UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF WISCONSIN

LATENTIER, LLC
3727 Candia Drive
Punta Gorda, FL 33950,

Plaintiff, Case No.: 08-C-__________

v.

INTERNATIONAL PAPER COMPANY
6400 Poplar Avenue
Memphis, TN 38197-0198,

Defendant.

COMPLAINT

Plaintiff, Latentier, LLC (hereinafter "Plaintiff" or "Latentier") f/k/a Hoffman Environmental Systems, Inc., and the Hoffman Group, Ltd., for its complaint against Defendant International Paper Company (hereinafter "Defendant" or "IP") alleges as follows:

NATURE OF THE ACTION

1. This is an action for infringement of United States Letters Patent and arises under the Patent Laws of the United States, Title 35 of the United States Code. Plaintiff Latentier is the owner of U.S. Letters Patent No. 6,157,916 (hereinafter "the '916 Patent") entitled "Method And Apparatus To Control The Operating Speed Of A Papermaking Facility."

JURISDICTION AND VENUE

2. This Court has personal jurisdiction over Defendant IP, upon information and belief, by reason of its transaction of business in this District, and commission of tortious acts of infringement within this District.

3. Subject matter jurisdiction is conferred upon this Court pursuant to 28 U.S.C. §1331 and §1338(a), and 28 U.S.C. §1332 based on diversity jurisdiction since both parties in this matter are citizens of different states, New York and Delaware, and the matter in controversy exceeds $75,000.00. Venue is proper in this Court pursuant to 28 U.S.C. §1391 and §1400.

THE PARTIES

4. Plaintiff Latentier is a Delaware limited liability company having a place of business at 3727 Candia Drive, Punta Gorda, Florida 33950. Plaintiff Latentier is the owner of the United States Letters Patent here in suit.

5. Upon information and belief, Defendant IP is a New York corporation having a place of business at 6400 Poplar Ave, Memphis, TN 38197-0198. Upon information and belief, Defendant IP is registered with the Wisconsin Secretary of State to conduct business in Wisconsin, and currently conducts business in Wisconsin, including in this district.

FACTUAL BACKGROUND

6. Since 1993, Plaintiff Latentier has worked to improve, and has improved, profit optimization in manufacturing paper products.

7. On December 5, 2000, United States Letters Patent No. 6,157,916 was duly and legally issued to Plaintiff Latentier. A copy of the '916 Patent is attached hereto as

Exhibit A. The '916 Patent, filed in 1998, includes claims for a method of, and apparatus and articles for, determining the operating speed of a papermaking facility, including claims directed towards a method in which a desired operating speed that depends on at least one economic variable is determined, and the operating speed is adjusted accordingly.

8. Since at least 1998, Plaintiff Latentier has referred to the process defined in the '916 Patent as the "Profit Optimization Process" (the "POP Process"). The POP Process is contrary to traditional accepted standards of papermaking production facilities, which aspire to maximize production by increasing throughput in an effort to maximize profit. In other words, greater production was assumed to result in greater profitability.

9. Since 1998, Plaintiff Latentier has practiced the invention claimed in the '916 Patent by consulting for members of the papermaking industry concerning the POP Process, including Defendant IP, and by attempting to license the process to the papermaking industry.

10. In and around March, 1998, Plaintiff Latentier initiated communication with Defendant IP, including with the Chief Executive Officer of Defendant IP, John Dillon, at Defendant IP's executive offices in Purchase, NY, which relocated to Stamford, CT. At that time, Plaintiff Latentier's executive offices were located at 125 South Jefferson Street, Suite 201, Green Bay, WI. Upon information and belief, Mr. Dillon was personally aware at that time that the POP Process had originated from Plaintiff Latentier and did not originate from Defendant IP.

11. An in-person meeting occurred at Plaintiff Latentier's offices in Green Bay, WI, in May 1998 between Plaintiff Latentier and a representative of Defendant IP, Larry

Stowell. Several meetings, including telephone conferences and in-person meetings, transpired between Plaintiff Latentier and Defendant IP, thereafter.

12. In or around June, 1998, Mr. Roger Hoffman, president of Plaintiff Latentier, met with Defendant IP and its consultant, Andersen Consulting, in connection with furthering a business relationship to improve Defendant IP's annual earnings through use of Plaintiff Latentier's POP Process. In these meetings, Mr. Hoffman presented information related to the POP Process pursuant to a Confidentiality Agreement.

13. In and around June, 1998 - November, 1998, upon information and belief, in furtherance of Defendant IP's goal to improve earnings, Plaintiff Latentier submitted proposals to Defendant IP in connection with applying the POP Process to Defendant IP's business. The proposals related directly to paper mills in various states that were owned and operated by Defendant IP. Although Defendant IP indicated an interest in the POP Process and despite Plaintiff Latentier's considerable costs, disclosure and efforts expended to Defendant's IP benefit, Defendant IP did not agree to work with or otherwise compensate Plaintiff Latentier for use of the POP Process at that time.

14. In and around April, 1998, Plaintiff Latentier contacted another corporation in the papermaking industry, Union Camp Corporation ("Union Camp"), in an effort to work with Union Camp to license and implement the POP Process. Plaintiff Latentier received a letter from a representative of Union Camp that expressed an interest in the POP Process and requested additional information regarding the POP Process.

15. In and around April, 1998 - October, 1998, Plaintiff Latentier communicated and met with Union Camp in furtherance of licensing the POP Process to Union Camp, and

implementing the POP Process therefor. Plaintiff Latentier expended considerable confidential disclosure and efforts concerning the POP Process to the benefit of Union Camp.

16. In November, 1998, Defendant IP and Union Camp announced that they agreed to a merger.

17. In December 1998, Plaintiff Latentier received a letter from Union Camp stating that, in view of the merger between Defendant IP and Union Camp, Union Camp decided to at least temporarily forego working with Plaintiff Latentier to implement the POP Process.

18. Upon information and belief, Defendant IP acquired valuable information and benefited from the confidential disclosures and efforts associated from Plaintiff Latentier's relationship with Union Camp.

19. Following multiple communications and contacts between Plaintiff Latentier and Defendant IP concerning the POP Process, Defendant IP reiterated an interest in working with Plaintiff Latentier to implement the POP Process in Defendant IP's papermaking facilities.

20. In and around March, 1999, in response to requests from Defendant IP, Plaintiff Latentier made further presentations to Defendant IP, including by providing confidential and proprietary concepts associated with the POP Process for operating a facility at less than full capacity, and to adjust for at least one economic variable in connection with the facility.

21. In March, 1999, Plaintiff Latentier and Defendant IP signed a joint Confidentiality Agreement that covered and followed discussions between Plaintiff Latentier and Defendant IP relating to the POP Process. That Agreement specifies, *inter alia*, that the

Agreement "in no way grants … a license or right to practice any concept, discovery, design, or improvement which either party may control or own[.]" Upon information and belief, Defendant IP violated the Confidentiality Agreement by practicing the concepts owned by Plaintiff Latentier, and disclosed under the terms of the Confidentiality Agreement.

22. In April 1999, Plaintiff Latentier and Defendant IP signed another Confidentiality Agreement that *inter alia*, permitted Defendant IP to share data with Plaintiff Latentier collected by Defendant IP from its mill operations.

23. Upon information and belief, Defendant IP provided operations-related data regarding paper mills that were owned by Defendant IP, and Plaintiff Latentier used the data to demonstrate Plaintiff Latentier's POP Process and to illustrate the benefits thereof.

24. In October, 2000 Mr. John Dillon, then Chairman and Chief Executive Office of Defendant IP, spoke at the Paper Industry International Hall of Fame's Sixth Annual Induction Ceremony. During his speech, Mr. Dillon stated that Defendant IP was to implement a "slow back" strategy by managing capacity using "marginal economics." In particular, Mr. Dillon described "finding a 'sweet spot' of production - that point of production that is most profitable." (See Exhibit B).

25. Upon information and belief, by the year 2000, the terms "slow back", "sweet spot" and "marginal economics" became associated with the POP Process as defined in the '916 Patent. See for example, Exhibit C, a September, 2000 article that appeared in *The Official Board Markets*, a publication of www.packaging-online.com, by the Editor- in-Chief that describes the successful implementation of "slowback" at a company, Georgia-Pacific, "running its containerboard mills at a 'sweet spot' that is less than full production." Upon

information and belief, these processes refer to the POP Process covered by the '916 Patent licensed to Georgia-Pacific by Plaintiff Latentier.

26. Upon information and belief, Mr. Dillon's speech was an admission that Defendant IP was improperly using methods covered by the '916 Patent, and taught to them by Plaintiff Latentier, without license or authority, from Plaintiff Latentier.

27. Following Mr. Dillon's speech, several highly regarded persons in the industry called Mr. Hoffman to congratulate him on his success in implementing POP Process at Defendant IP.

28. After reading the *Official Board Market* publication, and hearing of Mr. Dillon's speech at the Paper Industry International Hall of Fame's Sixth Annual Induction Ceremony, Plaintiff Latentier contacted Defendant IP to inquire as to Defendant's IP's use of the POP Process covered in the '916 Patent. At that time, Defendant IP refused to take a license under the '916 Patent, but never denied that it was using the POP Process of the '916 Patent.

29. In early 2001 Mr. Dillon announced that Defendant IP had saved $300 million from cost reduction, which, upon information and belief, was attributed to marginal economics. (Exhibit D (IP Annual Report)).

30. Since 2001, Plaintiff Latentier sought licensing arrangements with other companies in the papermaking industry relating to the '916 patent, including by submitting proposals to paper companies. Plaintiff Latentier was successful in obtaining a license from Georgia-Pacific relating to the '916 patent.

31. Also since 2001, Plaintiff was working during this time to develop a software solution for companies to add to their legacy systems that would enable the companies to

more readily optimize profitability. Upon information and belief, since 2001 three software companies were engaged with Latentier towards this end: Mountain Systems, which was purchased by a Division of General Electric; Skyva International; and Objectiva, a United States subsidiary of a Chinese company.

32. Within the last few years, Plaintiff Latentier and Defendant IP met on multiple occasions to discuss an arrangement related to Defendant IP licensing the '916 Patent from Plaintiff Latentier.

33. Defendant IP orally acknowledged to Plaintiff Latentier that Defendant IP continued to manage capacity by a slow back strategy, which again constituted an admission that Defendant IP was using the POP Process of the '916 Patent.

34. Despite this admission, Defendant IP asserted that it did not infringe any valid claim of the '916 Patent, but still did not deny that it was using the POP Process of the '916 Patent.

CLAIM FOR PATENT INFRINGEMENT

35. Plaintiff repeats and re-alleges the allegations contained in paragraphs 1-33 above as if fully set forth at length herein.

36. This is a claim against Defendant IP for patent infringement under the Patent Laws of the United States, 35 U.S.C. § 101 *et seq*.

37. IP has ignored Plaintiff Latentier's repeated efforts to work with Defendant IP and to agree to a fair and reasonable licensing arrangement for its use of the POP Process. By ignoring Plaintiff Latentier and practicing the methods and apparatuses of the '916 Patent in one or more of its papermaking facilities by controlling operations of machine speed-

dependent variables, and by using, selling and/or offering for sale products made in one or more of its papermaking facilities that uses methods and apparatuses for controlling operations of machine speed-dependent variables in accordance with the '916 Patent, Defendant IP has infringed and continues to infringe the '916 Patent in this District and elsewhere, in violation of 35 U.S.C. §271(a), (b) and (c).

38. Defendant IP's actions constitute a willful and deliberate infringement of the '916 Patent and will continue to do so unless enjoined by this court.

39. Defendant IP's acts of infringement, especially the acts of willful and deliberate infringement, have caused and continue to cause Plaintiff Latentier irreparable injury for which it has no adequate remedy at law.

PRAYER FOR RELIEF

WHEREFORE, Plaintiff Latentier prays as follows:

a. that United States Letters Patent No. 6,157,916 be adjudged valid and enforceable;

b. that Defendant IP be adjudged to have infringed United States Letters Patent No. 6,157,916;

c. that Defendant IP's acts of patent infringement be adjudged to be willful and deliberate;

d. that Defendant IP, its officers, agents, servants, employees and attorneys and any and all persons in active concert or participation with them be preliminarily and permanently enjoined and restrained from infringing United States Letters Patent No. 6,157,916;

e. that Defendant IP be ordered to pay pre-judgment and post-judgment interest on the damages awarded against it;

f. that Defendant IP be ordered to account for and pay to Latentier the damage sustained by Latentier due to IP's infringement of United States Letters Patent No. 6,157,916, and due to IP's breach of the Confidentiality Agreement, but in no event less than a reasonable royalty pursuant to 35 U.S.C. §§284 and 289;

g. that Latentier be awarded its costs and attorney's fees pursuant to 35 U.S.C. §285; and

h. that the court grant such other and further relief as it deems just and proper under the circumstances.

