

## Semiannual Patents Review January—June 2000

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### KEYWORDS

Chemical, Deinking, Enzyme, Patent, Recycling, Review, Stickies, Waste paper

### INTRODUCTION

This review summarizes patents related to paper recycling that were issued during the first six months of 2000. Two on-line databases, Claims/U.S. Patents Abstracts and Derwent World Patents Index, were searched for this review. This semiannual feature is intended to inform readers about recent developments in equipment design, chemicals and process technology for recycling paper, and alternative products derived from post consumer paper. Only brief summaries of individual inventions comprise this review. For more complete information, readers will need to access the full text of a specific patent.

The patents are organized into the following broad categories of recycling: equipment and their related processes, chemicals and related processes, products made from recycled paper, and environmentally sound processing.

### EQUIPMENT-PROCESSES

#### Flotation

Increased flotation efficiency achieved by the use of a pressurized deinking module is described in a

recent US patent. Recycled pulp containing surfactant and foaming agents is injected into a pressurized container equipped with three outlets located along the top of the container and separated by baffles. Foam and waste ink are vented from the first and second outlets; stock passing through the third outlet is recycled through the container (1).

Voith Sulzer's recent patent uses more and larger gas bubbles to improve the efficiency of ink and stickie contaminant removal. Additional bubbles are fed into the pulp suspension at a different entry point than in conventional flotation, permitting the use of a higher pulp suspension density. Lower energy consumption is also claimed (2).

#### Screening

A novel screening apparatus with multiple screening passages between inflow and outflow sides of the screening plate is the topic of a recent world patent. The plate design permits a more effective filtering capacity of fiber slurries within the screen cylinder (3).

Another patent covers a door seal for a pressure screen or gravity screen separation chamber. Water-tight sealing of chamber doors on screen assemblies is made possible without adhesives and results in long lasting, efficient seals on screens used in pulp and paper processing (4).

#### Washing

Ink removal is accomplished in a vertical washing machine featuring a shaft with stirring blade and screw for water conveyance within a porous rotating drum. The drum and shaft rotate in opposite directions permitting roll-over washing of concentrated stock. The claimed advantages of this appa-

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ratus are reduced chemical requirements and the possibility for a continuous operation (5).

### **OCC Processing**

A mill survey has identified wax as a major problem in recycling mills. A recent U.S. patent addresses this problem by offering a method to minimize wax released during the recycling of old corrugated containers (OCC) and waxed paper products. Wax is melted and emulsified by repulping at elevated temperature and subsequently the pulp fraction is separated by filtration through a finely perforated reverse pressure screen (6).

Another method for recycling corrugated containers has been developed by researchers at the Korean Research Institute of Chemical Technology. This patent targets fines removal for maintaining recycled pulp strength. The OCC is kneaded and floated to remove fines and ink contaminants from the fiber. Removal of fines enhances both the drainage and strength properties of the pulp, making it an excellent substitute for virgin fiber required for making corrugated containers (7).

One of the more "creative" patents reviewed was awarded to Oji Paper Co. for a Braille printing method for paper cartons. A recessed Braille stamp replaces conventional printing. The advantage claimed is that since no thermoplastic resin is used, the cartons are totally recyclable (8).

### **Other Processes**

A method and apparatus for recycling winding cores from paper rolls is featured in a U.S. patent. Metal tips are removed from core ends and crimped end portions are trimmed and formed into male/female joints to enable reconnection of core segments. A liner board web is glued over the reassembled compressed core (9).

Specialized equipment for bulk reduction and extrusion of waste materials including waste paper for producing a solid fuel is described in a Japanese patent (10). The design combines milling, compression and extrusion and claims reduced power consumption due to increased emission area and corresponding increased throughput.

A macro-separation of discarded liquid carton material from unsorted materials including plastics and metals is accomplished by slushing the material to recover the fibrous content. The process, covered by a world patent, involves cleaning the

fiber suspension for use in board or paper. Metal, primarily aluminum, also can be separated and reclaimed by gasification of the plastic material contained in the rejects (11).

A Canadian patent describes a process for separating fiber from aluminum foil paper. The method involves immersing the paper in an aqueous medium to which three chemicals are added. Both fiber and foil can be reclaimed (12).

