 42.6 | $-2.2$ | -4.9 | -2.0 |
| J | 4 | 37.6 | 37.6 | 0.0 | 0.0 | -8.7 |
| K | 4 | 42.2 | 44.9 d | +2.7 | +6.4 | -0.5 |
| L | 0 | 46.0 | $38.2{ }^{\text {d }}$ | -- | -- | -- |
| M | 4 | 42.6 | 45.4 | +2.8 | +6.6 | -3.3 |
| N | 4 | 37.9 | 39.0 d | +1.1 | +2.9 | -1.3 |
| 0 | 0 | 47.2 | $38.6{ }^{\text {d }}$ | -- | -- | -- |
| P | 4 | 45.3 | 46.1 | +0.8 | +1.8 | +3.3 |
| Q | 4 | 37.1 | $36.1{ }^{\text {d }}$ | $-1.0$ | -2.7 | -4.8 |
| R | 0 | 40.8 | $31.5{ }^{\text {d }}$ | -- | -- | -- |
| S | 4 | 40.1 | 40.0 | -0.1 | -0.2 | -3.0 |
| T | 4 | 43.4 | 46.0 | +2.6 | +6.0 | -- |
| U | 4 | 43.8 | 40.6 | $-3.2$ | -7.3 | -5.5 |
| V | 2 | 31.8 | 31.6 | -0.2 | -0.6 | -- |
| W | 4 | 39.8 | 38.6 d | -1.2 | -3.0 | -5.4 |
| X | 0 | 42.7 | $35.6{ }^{\text {a }}$ | -- | -- | -- |
| Y | 4 | 40.0 | 38.2 | -1.8 | -4.5 | -4.7 |
| Z | 2 | 36.0 | 41.2 | $+5.2$ | +14.4 | -- |
| AA | 4 | 37.9 | 38.9 | +1.0 | +2.6 | -0.5 |
| BB | 1 | 37.0 | 39.4 | +2.4 | +6.5 | -2.2 |

${ }^{\text {a Comparisons based on current machine average include only those rolls for which }}$ mill data were submitted.
${ }^{b}$ Average difference is the difference between the current machine average based on Institute test results and that based on mill test results with the Institute test results used as the reference.
${ }^{\text {Average }}$ difference (percent) is computed by dividing the average difference in p.s.i. by the Institute current machine average and multiplying by 100.
$\mathrm{d}_{\text {Mill }}$ data were not obtained on specimens tested immediately after fluting.
current machine averages based on Institute" and mill-data are shown:" The inclusion of these comparisons is made possible'by'the fact-that interested participants submit their Concora flat crush test"results"to The Institute of Paper Chemistry (on data sheets obtainable from the Institute): This affords each participant an opportunity to review the level of agreement noted for his data" with the levels noted for the other participants. Comparisons of this kind are a helpful adjunct to other calibration procedures.


[^0]:    ${ }^{\text {a }}$ Maximum percentage difference was -8.7 .
    ${ }^{\mathrm{b}}$ Maximum percentage difference was +14.4 .

[^1]:    ＊See Table II for Notes $A$ and $B$ ．

[^2]:    SUMMARY OF TEST RESULTS FOR MACHINE

[^3]:    *See Table II for Notes $A$ and $B$.