DEMAND FOR TRIAL BY JURY

Plaintiff Latentier demands a trial by jury on all issues that are triable by a jury.

Dated this 10th day of June, 2008.

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EXHIBIT A

US006157916A

United States Patent [19]

Hoffman

[11] **Patent Number: 6,157,916**

[45] **Date of Patent: Dec. 5, 2000**

[54] **METHOD AND APPARATUS TO CONTROL THE OPERATING SPEED OF A PAPERMAKING FACILITY**

[75] Inventor: **Roger Paul Hoffman**, Green Bay, Wis.

[73] Assignee: **The Hoffman Group**, Green Bay, Wis.

[21] Appl. No.: **09/098,811**

[22] Filed: **Jun. 17, 1998**

[51] **Int. Cl.**[7] **G06F 17/60**

[52] **U.S. Cl.** **705/8**; 702/182; 702/188; 705/1; 705/7; 705/11

[58] **Field of Search** 364/148.01, 152, 364/156, 166, 468.15, 471.01, 471.02; 702/182, 188; 705/1, 7, 8, 9, 11, 400

[56] **References Cited**

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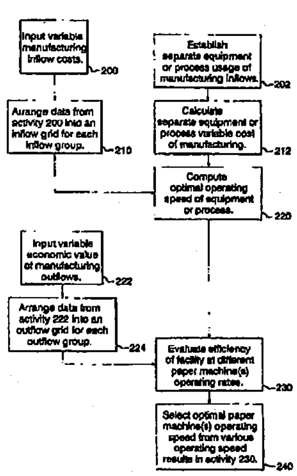
Primary Examiner—Edward R. Cosimano

Attorney, Agent, or Firm—Weiss & Weiss; Philip M. Weiss, Esq.

[57] **ABSTRACT**

A method and apparatus for controlling the operating speed of a papermaking facility is disclosed. It includes determining a desired operating speed that is dependent on at least one economic variable. The variables vary with the operating speed. Also, the operating speed is adjusted (if necessary) in response to the determination. Preferably the control is closed loop and includes determining a current operating speed and comparing the current operating speed to the desired operating speed. The operating speed is controlled in response to the comparison. The economic variable is preferably a cost of manufacturing, and/or manufacturing inflows, and/or manufacturing outflows. Also, a method and apparatus that determines the effect of one or more business transactions on the economic efficiency of the production of products in a paper manufacturing facility is disclosed. The economic efficiency is dependant on one or more economic variables that vary with operating speed. The current economic efficiency of the facility is obtained along with information on the business transactions that affects the economic variables. The economic efficiency of the facility with the proposed transaction, leaving the remaining variables constant is calculated. Then, the result is displayed to the end user.

39 Claims, 3 Drawing Sheets



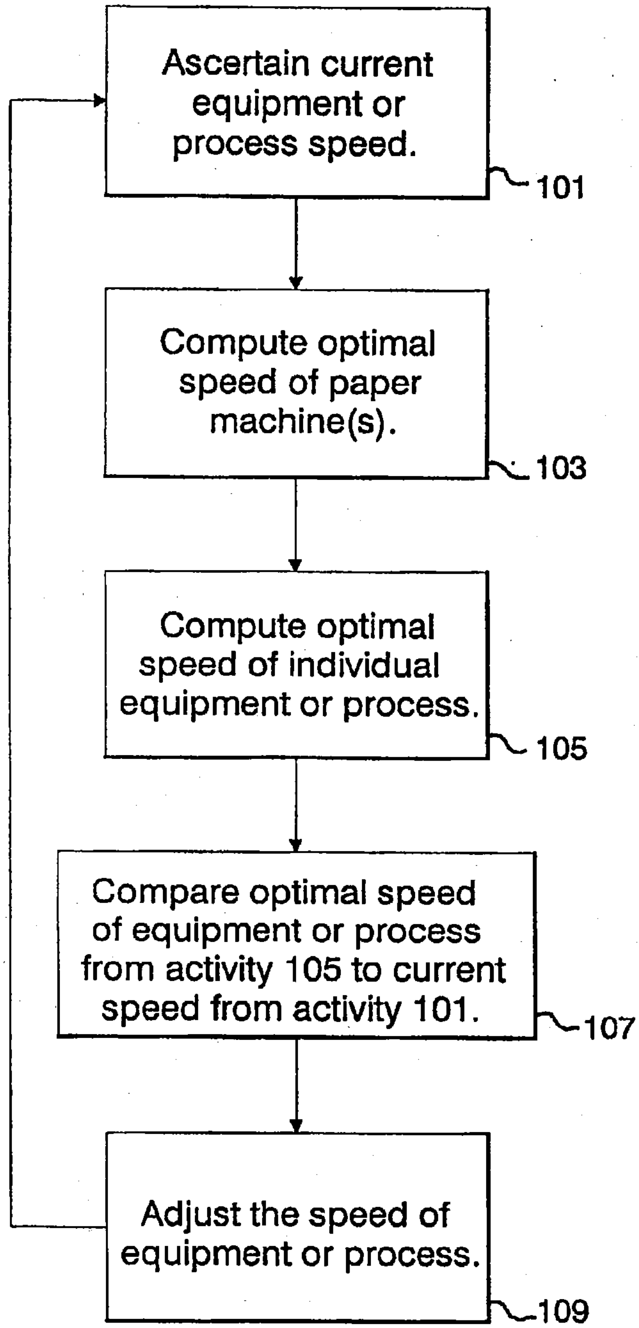

Ascertain current equipment or process speed.
101
Compute optimal speed of paper machine(s).
103
Compute optimal speed of individual equipment or process.
105
Compare optimal speed of equipment or process from activity 105 to current speed from activity 101.
107
Adjust the speed of equipment or process.
109

Figure 1

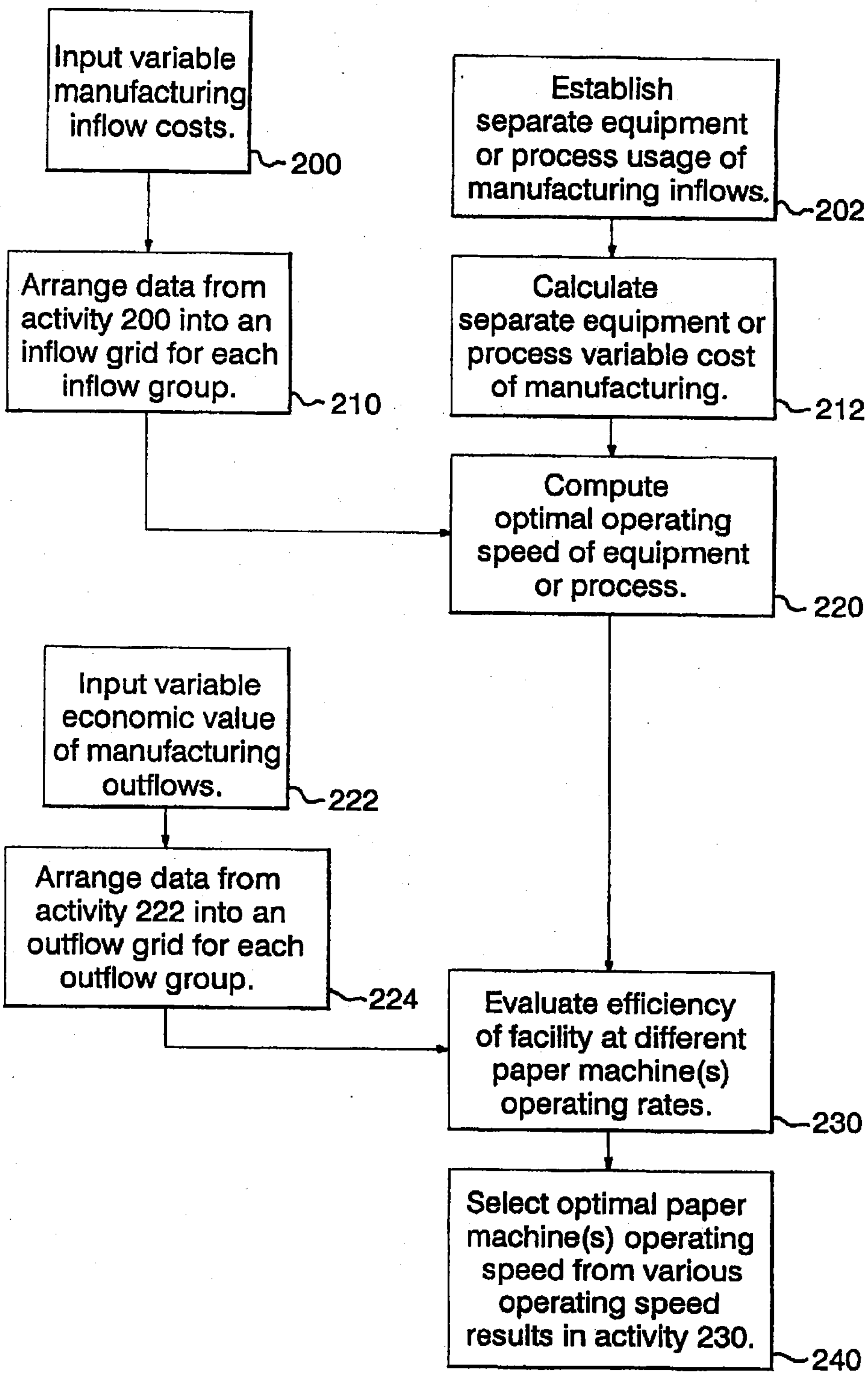

Input variable manufacturing inflow costs.
200
Establish separate equipment or process usage of manufacturing inflows.
202
Arrange data from activity 200 into an inflow grid for each inflow group.
210
Calculate separate equipment or process variable cost of manufacturing.
212
Compute optimal operating speed of equipment or process.
220
Input variable economic value of manufacturing outflows.
222
Arrange data from activity 222 into an outflow grid for each outflow group.
224
Evaluate efficiency of facility at different paper machine(s) operating rates.
230
Select optimal paper machine(s) operating speed from various operating speed results in activity 230.
240

Figure 2

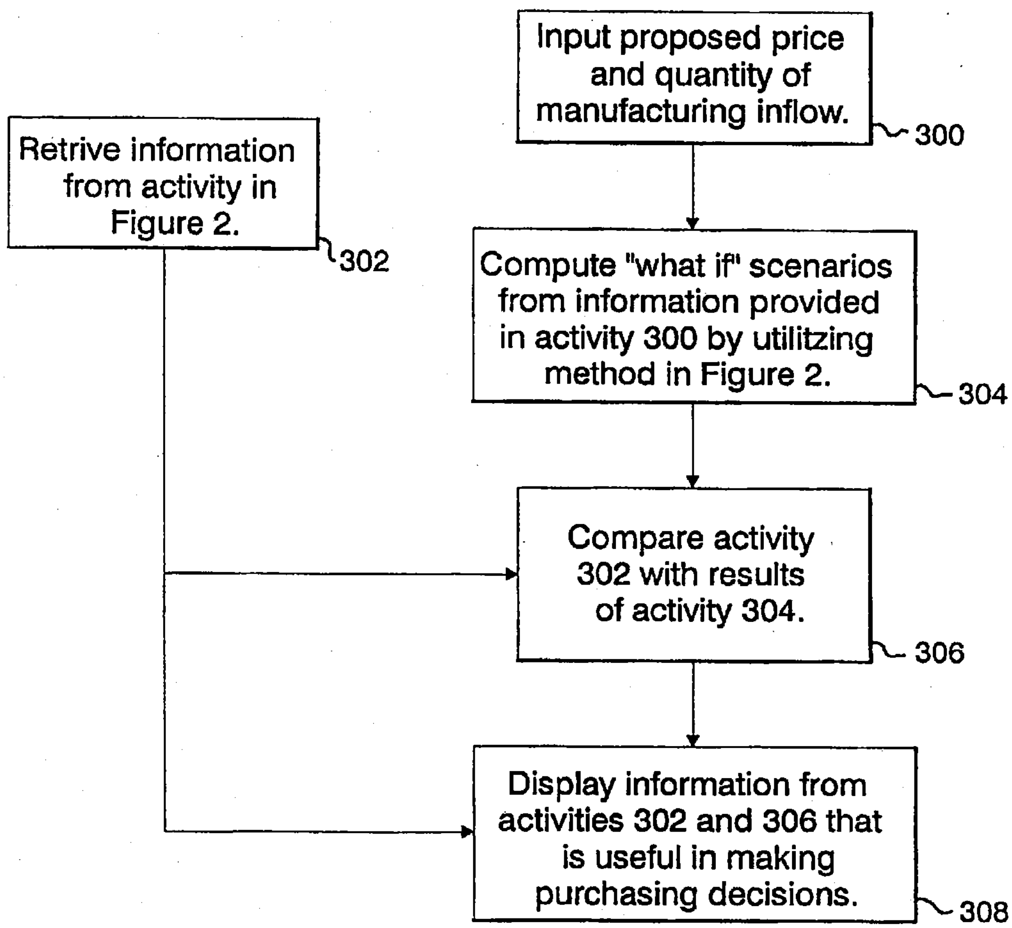

Input proposed price and quantity of manufacturing inflow.
300
Retrive information from activity in Figure 2.
302
Compute "what if" scenarios from information provided in activity 300 by utilitzing method in Figure 2.
304
Compare activity 302 with results of activity 304.
306
Display information from activities 302 and 306 that is useful in making purchasing decisions.
308

Figure 3

METHOD AND APPARATUS TO CONTROL THE OPERATING SPEED OF A PAPERMAKING FACILITY

FIELD OF THE INVENTION

The present invention relates generally to the control of machinery, and more particularly controlling operating speed of equipment in a paper manufacturing facility.