A do-it-yourself paper recycling machine featuring a porous tumbling barrel, screen board, water source, motor and drive shaft designed for recycling paper within homes and offices has been patented (13). Mixed paper is deinked by the washing and tumbling action in the barrel. A mat of cleaned fiber adhering to the screen board is peeled off after drying for reuse as paper towels or dust cloths.

The processing of used paper containing a high level of mechanical fibers into fiber appropriate for producing high quality paper is outlined in Voith Sulzer's patent. The procedure fractionates the pulp and the wood-containing fraction is heated, dispersed, and kneaded with the addition of chemicals to delignify the pulp. The process minimizes both chemical and water consumption (14).

A novel packaging system (15) comprises a film and pocket-like sheet attached to a base sheet that can be separated from each other after use to facilitate recycling.

## **PROCESSES/CHEMICALS**

### **Deinking**

High brightness recycled fiber is claimed in a novel deinking process patent assigned to the Kao Corp, JP in which one or more proprietary deinking chemicals are employed during paper processing. Foaming is minimized, ink detachment optimized, and cost reduced by its application in deinking (16).

Several patents were cited for chemicals to facilitate deinking of newspapers, magazines and office papers. In one patent the method for forming the deinking chemical containing a higher secondary alcoholic alkoxyate is described (17). The other process and deinking chemical is based on an alkyl cyclohexanol alkylene oxide used for flotation. This flotation aid also can be applied to other printing systems, including offset printing and photogravure (18).

A multi-purpose polyoxyalkylene polyol used as a surfactant or deinking agent is described in a patent assigned to Mitsui Chem Inc. Made by polymerizing an epoxide compound with an initiator, the polyoxyalkylene polyol is transparent and colorless. Applications other than its use in recycling include lubricants, coating materials, sealants, adhesives, and raw material for semi-hard polyurethane foam (19).

Another patent was granted for a deinking method and chemical suitable for paper printed with non-impact ink. Printed paper is washed with a cleaning solution, such as sodium stearate, and a surfactant for ink removal (20).

Perhaps the ultimate in recyclability is removing printed images from paper so that it can be reused. Toshiba is the assignee of an image erasing apparatus used to reclaim paper in printers and copy machines. Paper is printed with ink containing colored toners, an erasing agent, and resin binder. For removal, the printed paper is passed through a heating roller at a temperature higher than the melting point of the erasure agent to destroy the image, followed by immersion in a solvent with additional erasure material. The solvent is removed by passing the paper through the heating roller (21).

Either indoor or outdoor signboards can be reused when a newly patented removable ink is used for printing (22). The water-soluble ink emulsion contains a vinyl acetate resin, acrylic resin, surfactant, colorant, and a synthetic rubber-based binder. The printed ink is glossy and can readily be peeled off the board for reuse. Paperboard is conserved without use of solvents.

A comprehensive separation and recovery of laminate materials from food packaging containers is described in a Japanese patent (23). Thermoplastic resin, paper and aluminum-foil are individually reclaimed during a short process involving heating the laminates in a solvent. The recovered materials are collected without impurities; the required solvent also can be recycled.

### **Bleaching**

A novel twist on stabilizing peroxide bleaching of mixed recycled paper appears in a patent assigned to National Silicates Ltd. When a high level of a magnesium compound is added to the sodium silicate, it dissociates to form a higher percentage of high molecular weight silicates. High molecular

weight silicates adsorb transition metal impurities responsible for decomposing hydrogen peroxide. An independent claim for brightening pulp involves pressurizing the pulp (containing stabilized peroxide) with oxygen and heating the mixture to degrade a portion of lignin contained in the recycled fiber (24).

### **Process Water**

Nalco Chemical Co has developed a method for clarifying ink-laden water produced during recycling paper. The hydrophilic dispersion chemical used for clarification is a copolymer of an ammonium halide cationic monomer and an acrylamide polymer. Following dosing with the polymer, a floc is formed containing ink and other impurities that are then removed from the process water by dissolved air flotation (25).

