Measuring Paper Machine Performance

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Paper Machine Performance Systems

General standards associations

- VDI (German)
- SSG (Swedish-Standard Solutions Group)
- SFS (Swedish)
- Paper producer associations
 - TAPPI
 - Pulp & Paper Products Council (PPPC) Was CPPA
 - Zellcheming (Finnish/German)
- Machine builders
 - Metso
 - Voith/PTS
- Unique paper company systems

Paper Machine Performance Guidelines TIP 0404-47

- Has 15-20 good performance guidelines for linerboard, corrugating medium, fine paper, newsprint, Kraft paper, bleached board, and recycled paperboard.
- Explains the guidelines and provides suggestions for application.
- Issued 1997, revised 2001 and 2006

Paper Machine Performance Guidelines TIP 0404-47

- Uptime
- Salable Product
- Overall Machine Efficiency
- Headbox Consistency
- Steam Box Steam Consumption
- Flatbox Vacuum
- Couch Consistency

- Consistency After Last Press
- Steam Consumption
- TAPPI Drying Rate
- Basis Weight Profile Variation
- Moisture Profile variation
- Water Consumption

Paper Machine Uptime

Uptime = <u>Annual Hours Sheet On Reel</u> X 100% Annual Available Hours

- Excludes Scheduled Outages >24 Hours
- Other Mill Services Affect
- No Factor For Machine Speed
- Highest Observed 97% on Liner Machine
- Lowest Observed 58% on Coated Machine

Paper Machine Uptime Guidelines TIP 0404-47

Category	Units	% of Available Time
Breaks	%	<3.0
Scheduled Maintenance	%	1.5
Unscheduled Maintenance	%	<1.0
Process	%	1.0
Grade Changes	%	0 to 4
Other Departments	%	<0.5
Total	%	<7.0

Percent First Quality

Percent Salable = <u>Salable Tonnage</u> X 100% Reel Tonnage

- Net Tons Off Winder
- Losses Include Trim, Slabs, and Off-Quality
- Seconds Should be < 5%
- Highest 99% On News, Liner, and Market Pulp.

Overall Machine Efficiency

Annual HoursSalableOME =Sheet on ReelxTonnageX 100%AnnualReelAvailable HoursTonnage

Zellcheming Production Indices-Revised 2005

- Very similar to TAPPI TIP 0404-47.
- Major difference is scheduled outages are excluded if they exceed 48 hours instead of 24 hours for TAPPI.
- Provides more detail than 0404-47 and includes some additional indices.
- Guidelines include:
 - Time definitions
 - Time related efficiencies
 - Product definitions
 - Area efficiency
 - Overall efficiency
 - Production capability

Zellcheming Production Indices

- Long term goal is to have all paper mills in the world use the same performance reporting system.
- This is a great goal but it will take time to gain acceptance.
- It is widely used in Europe and has been adopted by Metso and Voith.

Pulp and Paper Products Council (CPPA) Reporting

- Newsprint Producers Association
- Market Pulp Association
- Printing and Writing Papers Association
- Paper Recycling Association

PPRC (CPPA) Newsprint Machine Comparison

- Machine speed
- Average trim
- Average basis weight
- Production per operating day
- Operating efficiency
- Production per operating day
- Percent maximum trim
- Moisture percentage

- Drying steam
- Furnish
- Percent loss-non-controllable
- Percent loss-sheet off wire
- Percent loss-sheet on wire
- Percent loss dry end
- Per cent loss miscellaneous

PPPC(CPPA) Reporting

- Most productive newsprint machine (1109.7 kg/cm/day for 2008)
- Operating efficiency
- Absolute efficiency
- Average trim width
- Average speed
- Tons per day
- Average basis weight
- Break information
- Former type

Paper Machine Productivity Survey

- Valmet/Metso Paper has conducted surveys annually since 1988
- Major paper and board grades reported globally
 - News, SC, LWC, WFU, WFC, Liner and Medium
- Complimentary service
- Electronic survey form
- Absolute confidentiality
- Statistical reports for benchmarking

Paper Machine Productivity Survey

- Scheduled downtime %
- Unscheduled downtime %
- Total downtime %
- Broke %
- Breaks %
- Breaks per day, number
- Time efficiency %
- Total efficiency %
- Shrinkage %
- Productivity in tons/day/inch
- Area efficiency

Paper Machine Productivity Survey-Energy Consumption

- Starting with 2008 survey will collect consumption for:
 - Water
 - Steam
 - Gas
 - Electricity



Paper Machine Productivity Survey-Production Trends

Average of Five Best PMs Production



Paper Machine Productivity Survey-Broke Trends

Average of Five Best PMs Broke



Paper Machine Productivity Survey-Break Trends

Average of Five Best PMs Breaks



What is World Class PM OME Performance?

Grade	Average- %	Top 10%	TIP 0404-47 2006
Newsprint	86	92+	90
SC	81	88+	
LWC & MWC	81	88+	
Woodfree Uncoated	86	92+	89
Woodfree Coated	79	86+	
Liner & Medium	86	93+	92
Carton Board	82	88+	84

Percent Production Line OME

OME=(100-(Total % PM Shutdown+% Breaks at PM)) x (100-% Production Line Total Broke) /100

Great Paper Machine Uptime-Liner Example

Lost Time Cause	Lost Time
Breaks	1.84%
Scheduled Maintenance	0.61%
Unscheduled Maintenance -Electrical and Instrumentation -Mechanical	0.38% 0.23% 0.15%
Process	0.29%
Other Departments	0.13%
Total	3.25%

Downtime Comments

- 1. Maintenance outages of 10-12 hours are scheduled every 10-12 weeks.
- 2. Maintenance workers on field days include 46-50 mechanics, 28-30 E&I, and 80-100 contractors.
- 3. There are three mechanical supervisors, three E&I supervisors, and four maintenance planners.
- 4. Extending time between outages has not hurt runnability or increased downtime due to mechanical or E & I breakdowns.
- 5. If any bearing is noisy, it is changed on the next outage.
- 6. There are few short outages for fabric changes, etc.
- 7. Overall, it seems best to do repairs, change clothing, etc., on long outages every 10 weeks than to have more frequent shorter outages. (It is also easier on superintendents!)
- 8. There have been minor issues with motor brushes. Brushes are now checked before all shutdowns.

Production Guideline Dryer Limited Machines

> Average production should be within 10% of record production.

What Does it Take to Achieve World Class Performance?

Attention to:
Details, etc.