BACKGROUND OF THE INVENTION

Current control systems of the machinery and processes of a facility in the papermaking industry generally run equipment and processes as fast as possible, while maintaining a set level of quality. The focus of control is on the current and historical operating characteristics of the particular piece of equipment, with a particular emphasis on output quality. The controls are sometimes designed to maintain maximum operating speed and the operator manually assesses and controls operations to maintain a targeted acceptable quality. Conversely, the controls may be designed to assess the operation of the equipment to assure that it is maintaining an acceptable quality of product while the operator forces the equipment to higher levels of production. In either case, the assumptions that faster is better (if quality is acceptable), underlies the prior art control systems. This is a faulty assumption: faster might actually be less desirable.

Controls are, therefore, designed to monitor, assess and aid in improvement of the quantitative and qualitative efficiency of the particular piece of equipment. For example, certain paper scanning devices are used on the finished end of a paper machine to determine if the paper product has adequate levels of dryness and basic uniformity. If these measurements detect a trend in the finished product towards unacceptable quality, the machine speed or other items may be automatically or manually adjusted (usually downward) to assure that adequate product quality is obtained. Similarly, the machine control system or operator personnel will monitor the amount of sheet breaks or excessive poor quality that occur on the machine. Again, speed or other items may be adjusted (usually downward) on the machine to reduce the number of breaks to assure that productive efficiency is achieved. Alternatively, if quality and the number of breaks are acceptable, the speed may be adjusted upward.

Production adjustments based on sheet breaks or subsequent roll quality problems discovered downstream are, however, predominately performed manually by operators who informally estimate whether the number of paper breaks or the quality deterioration is severe enough to merit adjustments, such as a reduction of machine speed. There are, in other words, no automated control systems that currently control the operating speed in response to productive efficiency of a paper machine.

An evaluation of the production efficiency is dependent on several variables and, therefore, an operator does not have all the necessary information to determine the ideal target operating speed. Thus, all adjustments based on efficiency are merely estimates to hopefully target ideal operating speed, even for the most experienced operators. Consequently, the operator unknowingly selects an operating speed based on a few obvious variables relating to inefficiencies. This selected speed may be, however, considerably far from the optimal operating speed. Further, changes to the operations that effect efficiency can occur rapidly, while manual reactions base on operator observations typically lag considerably behind. This lack of complete information and timely reaction greatly reduces the efficiency of the equipment operation.

While operating speed of a paper machine may be adjusted directly by control of the paper machine drive, it is often adjusted by changes to the steam pressure for the paper machine dryers. For example, when production is to be decreased, either manual input or machine controls first decrease the steam pressure in the dryer cans, which in turn increase the moisture content of the paper. As the moisture content increases, the machine's paper measuring system senses the moisture increase in the finished paper and automatically decreases the machine speed to allow for greater drying time. This, of course, has the same effect as decreasing the machine speed directly by slowing the paper machine drive motors. This is typical of many automatic adjustments to operating speed, which are affected by a forced change in quality, such as increased moisture content.

While unacceptable quality and sheet breaks occur at all acceptable paper machine operating speeds, increased frequency of breaks and diminishment of quality occurs as the operating speed increases. Current automated machine controls do not maximize efficiency by taking into account the loss of unacceptable quality and sheet breaks for determining the appropriate operating speed of a paper machine. Aside from providing information on sheet quality and sheet breaks, current machine and information system controls do not aid in the adjustment of the machine production to achieve the most efficient or optimal operating speed.

Similar situations occur through out a papermaking facility. Another example, for instance, is the control systems on a wood pulp digester. Pulp mill operators utilize current control equipment that measures, among other characteristics, the kappa number of pulp leaving the digester to determine an acceptable operating speed. As the production reaches or exceeds the digester's designed capacity, the kappa number increases. The pulp mill operators will set a limit on an acceptable higher-than-ideal limit on the Kappa number. This upper limit is established by understanding that additional delignification will occur in the subsequent bleaching process. While the higher limit may be established on a criteria that factors in an estimate of bleaching costs, the pulp mill control system does not actually calculate the cost of additional bleaching. There are no control features presently available that limit the digester operation speed based on the actual current marginal cost of the additional bleaching. Rather, pulp mill operators estimate the bleaching cost based on an average cost.

For example, it may be determined that the average additional bleaching activity required to achieve a certain level of additional delignification will cost $20 per ton of pulp, based on an average cost of bleaching. A pulp mill operator may, therefore, allow the digester to operate at a level that exceeds its capacity because such operation is considered efficient if the additional bleaching costs are actually $20 per ton. When all variables are considered, however, it may be discovered that the additional bleaching action required on a certain level of marginal operating speed may be measured to actually reach $100 per ton due to the non-proportional demands for bleaching chemicals, energy, and effluent treatment. Current controls do not calculate from the necessary variables the total additional bleaching cost on the marginal operating speed, and subsequently limit digester operations to not incur the additional inefficient bleaching.

Current equipment controls are utilized by paper manufacturing operators to control certain immediate inventories of items that are directly used by the equipment being controlled. For example, paper machine operating speed may be decreased manually or automatically by machine controls as high-density storage pulp inventory in front of the paper machine is decreased. When the machine controls recognizes an inventory depletion of pulp from high density storage, machine speed or steam pressure to the dryers may be limited to decrease machine operating speed to allow pulp storage to replenish or "catch-up" to desired levels of operation. This control of machine operating speed is, however, based solely on assuring adequate quantity of materials for continued operation, rather than any measure of operating speed based on efficiency.

One problem with current control systems is that they are strictly focused on either one particular piece of equipment's operating characteristics, or at best, focus on monitoring the availability of inflow materials for the piece of equipment. For example, the machine controls for a paper machine monitors the operating characteristics of the machine itself, primarily in the area of quality of the finished product. As discussed above, the controls may also monitor pulp inventory in high-density storage to help assure that inflows are available for continued operation. Current controls do not, however, monitor many, or even most, manufacturing inflows from the time of introduction into the process. For example, the availability of wood through recent purchases and all intervening steps throughout production from wood to pulp held in high density storage for the machine should be factored into the appropriate optimal operating speed of a paper machine. Similarly, a digester operating speed should be determined with a focus on the current efficiency of the bleach plant, based on its operating characteristics, to arrive at an efficient operating speed.

The current control systems also do not factor in many, or even most, events that occur with the product after it leaves the particular piece of equipment. For example, current controls of paper machines do not factor in the many activities that occur after the paper leaves the machine. Machine operating speeds are not, for example, tied to the finishing, inventorying and selling processes that occur after the paper leaves the paper machine. These activities should, however, have a significant effect on the operating speed of the machine, as the efficiency of the entire manufacturing process is relevant to any one component's operating speed.

To maximize operating efficiencies by optimizing the operating speed, control systems should link the entire manufacturing process activities together to analyze all, or as many as useful, potential variables. For a papermaking facility, these activities include the purchase of raw materials and the sales of finished goods. For example, the activity of procuring wood in the forest and the selling of finished product should be factored into the operating speed control of the paper machine and all other equipment.

An additional problem with current control systems is that any measured efficiency on marginal operating speed is based solely on quantitative and qualitative measurements, rather than total economic efficiency. While the quantitative and qualitative measurements are used to improve the economics of the concern, they do not include one other essential component of total economic efficiency, which is price.

In making equipment operating speed decisions, the current control systems fails to account for the price component of the economic efficiency of a particular activity. While productive and qualitative measurements of equipment operations are essential to establishing an appropriate efficient operating speed, the individual price components of input materials, processing or manufacturing, and value of outputs should also be factored into calculating the efficient operating speed of equipment. For example, under the current control system, additional steam showers may be added to the papermarking process on a paper machine to increase the operating speed. Current controls systems would dictate operating at the increased rate, without factoring the incremental use of the additional steam.

While the paper industry is the focus of the above examples, many additional industries have similar limitations in their current equipment control systems. These industries are similarly suffering from inefficiencies due to inadequate integrated control systems that factor in marginal operating speeds.

SUMMARY OF THE PRESENT INVENTION

According to a first aspect of the invention a method of controlling, and apparatus, which can include a computer program, that controls, the operating speed of a papermaking facility includes determining a desired operating speed. The desired operating speed is dependent on at least one economic variable that varies depending on the operating speed. Also, the operating speed is adjusted (if necessary) in response to the determination.

One embodiment also includes determining a current operating speed of the papermaking facility, and comparing the current operating speed to the desired operating speed. The operating speed is controlled in response to the comparison.

Another embodiment includes determining the desired speed where the economic variable is a cost of manufacturing, and/or manufacturing inflows, and/or manufacturing outflows.

The desired operating speed is determined by calculating the cost of manufacturing, the manufacturing inflow, and the manufacturing outflow at a plurality of potential operating speeds. Then the desired operating speed is selected from the potential operating speeds, in an alternative. The desired operating speed is determined by calculating a marginal cost of manufacturing, a marginal manufacturing inflow, and a marginal manufacturing outflow at a plurality of marginal potential operating speeds in another alternative. The desired operating speed is selected from the marginal potential operating speeds and a prior desired operating speed.

The economic variable is cost of manufacturing, and the cost of manufacturing includes ascertaining the correlation between operating speed and the cost of manufacturing, in yet another embodiment. The cost of manufacturing may be determined by ascertaining a correlation between operating speed and the per-unit cost of manufacturing inflows and/or the usage of manufacturing inflows. Also, the correlation between manufacturing cost and operating speed may be ascertained by establishing the correlation between manufacturing costs and operating speed of specific equipment or process in a paper manufacturing facility. In another alternative the correlation between manufacturing cost and the operating speed of a paper machine includes the manufacturing inflows during sheet breaks and/or while the facility is producing finished product of unacceptable quality.

Another alternative provides that the correlation between manufacturing cost and operating speed is ascertained by establishing the correlation between manufacturing costs and the operating speed of groups of equipment or processes in a paper manufacturing facility. Also, the purchase price of manufacturing inflows may be assigned, from lowest to highest per-unit cost, to increasing levels of the paper manufacturing facility's production.

Yet another alternative provides that the manufacturing outflow is determined by ascertaining a correlation between operating speed and sales of at least one of finished products and byproducts. The correlation between the operating speed and sales may be ascertained by assigning a plurality of manufacturing outflows to at least one specific portion of the paper manufacturing facility's production. Alternatively, the correlation between operating speed and sales may include variations in product mix. The manufacturing outflow is determined, from highest to lowest per-unit economic value, for increasing levels of the paper manufacturing facility's production, in one embodiment.

A second aspect of the invention is a method and apparatus that determines the effect of one or more business transactions on the economic efficiency of the production of products in a paper manufacturing facility. The economic efficiency is dependent on one or more economic variables that vary with operating speed. It includes obtaining the current economic efficiency of the facility and inputting information on the business transactions that affects the economic variables. Also, the economic efficiency of the facility with the proposed transaction leaving the remaining variables constant is calculated. Then, the result is displayed to the end user.

In one embodiment the operating speed of the paper manufacturing facility is dependent on at least one economic variable that varies depending on the operating speed. In another embodiment, the transactions include one or more of purchase of inflows, sales of outflows, capital additions, capital subtractions, changes to equipment, change in product mix. In a third alternative the business transactions are proposed business transactions.

Other principal features and advantages of the invention will become apparent to those skilled in the art upon review of the following drawings, the detailed description and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of the inventive control system's activity of controlling the operating speed of equipment or process in a paper manufacturing facility.

FIG. 2 is a block diagram that describes the activity of computing the optimal operating speed of a particular piece of equipment or process selected as the primary focal point. Other equipment or processes in a facility will have operating speed determined from the focus equipment or process. In this figure, the paper machine was selected.

FIG. 3 is a block diagram that describes the activity of providing critical ancillary information relating to the marginal operating speed analysis.

Before explaining at least one embodiment of the invention in detail it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments or of being practiced or carried out in various ways. Also, it is to be understood that the phraseology and terminology employed herein is for the purpose of description and should not be regarded as limiting. Like reference numerals are used to indicate like components.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is, in one embodiment, a method and apparatus for an integrated control system in a manufacturing facility, or computer program implementing the system, that establishes and implements an optimal operating speed for equipment or processes that enhances the efficiency of the entire activity involved in a manufacturing facility. While the invention could be utilized in a number of manufacturing businesses, such as steel (and the production of other metals), petroleum and energy, the description primarily focuses on manufacturing facilities in the paper industry. The use of a papermaking facility example throughout the description is not meant, however, to limit the scope of the invention to the paper industry. It is used to illustrate the applicability of the invention to a particular industry that will greatly benefit from its use. The applicability of this control system to other industries will become apparent through the summary and description of the invention.

The use of the term papermaking or paper manufacturing facility in this application shall include any manufacturing plant, any single piece of equipment or process, or groups of equipment or processes that includes a manufacturing activity for the manufacture of pulp (including pulp to be sold to outside customers), paper, or any paper converting operation. The use of the term also could include groups of facilities, particular product lines in a paper manufacturing company or the entire company itself. The control system, therefore, could encompass more than a single manufacturing plant but rather could be integrated throughout all the plants of an entire company. For example, the operating speed of a paper machine in facility A of a paper manufacturing company could be interrelated to the optimal operating speed of a paper machine in facility B or interrelated to a paper converting operation.

The present invention, as it relates to the paper industry, is a method of controlling the operating speed of equipment or processes in a papermaking facility by computing and implementing an optimal operating speed for the equipment throughout the entire facility. The computed optimal operating speed is dependent on variables that are correlated with operating speed. The invention includes, in various embodiments, the software used to compute the optimal operating speed, the hardware that implements the control, and the method used in determining the optimal operating speed.

Operating or production speed is defined as the output, measured in any applicable units (such as tonnes per day for a pulp washer, cords per hour for debarking equipment or feet per second for a paper machine): of particular pieces of equipment (such as a paper machine or a digester), of particular processes (such as a bleaching operation), or of the entire facility. Operating speed may be expressed as a percentage of maximum speed or as the fraction of actual operating time over the total possible time of operation. It may also be reflected as a fraction of output (measured in any applicable units) over the total maximum output. Facility operating speed is the operating speed of a facility, including: one or more plants, one or more product lines of a company, and one or more pieces of equipment or process.

The variables that are dependant on the operating speed can include: the variable usage of manufacturing inflows, the variable cost of manufacturing inflows and the variable economic value of manufacturing outflows.

Manufacturing inflows include raw materials and/or other manufacturing supplies that are utilized in the manufacturing process that has either per-unit cost or usage that varies with operating speed. For a pulp and paper manufacturing facility, these may include, but are not limited to, pulpwood,

wood chips, secondary or post-consumer recyclable fiber, purchased virgin pulp, purchased secondary or post consumer pulp, water, pulping chemicals, bleaching chemicals, paper additive chemicals, electricity, fossil fuels of any type, purchased steam, paper machine felts, paper machine wires, labor costs (to the extent that it varies with production speed), effluent treatment chemicals and paper finishing chemicals (such as coating and sizing ingredients). Costs for outside services that substitute for activities within the facility should also be included as manufacturing inflows if they vary with Operating Speed. For example, payments to municipalities to handle excess effluent treatment are in lieu of the chemical, energy and other supply purchases that are associated with in-facility effluent treatment, and therefore, should be considered as a manufacturing inflow.

The variable usage of manufacturing inflows (or sometimes referred to as manufacturing inflows), is established at different paper machine operating speeds by computing the effect of operating speed on the usage of manufacturing inflows.

To compute the variable usage of manufacturing inflows at various operating speeds for the entire facility, the inventive control system aggregates the variable usage of manufacturing inflows for the separate pieces of equipment or process in the facility. While it is not likely, practical or relevant to include every piece of equipment in a facility for this purpose, each facility operator will be able to use the inventive control system by selecting which equipment to include in the control process. Further, each facility operator can aggregate the results of separate equipment or process usage into grouping of equipment or processes.

The information on variable usage of manufacturing inflows could be obtained, either manually or electronically, from other control or information systems in the mill that could provide historical data to create a formula or other computation mechanism to establish the usage at different operating speeds. This information could also be obtained through physical observation by facility personnel or through feedback systems designed solely to work with this inventive control system.

To effectively measure total efficiency, the inventive control system will convert the variable usage of manufacturing inflows to dollar amounts based on manufacturing inflow costs. These costs are inputs of the inventive control system, to generate a variable cost of manufacturing inflows. The inputs on costs could be performed manually or through other information systems within the facility.

Finished goods and sellable byproducts, which are referred to as manufacturing outflows, can also have a value assigned to help establish the optimal operating speed of equipment based on economic efficiency. These values can vary based on the operating speed of the equipment. This is referred to as the variable economic value of manufacturing outflows. The value assigned could be the net sales price of finished goods. These prices could be input into the inventive control system manually or electronically through other information systems within the facility. They could also be input through physical observation or by feedback systems designed solely to work with this inventive control system.

While the optimal operating speed may be defined in many different ways by a facility operator implementing this invention, in the preferred embodiment it is the operating speed of the entire facility, or part of the facility, that provides the greatest efficiency to the facility. The optimal operating speed of any particular piece of equipment or process may not be its own most efficient or optimal speed, since the optimal operating speed may be measured on the basis of integration of all relevant equipment and processes in a facility. In other words, the equipment may be limited in reaching its own most effective operating speed, if its contribution to the overall efficiency of the facility can be enhanced by operation at a greater or less speed.

The optimal operating or production speed may focus on the operating speed of a particular piece of focal point machinery from which other equipments' operating speed could be established. For purposes of effectively controlling and measuring the speed that achieves the greatest overall efficiency of a facility. A paper machine, for example, would be a logical choice for a focal piece of equipment. This choice allows other equipment or processes to establish their required operating speed based on the requirements of the process flows for the paper machine (these process flows include manufacturing activities that occur before and after the paper machine). The focal point may first be on the combined operating speed of all the paper machines before segregating the speeds to the separate machines for multi-machine facilities. The term paper machine in the singular discussed herein, therefore, also includes the plural.

The optimal operating speed, in terms of economic efficiency, can be defined as the operating speed that provides the highest amount of positive difference between the facility value of manufacturing outflows and the cost of manufacturing.

Manual or automatic adjustments of the operating speed of a particular piece of equipment or process is made after the inventive control system computes the optimal operating speed. The inventive control system computes a revised optimal operating speed as variables in the process change, such as changes in variable usage or costs of manufacturing inflows, either instantaneously or at a later time. The inventive control system will then be used to either initiate manual or automatic adjustments to the operating speed of the equipment to achieve the new optimal operating speed.

Like other control systems, the inventive control system can also provide ancillary data that will be useful for operations. For example, it can provide information on the effect of deviations from the optimal operating speed. If equipment is not performing at the designated optimal operating speed, the inventive control system could compute and provide information on the deviation's effect on the efficiency (economic or otherwise) of the facility.

The inventive control system will also provide useful ancillary information for activities outside of the controlled environment, such as purchasing and selling decisions in the paper manufacturing business. For example, the wood procurement department would be able to access information from the inventive control system to understand the impact that a proposed or accepted wood purchase decision would have on the economic efficiency of the operation.

Another potential source of ancillary information would be the effect that capital improvements, additions or deletions have on the speed and efficiency of an operation. For example, the inventive control system can provide useful information on the effect that a new paper machine, other piece of equipment, or change in process would have on the optimal operating speed of the equipment in the facility.

Generally, the inventive control system may be implemented using a closed-loop control, where feedback indicating the actual speed is used to adjust the speed, or implemented using an open-loop control. An example of a possible embodiment of the control system invention is described in more detail with the use of the accompanying drawings.

FIG. 1 shows the use of a closed loop-control system version of the inventive control system. Block **101** represents the activity of ascertaining the current operating speed of a particular piece of equipment or process within the facility. Current speed data may also be used in accumulating historical speed data for a particular measured time period, which is then used to set an average speed for a particular time period (as discussed below). Block **103** represents the activity of determining the optimal operating speed of the paper machines. This activity is diagramed in more detail in FIG. **2**.

Block **105** represents the activity of determining the optimal operating speed of a particular piece of equipment or processes from the output of block **103**. This activity involves computing the appropriate operating speed of a particular piece of equipment or process to fulfill the requirements of the paper machines' running at the optimal operating speed (this may first require a determination of the operating speed of equipment groups or processes at a higher grouping level).

It is important to point out that at any given time period, equipment and processes can deviate from the optimal operating speed, and through a process of averaging can still fulfill the needs of the paper machine. For example, the inventive control system may determine that a pulp washer must operate at a speed of 1,000 feet per minute to achieve optimal operating speed. If the washer operates at 500 feet per minute for 12 hours and then at 1,500 feet per minute for 12 hours, its daily speed has been optimized. The inventive control system can, however, take into account in establishing the optimal operating speed that the washer may experience two different manufacturing inflow usage profiles by operating at different speeds during the day. Historical speed data (accumulated in block **101**, as discussed above) may be used in determining current speed, so that a desired average speed is obtained.

Block **107** represents the activity of comparing the current speed of the equipment or process determined in block **101** to the optimal speed determined in block **105**.

Block **109** represents the activity of adjusting the speed of the equipment or process in response to the comparison established in block **107**. The arrow from block **109** back to block **101** represents the activity of repeating of the above-described procedures in the closed-loop process. The process may be continuously repeated, intermittently repeated, or used once. The order of the steps shown is only the preferred embodiment. Other embodiments include performing the steps in a different order.

As mentioned above, FIG. 1 illustrates a closed-loop system. An open-loop system would preferably include blocks **103**, **105** and **109**. No monitoring of current operating speed would occur in the open loop system. Rather, a determination of the paper machine optimal operating speed (block **103**) is followed by the equipment or process optimal speed computations (block **105**) which is followed by a change in machine or process speed to the optimal operating speed established in block **105** (block **109**). Open-loop control may be particularly useful when machines in the facility have their own speed control.

FIG. 1 shows that the optimal operating speed is determined in an integrated fashion (i.e. including all relevant facility equipment) established before establishing the optimal operating speed for any individual equipment or processes. This integrated optimal operating speed is established before controlling any one piece of machinery or process because the preferred embodiment of the inventive control system involves an integrated calculation of the efficiency of the entire manufacturing process. Another alternative would be to establish the optimal operating speed of a single piece of equipment or process or groups of certain equipment or processes (for example, the paper machine alone) without establishing the optimal operating speed of all the relevant equipment in the entire facility.

Further, the above description utilized the paper machine (s) as the piece of equipment to serve as the measured optimal operating speed, since it is the focal point of production in the papermaking operation. While all machinery can likewise be speed controlled in the same manner, the paper machine operating speed will likely best dictate the operating speed of other equipment. Other equipment could be chosen, however, to establish the operating speed of all the facility's equipment.

FIG. **2** represents the sub-activity of determining the optimal operating speed of the paper machine (block **103** of FIG. **1**). Block **200** represents the activity of inputting all the variable cost of manufacturing inflows. This may be done manually or electronically at the occurrence of the actual purchases. For example, when a purchase of wood is made by the purchasing department of a papermaking facility, either manual data on cost and quantity are entered or such data is automatically transferred from the computer system handling the purchase information.

Inputs may also be made on known price and quantity quotes rather than actually purchase transactions. This may be an effective means of gathering more real-time information. For example, quoted energy prices may be able to flow directly to the inventive control system to obtain current potential per-unit energy costs.

One purpose of inputting the quantity of each variable manufacturing inflow purchase is to establish the quantities of available resources. This will help determine the optimal operating speed based on the available resources. Further, information on quantity of purchases will aid in determining the variable usage of manufacturing inflow alternatives. For example, the inflow data may establish that pulp wood purchases can only be made to fulfill 75 % of the facility's potential operating speed. Additional operating speed will, therefore, have to be met through an alternative variable manufacturing inflow, such as purchased wood chips or market pulp. This may lead to less economic efficiency at higher operating speeds, which results in a lower optimal operating speed compared to a facility that can fulfill its pulp requirements internally.

The inputting of manufacturing inflows may also include the production of ancillary products needed in the manufacturing process. For example, steam generation is needed for many parts of paper manufacturing. Steam may, therefore, be considered a manufacturing inflow in which the per-unit cost of particular quantities of steam could be included as inputs in block **200**.

An alternative to treating steam as a manufacturing inflow would be to treat its manufacture as part of the papermaking process of the facility. In this regard, steam generation would have its own variable manufacturing inflow needs. For example, fossil fuel (such as coal or natural gas) would be a manufacturing inflow to the production of steam and would, therefore, be a separate input at the activity in block **200**.

Block **210** involves a computing or data organizing function of the inventive control system where the information from the variable manufacturing inflow inputs of block **200** is arranged by individual layers of inflows to be retrieved by later computations described below. The results of this activity will be the creation of a purchase grid.

A paper manufacturing facility, ideally, purchases its manufacturing inflow items in an increasing per-unit cost fashion based on operating speed. This means that the purchasing departments are securing manufacturing inflows with the lowest per-unit cost before investigating purchases of greater cost. Consequently, if the operations were curtailed, the highest per-unit cost raw materials would not be purchased. Under this arrangement, per-unit cost of inflows is directly correlated to increasing operating speed. More particularly, this would result in the use of a particular item of inflow with the highest per-unit cost to fulfill the last quantity needed by the facility to operate at full speed. Conversely, as speed decreases, less expensive per-unit inflows would be utilized. If this behavior exists or is desired, the purchase grid from the input data in activity block **200** would be layered in the block **210** activity in a fashion of increasing per-unit costs so that inflows are retrieved in a least-expensive-out-first fashion.

A simple example of this would be a facility that has two wood purchases: one purchase layer at $50 per-unit (such as a cord) that covers 75 percent of the potential operating speed and a second purchase layer at $85 per-unit that covers the remaining 25 percent of potential speed. In establishing the optimal speed (which will become apparent with the full description of this FIG. **2**), the inventive control system would utilize the $50 purchase layer for potential operations up to 75 percent of the potential speed and the more expensive $85 purchase layer for potential operations that exceed 75 percent of the potential speed.

Data arranged in the activity of block **210** would likely be segregated for each category of variable manufacturing inflow. For example, the input for pulp wood purchases would be arranged in the above manner separately from market pulp purchases.

Facility operators will establish their own methodology of what purchase data will be input and how it will enter and exit the purchase grid. Current purchase orders, for example, can be an effective input for the purchase grid. As the orders are input, the activity of block **210** could add them to the purchase grid. The items would later be removed from the purchase grid at an established point in time decided by the operator. In general, the time of deletion from the purchase grid will be based on operator's decision of when the information no longer has relevance for determining optimal operating speeds. This removal could be performed manually or electronically from information systems that track purchases and flows of inventory.

Since the optimal operating speed is determined by marginal transactions, the operator may chose only to include those purchases above a certain operating speed. For example, an operator may not want to include low cost wood purchases that represent the first 50 % of operating speed because the operator knows that the facility could never be efficient below this speed.

Block **202** represents the activity of establishing the variable usage of manufacturing inflows for individual pieces of equipment or process. The result of this activity is to establish a correlation between the operating speed and the variable usage of manufacturing inflows for a relevant particular piece of facility equipment or process. The data used to establish the correlation would be input manually or electronically from historical data on operations at different operating speeds. It may also likely involve the creation of formulas or other data-solving methodologies, either electronically or manually, to establish the correlations based on the unique characteristics of the facility equipment and processes.

The activity represented in block **202** would be performed for each chosen relevant piece of equipment or process of the facility. The potential activities represented in block **202** are numerous. Some examples of equipment are: debarkers, chippers, digesters, grinders, pulp manufacturing refiners, pulp manufacturing refiners, screening equipment, washers, bleaching equipment, stock preparation refiners and chests, cleaners, paper machines, off-machine finishing equipment, roll wrapping and handling, and converting equipment.

A slightly more detailed example of the activity of block **202** would be for the establishment of the variable usage of manufacturing inflows for a paper machine. The usage of manufacturing inflows of a paper machine could include pulp, electricity, steam, water, chemicals, effluent treatment, paper machine felts, paper machine wires, to name a few. Historical data on prior operations could be gathered to correlate the operating speed of the paper machine to its usage of inflows. Physical observations can also establish the usage correlations.

Usage could be measured in relation to acceptable output from the particular piece of equipment. For example, if sheet breaks and unacceptable rolls of finished product increase as paper machine operating speed increases, a mathematical relationship to the equipment's increased pulp usage, measured by quantity of pulp required for a given level of acceptable finished product, can be ascertained.

Usage of different types of manufacturing inflows will occur at different speeds of equipment. For example, a paper machine speed increase will likely result in an increase in pulp usage. If the pulp operation of the facility is limited to only supplying 80 percent of the fiber requirements of the paper machine running at full speed, the manufacturing inflow usage of purchased market pulp will be required, whereas operations below 80 % may not dictate such usage. Purchased pulp would become a necessary inflow usage at levels above 80 %. Alternatively, purchased pulp could be assigned a cost of zero below 80 %. The optimal facility efficiency will dictate whether purchased pulp will become part of the manufacturing inflows for speeds below 80 %.

Block **212** represents the activity of establishing the variable manufacturing cost for individual equipment or process. This activity involves applying the manufacturing inflow cost from the purchase grid developed in the activity at block **210** to each piece of equipment's variable usage of manufacturing inflows established in block **202**. As discussed above, items retrieved from the purchase grid will be done so in a specific order as established by the user of the inventive control system. One possibility, as discussed above, would be based on a lowest-cost-first priority. The results of the activity in block **212** will be to establish a correlation between potential equipment or process operating speeds and the cost of manufacturing.

Some manufacturing inflow items will be required of more than one piece of equipment or process. For example, electricity will be a manufacturing inflow item that would be needed throughout virtually every piece of evaluated equipment in the facility. It will, therefore, require additional computations or assumptions regarding the usage of this item at the individual equipment level. For example, an average of actual electricity costs could occur at this level of analysis.

Activity block **220** involves the process of solving for the optimal operating speed of individual equipment or process when joined with other equipment or processes to form larger processes or groups of equipment that can have their own measurable operating speeds. The activity in block **220** also involves computes the variable cost of manufacturing of the larger processes or groups of equipment.

For example, pulp digesters and bleaching equipment are separate pieces of equipment that can be analyzed in the activity at block **212**. This equipment can, however, be grouped into larger categories of production or processes. For example, each separate piece of bleaching equipment can then be grouped together to be analyzed for various operating speeds of the entire bleaching process. Further, since part of the bleaching process involves delignification, it can be grouped with other equipment (such as the digesters) to establish the variable cost of manufacturing in the delignification process. This also shows that equipment can become part of more than one grouping (i.e. bleaching and delignification).

Two similar pieces of equipment performing the same function could also be grouped together. For example, two paper machines producing identical printing paper products could be grouped together to determine the combined optimal operating speed of the machines in the printing papermaking process. If other machines in the mill also make another type of paper, such as linerboard, they also can be aggregated with the printing paper machines to establish the optimal operating speed of all paper machines in the manufacturing process.

Block **222** of FIG. **2** represents the activity of inputting the variable economic value of manufacturing outflows. This activity would involve the inputting of the net per-unit sales price and quantity of finished product (such as paper, pulp, or converted paper) and by-product (such as steam, fertilizer filler, spent chemicals, or electricity) sold. Similar to the activity in block **200**, inputting could be done manually or electronically through the facility's accounting or other information systems. It could include actual sales, market prices or some other form of sales data.

Block **224** represents a data arrangement activity for manufacturing outflows that is similar to the activity occurring in block **210** for manufacturing inflows. Block **224** arranges the variable economic value of manufacturing outflow data inputs of block **222** in a layered fashion based on per-unit price of sales, which is referred to as the outflow grid. In the ideal environment, a paper manufacturing facility would be able to show a direct inverse correlation between net per-unit sales price of outflows and operating speed. If this occurs, the operator would establish a system in activity block **224** to arrange the data from block **222** in layers of decreasing per-unit price. These layers could be utilized by later steps of the inventive control system (described below) in a fashion of the highest per-unit value down to the lowest per-value unit based on operating speed.

A simple example of the activity in block **224** would be for a facility that only has two sales: one sale that covers 75 percent of the potential operating speed of the paper machine is at a net per-unit sale of $500. The other sale that covers 25 percent of the potential operating speed of the machine has a $400 net per-unit sale price. In establishing the optimal speed, the inventive control system could assume that the $500 per-unit sales for operations would be made before the $400 per-unit sales (other assumptions could be made).

Like the purchase grid described-above, the outflow grid could be customized by the operator in a number of different ways, including the size of the grid and how it changes over time. Sales of a particular chosen time periods and dollar amounts could dictate its characteristics. See the discussion of activity block **210** above for a similar discussion.

Data relating to a variety of finished products and byproducts would be organized or layered separately for each product (including basis weight differences) or by product. For example, if a paper facility manufactures both brown linerboard and bleached linerboard, each product line's variable economic value of manufacturing outflows would be arranged separately.

Block **230** represents the activity of evaluating the efficiency of the facility at different possible paper machine operating speeds. To accomplish this task, the activity in block **230** represents the comparison of the variable cost of manufacturing (established in block **220**) to the variable economic value of manufacturing outflows (block **224**) at different paper machine operating speeds. As discussed above, block **224** provides the per-unit price layers of economic value of manufacturing outflows. As also discussed above, these layers could be arranged by decreasing prices, so that the highest marginal operating speed results in the lowest marginal per-unit sale.

The activity in block **230** of comparing the results in block **220** to the results in block **212** may be done at any desired number of different potential paper machine operating speeds. Each facility operator could determine the appropriate number of different operating speeds to investigate. As discussed above, the paper machine or paper machines are the chosen piece of equipment to analyze the facility efficiency at different equipment operating speeds because it can be considered the most significant representation of production equipment in the papermaking process. A facility operator may, however, chose any number of other equipment or processes as the measuring instrument.

The activity in block **240** represents a selection of the optimal operating speed from all the potential operating speed performances calculated in block **230**. The activity in block **240** will be dependent on the operator's definition of optimal operating speed.

The desired optimal operating speed may be defined as the operating speed that produces products and byproducts with the greatest excess of variable manufacturing cost over the economic value of manufacturing outflows. This speed also represents the speed at which the largest positive numerical sum can be obtained from the product of subtracting the variable manufacturing cost from the economic value of manufacturing outflows. This numerical sum is referred to as the greatest economic efficiency. If this is the selected definition, then one possibility for the methodology of carrying out the activity of block **240** would be to select from the resulting potential operating speeds in block **230** the operating speed that has a facility performance that achieves the greatest economic efficiency.

As data changes, the inventive control system will establish new optimal operating speeds in the manner described in FIG. **2** and adjust the equipment speed to achieve the new optimal operating speed as described in FIG. **1**. For example, if a new high per-unit cost wood purchase is input in activity **200**, it may ultimately result in a paper machine operating speed of 3,000 feet per minute for a single machine facility. The activity in Block **101**(using a closed-loop control system) may measure that the current machine operating speed is 3,100 feet per minute (based on a prior set optimal operating speed before the expensive wood purchase). The activity represented in block **107** would compare the operating speed determined in block **101** with the determined revised optimal operating speed result from the activity represented in block **105** (which for the paper machine, was already computed from activity **103**). The activity represented in block **109** would be a 100-foot per minute downward adjustment of paper machine speed from 3,100 feet per minute to 3,000 feet per minute.

As discussed above, another important feature of the inventive control system is that it will be able to provide ancillary information for its users. For example, personnel making manufacturing inflow purchase decisions or manufacturing outflow sales decisions could be provided with information regarding the effect of a potential purchase or sale. One possible piece of useful information is whether the proposed purchase or sale price of a transaction is efficient, and therefore, acceptable. The block diagram of FIG. **3** provides a methodology for providing ancillary information for a proposed purchase transaction. Although the methodology shown is for a purchase transaction, any business transaction or proposed transaction could employ a similar methodology. The Figure, therefore, is not meant to limit the scope of the method or apparatus of only providing ancillary information on purchase decisions.

Block **300** represents the activity of inputting information that contains the data to determine the per-unit price and quantity of a potential purchase transaction, such as a wood purchase for a papermaking facility.

Block **302** represents the activity of retrieving information from the activity in FIG. **2** relating to the current paper machine optimal operating speed calculations. Some examples of this information are: the current optimal speed, the current facility optimal economic efficiency, the current cost structure of the wood inventory (from its purchase grid), and the current selection of the highest wood cost being utilized from the wood purchase grid at the optimal paper machine operating speed.

Block **304** represents the activity of computing "what if" scenarios with the proposed purchase information input of block **300**. The activity involves running operating scenarios under the methodology described in FIG. **2** as if the proposed purchase was actually made. This will provide information on the effect that the proposed purchase would have on the operation of the facility.

Block **306** represents the activity of comparing the data obtained from the "what if" scenarios created in the activity of block **304** with the current operations information obtained from block **302**.

Block **308** represents the activity of displaying the information obtained from blocks **302**, **304** and **306** for the purpose of providing useful information to aid in making the purchase decision. Examples of this information includes comparisons of current operations to "what if" scenarios for the purpose of showing the effect that the purchase has on optimal operating speed and efficiency, the effect that the purchase has on the average cost of wood utilized at the current optimal operating speed, information on the effect of the purchase on operating speed and economic efficiency based on different hypothetical wood purchase quantities at the proposed price. Other embodiments include using lookup tables, or solving equations based on marginal changes in one or more variables.

As mentioned above, a similar methodology could be followed for sales decisions. Further, similar methodology could also be employed to determine the effect on economic efficiency and operating speed for other decisions. These could include decisions on capital equipment additions, capital equipment deletions, proposed changes in the processes, or changes to other operating variables.

It is anticipated that the input activity of blocks **200** (purchasing inflows) and **202** (selling outflows) and the data input and output for the ancillary information could be accomplished at locations away from the manufacturing facility. For example, wood procurement personnel could enter a proposed purchase of a certain quantity and price of pulpwood (activity represented at block **300** of FIG. **3**) into a personal computer, lap-top computer or other remote data input and retrieval device (including wireless) at a remote location, such as a forest where pulpwood is located. The device could relay the information back to devices at the facility for a computation of the effect that the proposed purchase would have on economic efficiency. This information would be instantaneously relayed back to the device for display (activity in block **308**). Similarly, inputs of completed purchases (activity **200**) or sales (activity **202**) could be immediately input into the inventive control system from remote locations, such as customer locations.

While there are many methods of calculating the proper operating speeds based on the many operating variables in the process, the preferred way of carrying out the method of the invention will be through, at least in part, the use of a computer program that utilizes a digital or analog computer processing mechanism. Any or all of the activities associated with establishing an optimal operating speed can, however, be computed or implemented in other means including, but not limited to, manual computations, look up tables, analog control circuits and charts that will perform the calculations necessary to compute the appropriate operating speed of the facility or equipment. One skilled in this art will be able to write computer routines, design control circuitry, or create tables that implement the various steps described herein. The computer program may be run on a "stand alone" computer, to which data is manually inputted, or by a microprocessor that is part of a larger control system, and which receives data automatically from other parts of the control system. Likewise, the output may "stand alone" or be integrated into a larger control system.

Monitoring and adjusting the speed of the equipment or processes could, therefore, be performed manually from the data output of the inventive control system. It would, however, be preferred for several, if not most, pieces of equipment or processes in a papermaking facility to integrate the inventive control system's calculated operating speed directly to the control of the machine's operating speed by means of electronic connection to the equipment. For example, the paper machine controls could automatically slow the operating speed down to a new optimal operating speed if a change occurs to one or more variables in the entire papermaking process that dictates a slowing of the operating speed.

To establish the electronic connection to the equipment, inputs and outputs from the inventive control system could be integrated with other existing control or information systems in the facility. For example, existing controls of equipment could provide input on the variable usage of manufacturing inflows and also could implement the computed optimal operating speed established by the inventive control system. Similarly, accounting and other information systems could also provide cost information for the manufacturing inflows, the manufacturing inflow usage, and the economic value of manufacturing outflow information. Ancillary data computed by the inventive control system (discussed above) could also be integrated with the other systems to provide information to the operators and other departments in the facility.

Another possible embodiment of the inventive control system is that it could become a part of the overall machine control systems of equipment or processes and/or become a part of other information systems within the facility. For example, present machine controls, such as control systems on a paper machine could include the embodiment of the inventive control system.

Numerous modifications may be made to the present invention which still fall within the intended scope hereof. Thus, it should be apparent that there has been provided in accordance with the present invention a method and apparatus for the inventive control system that fully satisfies the objectives and advantages set forth above. Although the invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art. Accordingly, it is intended to embrace all such alternatives, modifications and variations that fall within the spirit and broad scope of the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A method of controlling the operating speed of a papermaking facility comprising the steps of:

Determining a desired operating speed, the desired operating speed dependent on at least one economic variable that varies depending on the operating speed; and

adjusting the operating speed in response to the determination.

2. The method of claim 1, further including the steps of:

determining a current operating speed of the papermaking facility;

comparing the current operating speed to the desired operating speed; and

further adjusting the operating speed in response to the comparison.

3. The method of claim 2, wherein the at least one economic variable is at least one of: a cost of manufacturing, at least one manufacturing inflow, and at least one manufacturing outflow.

4. The method of claim 3, wherein the desired operating speed is determined by calculating the cost of manufacturing, the manufacturing inflow, and the manufacturing outflow at a plurality of potential operating speeds, and selecting the desired operating speed from the potential operating speeds.

5. The method of claim 3, wherein the desired operating speed is determined by calculating a marginal cost of manufacturing, a marginal manufacturing inflow, and a marginal manufacturing outflow at a plurality of marginal potential operating speeds and selecting the desired operating speed from the marginal potential operating speeds and a prior desired operating speed.

6. The method of claim 3, wherein the manufacturing outflow is determined by ascertaining a correlation between operating speed and sales of at least one of finished products and byproducts.

7. The method of claim 6, wherein the correlation between the operating speed and sales is ascertained by assigning a plurality of manufacturing outflows to at least one specific portion of the paper manufacturing facility's production.

8. The method of claim 6, wherein the manufacturing outflow is determined, from highest to lowest per-unit economic value, for increasing levels of the paper manufacturing facility's production.

9. The method of claim 1, wherein the economic variable is cost of manufacturing, and the cost of manufacturing includes ascertaining the correlation between operating speed and the cost of manufacturing.

10. The method of claim 9, wherein the cost of manufacturing is determined by ascertaining a correlation between operating speed and at least one of the following: the per-unit cost of manufacturing inflows and the usage of manufacturing inflows.

11. The method of claim 10, wherein the correlation between manufacturing cost and operating speed is ascertained by establishing the correlation between manufacturing costs and operating speed of specific equipment or process in a paper manufacturing facility.

12. The method of claim 10, wherein the correlation between manufacturing cost and the operating speed of a paper machine includes the manufacturing inflows during one or more of sheet breaks and production that produces finished product of unacceptable quality.

13. The method of claim 10, wherein the correlation between manufacturing cost and operating speed for a paper machine is determined by including usage of manufacturing inflows associated with paper breaks.

14. The method of claim 10, wherein the correlation between manufacturing cost and operating speed is ascertained by establishing the correlation between manufacturing costs and operating speed of groups of at least one of equipment and processes in a paper manufacturing facility.

15. The method of claim 14, wherein the purchase price of manufacturing inflows is assigned, from lowest to highest per-unit cost, to increasing levels of the paper manufacturing facility's production.

16. A papermaking facility operating speed controller comprising of:

means for determining a current operating speed of the papermaking facility;

means for determining a desired operating speed, the desired operating speed dependent on at least one economic variable that varies depending on the operating speed;

means for comparing the current operating speed to the desired operating speed; and adjusting the current speed in response to the comparison.

17. The apparatus of claim 16, wherein the means for determining includes means for determining a desired operating speed to achieve an optimal operating speed from at least one of: a cost of manufacturing, at least one manufacturing inflow, and at least one manufacturing outflow.

18. The apparatus of claim 17, wherein the means for determining includes means for determining a desired operating speed by calculating the cost of manufacturing, the manufacturing inflow, and the manufacturing outflow at a plurality of potential operating speeds and selecting the desired operating speed from the potential operating speeds.

19. The apparatus of claim 17, wherein the means for determining include means for determining a desired operating speed by calculating a marginal cost of manufacturing, a marginal manufacturing inflow, and a marginal manufacturing outflow at a plurality of marginal potential operating speeds and selecting the desired operating speed from the marginal potential operating speeds.

20. The apparatus of claim 18, wherein the means for determining include means for determining a desired operating speed by ascertaining the correlation between operating speed and the cost of manufacturing.

21. The apparatus of claim 20, including means for determining the variable cost of manufacturing by ascertaining a correlation between operating speed and at least one of the following: the per-unit cost of manufacturing inflows and the usage of manufacturing inflows.

22. The apparatus of claim 19, further including means for determining manufacturing outflows by ascertaining a cor-

relation between operating speed and sales of at least one of finished products and byproducts.

23. The apparatus of claim 22, wherein the means for ascertaining includes means for correlating the manufacturing outflows by assigning different economic values of manufacturing outflow with specific portions of the paper manufacturing facility's production.

24. The apparatus of claim 23, further includes means for determining the at least one of manufacturing outflows from highest to lowest per-unit economic value, to increasing levels of the paper manufacturing facility's production.

25. An article of manufacture comprising:

a computer usable medium having computer readable program code embodied therein for determining a desired operating speed of a papermaking facility comprising;

computer readable program code means for receiving as an economic input at least one economic variable that varies depending on the operating speed;

computer readable program code means for determining the desired speed, the desired speed being dependent on the economic input; and

computer readable program code means for outputting the optimal speed,

said optimal speed being inputted into said papermaking facility in conjunction with a computer system.

26. The article of claim 25, further including:

computer readable program code means for determining a current operating speed of the papermaking facility;

computer readable program code means for comparing the current operating speed to the desired operating speed; and

computer readable program code means for further adjusting the current speed in response to the comparison.

27. The article of claim 25, wherein the means for determining includes computer readable program code means for determining a desired operating speed from at least one of: cost of manufacturing, manufacturing inflows, and manufacturing outflows.

28. The article of claim 27, wherein the means for determining includes computer readable program code means for determining a desired operating speed by calculating the cost of manufacturing, the manufacturing inflow, and the manufacturing outflow at a plurality of potential operating speeds and selecting the desired operating speed from the potential operating speeds.

29. The article of claim 27, wherein the means for determining includes computer readable program code means for determining a desired operating speed by calculating a marginal cost of manufacturing, a marginal manufacturing inflow, and a marginal manufacturing outflow at a plurality of marginal potential operating speeds and selecting the desired operating speed from the marginal potential operating speeds that contribute to achieving an optimal operating speeds.

30. The article of claim 29, further including computer readable program code means for ascertaining a correlation between operating speed and sales of at least one of finished products and byproducts.

31. The article of claim 29, wherein the economic variable is cost of manufacturing, and further including computer readable program code means for ascertaining the correlation between operating speed and the cost of manufacturing.

32. The article of claim 31, further including computer readable program code means for ascertaining a correlation between operating speed and at least one of the following: the per-unit cost of manufacturing inflows and the usage of manufacturing inflows.

33. The article of claim 31, further including computer readable program code means for establishing the correlation between manufacturing costs and operating speed of specific equipment or process in a paper manufacturing facility.

34. The article of claim 31, further including computer readable program code means for correlating the manufacturing cost and the operating speed of a paper machine including the manufacturing inflows utilized during one or more of sheet breaks and to periods in which finished product of unacceptable quality is produced, measured by including such manufacturing inflows utilized with other manufacturing inflows utilized in the paper machine operation.

35. The article of claim 31, further including computer readable program code means for assigning different economic values of manufacturing outflows to specific portions of the paper manufacturing facility's production.

36. The article of claim 31, further including computer readable program code means for correlating the manufacturing cost and operating speed for a paper machine by including usage of manufacturing inflows associated with paper breaks and finished goods of unacceptable quality.

37. The article of claim 36, further including computer readable program code means for assigning the purchase price of manufacturing inflows from lowest to highest per-unit cost, to increasing levels of the paper manufacturing facility's production.

38. The article of claim 31, further including computer readable program code means for correlating the manufacturing cost and operating speed by establishing the correlation between manufacturing costs and operating speed of groups of equipment or processes in a paper manufacturing facility.

39. The article of claim 38, further including computer readable program code means for assigning the manufacturing outflow from highest to lowest per-unit economic value, to increasing levels of the paper manufacturing facility's production.

* * * * *

EXHIBIT B

Close Window

INTERNATIONAL PAPER

News Release

International Paper Chairman Outlines Industry Challenges; Global Consolidation and Improving Shareowner Value Key To Future, Dillon Says

Wednesday, October 04, 2000

Appleton, Wisconsin - The following remarks were delivered by John Dillon, International Paper Chairman and Chief Exectuive Officer, at the Paper Industry International Hall of Fame's Sixth Annual Induction Ceremony in Appleton, Wisconsin, tonight:

Thank you, George, for those kind remarks. It's good to be here this evening among so many friends of the paper industry. [And a special hello to the nearly 50 IP employees who are here.]

I know that many of you had the opportunity to visit the Atlas Mill this afternoon. What a fantastic new home for the Paper Industry International Hall of Fame. There is a lot of good work going on there, and it will be a fitting place to promote understanding and appreciation of the paper industry.

Let me start off tonight by adding my congratulations to the honorees of this 6th annual ceremony. This year's inductees have played an important role in the development of our industry around the world. We're grateful for their leadership, innovation, and commitment to future generations.

We are reminded tonight of our strong and rich heritage - one we can all be proud of. I find it interesting to take a look back and see what's the same and what's different in this industry. Managing our lands and making paper is a lot different now than it was a hundred years ago. And it's certainly different from 35 years ago when I joined International Paper.

Over the course of those years I've had the opportunity to work with all product lines at one time or another, in forestry and manufacturing. It's just a terrific business and one with so many good people. Yes, we have to focus on being profitable and competitive as an industry, but we have to remember to take care of the people we have working beside us day in and day out.

As we look back, it's not hard to see that things are quite a bit different right here in Wisconsin.

Wisconsin has been a leading papermaking state and the backbone of the manufacturing sector for decades. As a result, there is deep concern when we lose household names like Consolidated, Fort Howard, James River, and Scott.

Industry consolidation is very visible in your own backyard. And it's something we're well acquainted with at International Paper, as we continue to work through our integration of Union Camp and Champion International.

While consolidation understandably causes concern, I think we also have to look at why it is happening and what it will accomplish for the long-term health of the industry. There are at least two factors to consider.

First, it centers on the fact that we are now operating within a global marketplace. And if we can't compete globally, or if we can't serve our global customers, we simply can't make it in today's world. As we consolidate and build stronger businesses and companies, we'll be better able to serve our global customers, to compete, and more importantly - to survive, in that global marketplace.

Second, and equally important, is the fact shareholders are forcing consolidation and it is this shareholder concern that I would like to devote a few more minutes to this evening. In fact, it is the shareholder issue which I think is the dominant issue facing the industry today.

As you know, our shareowners are upset with this industry. They've lost confidence in us. We are increasingly viewed as a low priority investment vehicle for their dollars. We are providing unacceptable performance. Our earnings are not only poor - and highly volatile - they aren't meeting the cost of capital.

We have got to make changes. We have got to significantly improve performance. We can't just keep doing the same things we've done in the past. Let me tell you how we at International Paper are making changes in how we do business and in how we think.

Two of the changes we're making are: 1) managing our capacity and 2) moving from a commodity-based company to a customer-focused company.

Let's start with our capacity management. We're changing International Paper from a belief that every machine and facility must be operated at 100% of capacity to managing capacity consistent with our customer demand for products. This means we operate our facilities so we meet our customers' supply needs while avoiding excess production that builds inventory. It means changing the belief that the only way to make more money is to operate flat out. We call this making more money not making more tons.

At IP we believe that our capacity can be managed. It is not something beyond our control. Indeed, International Paper's shareowners have told us there is a price to pay if we ignore the basic supply and demand balance.

For years the paper industry has been viewed as highly cyclical almost as if this were some form of law. The fact is earnings are cyclical not because of fundamental demand, but because we choose to operate beyond customer demand, thereby building inventory and driving down revenue to the point where the lack of profitability causes either temporary or permanent capacity closures. As with consolidation, our shareholders are demanding a different view. And they are saying stop operating beyond your order book and stop adding new capacity because customer growth is not likely to match capacity additions.

One of the other tools for helping to manage capacity we are using is marginal economics. We apply marginal economics to the operation of our facilities to help us run profitably for sustained periods of time at less than full operating rates. Rather than spreading fixed costs across a larger production base, we focus on reducing absolute costs and finding that "sweet spot" of production - that point of production that is most profitable.

For example, in contrast to the "old" thinking, we now know that the "last tons" of paper we produce on a machine cost more money than the average ton produced on the same machine?and usually sell for a lower value. Therefore, simply put, in all but very strong markets we should not be making those last tons. We should be finding the real sweet spot where we make more money not more tons.

By operating in this efficient mode, we can keep the machines operating, meet customer needs, and keep the employees working - all of which is good for our communities, our shareowners, and our bottom line.

As was the case during the summer and this fall, a slow down of machines alone is not enough. In which case, we do have to shut down the machines. We took over 500,000 tons of market-related downtime in the third quarter of this year. Here again, International Paper's focus is to manage our capacity to our customers' demand. Whether it's by downtime or slow downs, at IP, we are committed to running efficiently, yet maintaining our flexibility to respond to our customers' needs.

I'm sure by now you're convinced I'm from another planet or perhaps another industry and you're saying that my company has the low cost production capacity and therefore we have learned that low cost capacity should operate full all the time.

Well, we at International Paper do think about that a little differently. We believe having low cost production units is essential, and in our three core businesses we have the best in the world. However, in times of rapidly declining demand, such as we are experiencing right now, the shareholder driven answer is to match production to customer demand and take the cyclicality out of the earnings stream.

This leads to the second big change we're undergoing at International Paper - moving from a commodity-based company to a customer-focused company. In plain and simple terms, we have to pay better attention to our customers. We have to help them grow and become more successful if we are to be more successful. We can't produce more and more of the same old same old and then be surprised when they don't buy it. We've got to listen to customer needs and then work together to solve our customer's customers business needs.

In fact, it means knowing as much about their business as we know about our own. By doing so, we will not just respond to their needs, we will be able to anticipate their needs and make them more successful.

This is where the opportunity for new product development and deep thinking about every aspect of our customer offering comes into play. At the same time we help our customers grow, we also help create demand for our product. Again as I think about what is the same and what has changed in our business, I wonder if our forefathers didn't do a better job than we are in the areas of product development.

If you think back 40 or 50 years ago, the development of linerboard and milk cartons generated billions of dollars of revenue. The need to develop new products today, as a way to help increase the demand function, is even greater now than it was then.

We have to look at both sides of the supply and demand curve. At IP, we recognize that both sides of the curve - our supply and our demand - can, and indeed must, be managed. We don't have to assume that our business will rise and fall only in concert with general economic indicators. We can impact that demand curve by the way we develop that product or service.

Today, those new products or services may be completely different from anything we've done before. For example, one new venture for International Paper is ForestExpress - a global business-to-business electronic marketplace for the forest products industry. ForestExpress was started this past July by International Paper, Georgia-Pacific and Weyerhaeuser. Mead joined us a few weeks ago.

We plan to debut ForestExpress.com in the fourth quarter of 2000. Initial areas of focus will be building materials, printing and writing papers, recovered fiber, and timber. The goal of the ForestExpress marketplace is to reduce transaction costs, lower total supply chain costs by reaching customers more efficiently. It's an exciting venture that will help our customers and we're looking forward to positive results.

We've talked about capacity management and moving to a more customer-focused company at International Paper. These are two big changes for us, but they're not the only ones. We also are changing the way we look at our public responsibilities. First, because it's the right thing to do. And second, because our constituents and communities are expecting - indeed, demanding - better performance in the environment, and health and safety.

We're responding. For example - when concerns over dioxin was raised in the mid-80s, our industry addressed them by committing to elemental chlorine-free bleaching, and as a consequence ECF mills are no longer generating any measurable dioxin. We've also succeeded in dramatically reducing our overall air and water emissions.

On the safety side, IP is absolutely committed to achieving and sustaining an injury-free workplace. We are proud of what our employees have accomplished. We received the Business Roundtable's 1999 Construction Industry Excellence Award for world-class construction site safety programs and a commitment to an injury-free workplace. And we continue to have the greatest number of business sites in the United States certified by the federal and state Occupational Safety and Health Administration's Voluntary Protection Program. These things are important to us.

But the challenges have, and will, continue. In forestry, the issue of certification is a huge one. Everything we do - all of our actions - must represent the practical understanding that our stakeholders and our customers are demanding better performance. And our response must reflect a deep understanding that we need the public's approval and support to do what we do.

The practice of sustainable forestry is a good example. Sustainable forestry is not only the right thing to do, but this method of managing our lands reflects our commitment as an industry to ensure healthy forests for tomorrow. At IP, we are dedicated to the principles of the Sustainable Forestry Initiative.

As we stay attuned with the public, we must also keep in mind the importance of maintaining a public policy and political presence. Many of our industry's Washington and state offices are closing due to consolidation, and as a consequence, our presence in the public affairs arena is declining. Yet, this is a time of increasing public policy debate, which can have a huge impact on us. It is critical, therefore, to have the strongest position possible, and not let our political voice diminish.

In all of these areas, we not only must do the right thing, we must communicate with the public that we share their values; be it clean air, clean water, healthy forests, or strong communities. Not only do our actions have to match our values, we have to do a better job of talking about them.

To recap, I believe it is critical for our industry to rebuild shareowner confidence. We must take a dynamic approach, and embrace the changes our industry confronts by changing with it.

Our strong heritage as an industry has brought us to where we are today. We have exciting opportunities ahead of us. But - at IP we confronted a choice. We could operate on the basis of the status quo and keep doing things the same way, and ride with history. Or, we could change things at IP. It is clear to me that our only choice is that of change.

Indeed, I believe success requires constant change. We must constantly adjust to the needs of shareholders, customers, employees and communities.

In the end, I believe we and our industry will be stronger - different - but more competitive, more responsive to customers, more efficient, and more profitable. When we come out the other end of the "change tunnel" that we are in, I am absolutely confident we will be a company and an industry where people will want to work, where people will want to invest, and an industry and a company people will want in their communities.

Thank you so much.

EXHIBIT C

VOLUME 76, NUMBER 39
September 23, 2000

CELEBRATING 75 YEARS

Official Board Markets

THE YELLOW SHEET

3M's Box Will Be Well-Traveled

3M's "Box Around the World" will be visiting Sao Paulo, Brazil, Sydney, Australia, Tokyo, Japan, and other cities leading up to Pack Expo International. The promotion will showcase 3M's packaging integrity and global capabilities.

"The Box Around the World gives the far-reaching members of our team a face," says Jim Stake, vice president for 3M's Packaging Systems Division. "3M has operations in 62 countries and manufacturing facilities in more than 40."

Starting at its global headquarters in St. Paul, Minn., the box will be shipped to five of 3M's global subsidiaries. It will contain a digital camera, instructions, and stickers representing each country the box will "visit." At each international stop, the 3M subsidiary contact will take the box to a recognizable tourist destination or landmark and photograph it. The box will then be re-closed and sent to the next destination. The final stop for the box will be Pack Expo 2000, November 5-9 in Chicago. The box and a photo diary of the journey will be displayed at 3M's Pack Expo booth, N-3470.

Inside This Issue

Want Higher Earnings? Slow Down, Says G-P

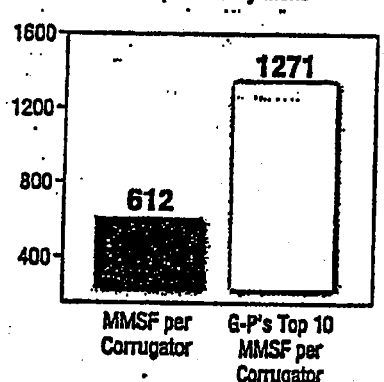
By Mark Arzoumanian
Editor in Chief

Georgia-Pacific has found a low-cost way of running its containerboard mills at a "sweet spot" that's less than full production, says Stephen Macadam, the company's senior vice president for containerboard and packaging. It's all about "slowback," he told 320 attendees at last week's 9th International Containerboard Conference, sponsored by *Pulp & Paper Week*, in Miami.

G-P's Macadam says his company won't need to add new containerboard capacity until at least 2005.

Corrugator Production

Average vs. Top 10
MMSF/corrugator
Up to 52% excess capacity in the industry based on productivity alone



Source: FBA

"Slowback" is running board machines at slower speeds versus taking downtime during times of weak demand.

Before July 1998, G-P ran its board mill machines to demand, using downtime when necessary, just like its competitors would. But that resulted in high costs connected with shutdown and startup cycles, a negative impact on employee morale, and a significant risk of equipment damage.

Starting in July 1998 (and through last December), it ran these machines to demand but used slowback rather than downtime. Trials at its mills in Cedar

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Transacted containerboard prices

Average transacted price levels are tabulated by obtaining paid prices from independent converters purchasing linerboard and medium. All prices are intended as a reference standard only. Transactions may be concluded at any time at any price agreed upon by seller and purchaser. These are delivered prices for week ended previous Tuesday. Price ranges listed are per short ton.

	Northeast	East Central	Southeast/ South Central	North Central	West
42# Fourd. Kraft Linerboard 26# upcharge: $60	445–455	460–470	455–465	460–470	480–490
26# .009 Semichemical Medium	410–420	420–430	430–440	420–430	440–450

Continued from page 1

Springs, Ga., and Monticello, Miss., proved cost savings were po sible. The move was enthusiastically supported by employee and savings were found in unexpected areas, Macadam states.

"Slowback has been very positively received by employees a an alternative to shutdown, but you have to communicate, com municate, communicate," he states. "You also have to allow enoug time for planning. Slowback needs to be pursued as an aggressiv cost-cutting and risk-taking improvement opportunity."

Hashing out Problems

From left, SCA's Renders; Smurfit-Stone's Dages, and moderator Kangas.

A key driver in the containerboard industry has been and will continue to be consolidation, says Pete Dages, vice president and general manager, Smurfit-Stone Container Corp. Along with Rob Jan Renders, president, containerboard, SCA, he participated in a freewheeling conversation about industry problems with Paul Kangas of the Nightly Business Report at the 9th International Containerboard Conference in Miami last week. Dages adds that the industry's current mill system has to be optimized by taking out older operations.

Turning to competition from plastics, both Dages and Renders agree that about 1 percent market share has been lost to plastic crates but stress that the key determining factor in whether or not a box buyer decides to use plastic or corrugated containers is the *total cost* of the solution.

When Kangas brought up the industry's poor stock performance, both executives agreed that over the past 20 years the industry has rarely earned its cost of capital.

"We need to have sustainable earnings, not just for a few years," says Dages. "The market doesn't believe that current earnings will last. Investors look at historical performance, so doing it is the key, not talking about it."

Macadam says the incremental ton has no value. The mill needs to ensure that employees understand it's OK to eliminate costly redundancies like working overtime to finish repairs and running equipment that could be idled.

But he stresses that slowback is no miracle cure. It will fail if there's a lack of commitment from the top to the bottom of the organization.

"Some of the benefits of slowback can remain [after machines start running full tilt again], if the slowback view is retained and mill management makes every effort to reinforce the benefits," he adds.

WHY ADD CAPACITY?—With all this talk about slowing machines down, is it safe to assume that G-P won't soon be adding any greenfield capacity to its operations? Yes. When the impact on other G-P facilities is considered, new greenfield capacity doesn't return its cost of capital, Macadam reports. He adds that his company won't need new board capacity until at least 2005.

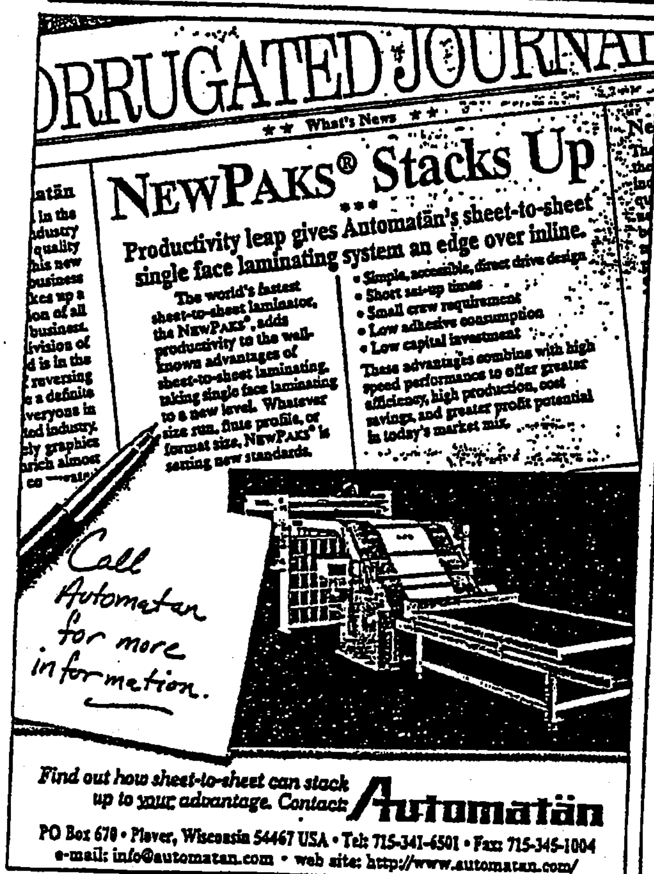
Continued on page 8

OBM STOCK *index*

Key: NYS = New York ASE = American NASD = NASDAQ(s) = Stock split MON = Montreal

Exch.	Company	Ticker Symbol	Close 09/20/00	% Change This Week	% Change This Year	EPS Last 12 Months	P/E Ratio	52 Week High	52 Week Low
NYS	Boise Cascade	BCC	26.63	6.58	34.25	2.98	9	43.93	25.00
NASD	Caraustar Industries (L)	CSAR	11.00	2.22	54.17	1.21	9	25.87	10.31
MON	Cascades Inc. (L)	CAS	7.25	2.68	17.14	1.13	6	10.50	7.10
NYS	Chesapeake Corp.	CSK	21.88	5.41	28.28	11.76	2	35.75	20.18
NYS	Domtar Inc.	DTC	8.69	-5.44	-26.06	1.32	7	14.81	8.25
NYS	Fort James Corp.	FJ	31.19	-3.67	13.93	1.45	22	36.50	16.43
ASE	Gaylord Container (L)	GCR	1.94	-22.50	-71.56	-0.12	—	8.68	1.94
NYS	Georgia-Pacific (L)	GP	24.25	-8.55	-52.22	4.61	5	51.93	24.25
NYS	International Paper	IP	28.88	-8.33	-48.84	1.77	16	60.00	28.31
NYS	Longview Fibre	LFB	11.00	3.30	22.81	0.79	14	17.75	10.62
NYS	Mead Corp. (L)	MEA	22.56	10.20	48.06	2.20	10	45.12	22.56
TOR	Paperboard Industries	PI	1.70	4.94	19.05	0.00		2.70	1.70
NYS	Packaging Corp/Amer.	PKG	11.68	6.40	1.04	0.00		13.18	9.25
NYS	Potlatch Corp. (L)	PCH	30.75	5.75	31.09	0.89	35	45.50	30.56
NYS	Republic Group Inc.	RGC	18.00	0.00	19.01	0.23	78	18.50	7.68
NYS	Rock-Tenn Co.	RKT	10.13	-1.82	-31.36	-0.28	—	16.43	8.37
TOR	Roman Corp.	RMN	1.44	0.00	2.86	0.26	6	1.80	1.00
NYS	Sonoco Products (L)	SON	17.00	-17.07	-25.27	1.85	9	25.56	16.56
NASD	Smurfit-Stone Cont. Corp.	SSCC	11.69	-9.22	-52.30	1.63	7	25.62	10.87
NYS	Temple-Inland (L)	TIN	39.00	5.88	40.85	2.95	13	69.56	38.62
NYS	Westvaco	W	25.81	2.82	20.88	1.97	13	34.75	24.43
NYS	Weyerhaeuser (L)	WY	39.69	6.75	44.73	3.89	10	74.50	39.69
NYS	Willamette Industries (L)	WLL	27.06	7.28	41.72	3.06	9	48.68	26.87

(H) = New annual high reached in period. (L) = New annual low reached in period. *Source:* CNET Investor (investor.cnet.com) This information is based on sources believed to be reliable, and while extensive efforts are made to assure its accuracy, no guarantees can be made. *CNET Investor assumes no liability for any inaccuracies.*



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He took the Boston-based paper forecasting company RISI to task, telling his audience that although it's forecasting new containerboard capacity of 4.8 million tons over the next 5 years, he believes that current capacity is adequate to meet demand growth.

"In our experience, even the most capital-efficient, well-executed greenfield capacity projects have failed to earn their cost of capital," he says. He then proceeded to detail how his own company's Big Island, Va., recycled linerboard machine, which successfully started up in April 1996, might not make a return on the company's $126 million investment for another 10 years or more. OBM

Skills needed to successfully manage a mill change

	Traditional View	Marginal View
Measures	• Average cost for direct materials, energy, chemicals, etc. • Fixed and variable cost/ton • Sales opportunities compared to average cost • Maximizing throughput	• Incremental cost for direct materials, energy, chemicals, etc. • Fixed and variable cost on a total $ basis • Sales opportunities compared to incremental cost • Running to mill optimum cost level
Focus	• Investing capital to "debottleneck" mill • Building inventory if necessary • Pursuing orders to "keep machines full"	• Capital focused on direct and total $ cost reduction • Running to market demand

EXHIBIT D

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targeted acquisitions, expansion in growing markets overseas and an aggressive customer-driven way of doing business.

As evidence of our commitment to our paper, packaging and natural resources businesses, we made acquisitions last year to strengthen our operations and enhance our prospects for greater returns. The most significant of these included the Zellerbach distribution business, the Weston Paper industrial packaging business and OAO Svetogorsk, a Russian pulp and paper manufacturer. Also, Carter Holt Harvey, the largest forest products company in New Zealand and a company in which we own a majority stake, expanded its folding carton and cup operations into Australia, the latter jointly with our U.S. foodservice business.

Reduction of Assets and Capacity

Our actions in the past three years have also pruned businesses that had no fit in our future. The Imaging Products Division and Veratec, our nonwovens business, have been sold. We've also sold non-strategic timberlands on the West Coast and in New York and Pennsylvania. These non-core assets represented nearly 10% of our asset base. And even in our principal businesses, we've closed down significant assets–1.3% of U.S. industry linerboard capacity was closed, and 3% of U.S. industry uncoated papers was closed or reallocated to other product lines.

Financial Performance

In 1998, International Paper's net sales totaled $19.5 billion, down 3% from year-earlier levels. For 1998, net earnings of $236 million, or $.77 per share, included special items that reduced our earnings by $72 million, or $.23 per share. Full-year earnings before special items were $308 million, or $1.00 per share.

While we made progress in improving our return on investment (ROI) last year, our returns are far from satisfactory. We use ROI as the key measurement of financial performance because it focuses attention on the efficient use of capital as well as on earnings. Management incentive compensation is tied to measurable ROI objectives, the most prominent of which is doing better against competition.

Our actions during 1998, and continuing in 1999, are centered on improving our profitability. Many new initiatives have been put in place, and many of the existing ones reinvigorated. Our company accomplished a great deal, although industry conditions severely pressured prices and volumes and offset many of the positive actions we were able to put in place.

Success Drivers

Internally, we are employing three key drivers to raise International Paper's level of profitability. The first is focusing on customers in all that we do, driven by a dedication to providing solutions to our customers and ensuring our products and services help them to become more profitable. The second is operational excellence, continuing to do everything we do–from making paper, to supporting our customers, to how we pay our bills–but doing it even better. Through cost reduction and improved capital efficiency, we reduced our costs by over $300 million in 1998 and expect to do even better in 1999. We are very excited about the realignment of our facilities with specific product segments and customers. We are already starting to see significant benefits in terms of costs and customer responsiveness. For the second consecutive year, we brought capital spending in 1998 below depreciation and amortization levels. The third key driver is the engagement of our employees in the entire process. The people of International Paper are our most valuable resource. They're the ones that originate the most effective ideas for improving productivity, make our facilities safer, preserve the environment and build strong relationships with customers. We are currently implementing a company-wide program designed to build on our "people assets."

Outlook

Things continue to look good in the United States and are starting to look better in many other parts of the world. We are seeing recovery in the Asian markets that will have a positive effect not only in the United States but also on Carter Holt Harvey. There are very low rates of new capacity anticipated in the United States and European markets. There, the supply/demand relationship seems to have begun to equalize. We do, however, anticipate a significant increase in the Asian output of uncoated printing papers, and some of this is likely to be exported to the United States and Europe. But, generally, for most of our other major paper and packaging product lines, the capacity outlook is as favorable as it has been in a generation. We are beginning to see improving market conditions and expect this trend to gain strength as we look to the remainder of 1999, and into the year 2000 and beyond.

In addition to the Union Camp merger, International Paper has a number of substantial internal initiatives under way that will result in a major improvement in our performance.

- We are building on our success with coordinated selling to customers, previously served by separate International Paper units.
- We are developing a broad array of new and improved products to meet the technologically advanced equipment and printing processes of the 21st century.
- We expect that the well-known HammerMill® brand name will be positioned in the expanding retail market in entirely new ways that will benefit that growing consumer base.
- We will keep our capital spending below depreciation and amortization levels and expect it to be under $1 billion this year. Our projects are centered on cost savings, productivity and product quality efforts as well as on meeting our environmental standards.
- We will continue to manage our capacity so as to keep our production in balance with our customers' requirements. Using more precise unit cost and revenue data, we have learned how to reduce production without adversely impacting our cost structure.