A European patent has been awarded for a process to remove stickies and micro-stickies from recycled fiber contained in pulp slurries (26). Hydrophobic natural or synthetic mineral material is added to pulp slurries before or during flotation to adsorb micro-stickies and remove them in the foam rejects. Additional hydrophobic material can be added to flotation accepts to adsorb remaining stickies.

Sunds Defibrator's patented process (27) involves recovering usable fiber from contaminated process water in pulp mills. The fiber fraction is separated from other particles by screening and redirecting the flow of process water resulting in efficient reclamation of valuable fiber.

Closed mills where white water is recirculated with only minimal fresh water introduced are a challenge to the papermaker. A combined drainage and retention agent comprising a cationic organic polymer and anionic microparticulate material is suggested as a remedy in a patent assigned to Akzo Nobel and EKA Chem. (28). A low dosage of this additive permits the paper machine to run faster and more economically even in situations where extensive recirculation of white water is used.

### **PSAs/ Release Liners**

Several new patents for pressure sensitive adhesives (psa) were cited in the new issues of 2000. One formulation, a copolymer of methacrylate and acrylic polymers, is used on labels or tape. This psa is water soluble or redispersible facilitating recycling (29). Another citation is for an aqueous vinyl acetate/ethylene pressure sensitive adhesive

for repositionable notes. Recently awarded a European patent assigned to Air Products Polymers, this adhesive also is appropriate for use on paper labels, decals, and laminating polymeric films. Enhanced thermal storage as well as superior adhesion is claimed (30).

Oji Paper Co is the assignee of a patent (31) for the adhesion sheet for stamps. The sheet has an ethylene carboxylic acid monomer-containing co-polymer that disaggregates in water. Neither the adhesive nor disaggregation properties of the binder deteriorate even in the presence of calcium carbonate.

Related Japanese patents (32, 33) disclose methods for producing recyclable release liners used for pressure sensitive adhesives for labels, tapes or sheets. Proprietary polyvinyl alcohol based resins and either polyalkylene glycol or a polyalkylene-based ether are coated on base paper. The coatings provide both a good barrier and good releasability. The coated liner is easily dissolved with water during recycling, permitting fiber recovery.

A recyclable base paper for release liners used for labels and tapes involves coating the surface of the base paper with an aqueous polyvinyl alcohol solution. The coating is applied using a gate roll coating system that smoothes the surface of the base paper and contributes high barrier properties (34).

A release paper used for backing adhesive labels is made with an undercoat containing an aqueous dispersing agent and pigment. The undercoat, applied on a base paper with a removal layer, has excellent solvent barrier properties, peelability and stability. The dispersing agent contains a methacrylate monomer and copolymerized vinyl monomer (35).

Printing paper with a non-sticking barrier layer contacted to the paper surface at a predefined contact angle has been designed to facilitate ink removal. Deinking is accomplished rapidly and requires a lower chemical dosage (36).

A hot melt adhesive with controllable water solubility is described in a U.S. patent. The adhesive is based on polyalkyleneimine copolymers for paper products. By varying the amount of copolymer or the chain structure, an adhesive can be formulated to modify the degree of solubility, permitting adequate adhesive bond strength during normal use but which solubilizes during recycling (37).

## **Other Chemicals/Processes**

Vinings Industries has developed a method for enhancing the anti-skid or friction properties of a cellulosic fiber by introducing anionic colloidal silica to a fiber slurry in either the headbox or stuff box. This patent also covers products that can be produced by this invention (38).

A process for disinfecting post-consumer paper materials for recycling is described in a European patent (39). Contaminated material is compressed, degassed, and steamed to loosen fibers. Hydrogen peroxide is mixed into the pulp followed by kneading or dispersion. The system effectively disinfects post-consumer paper.

Researchers at the Korea Research Institute Chem Technology have developed a process for changing the microscopic structure of cellulosic material by a combination of chemical pretreatment, drying, and repeated steam explosion (40). The process can be used to upgrade wood pulp waste, paper, and other cellulose-containing agricultural materials. The invention alters the morphology of the materials to improve processability and affinity for chemical treatments without loss of molecular weight.

A process for producing a multistage impregnated/coated paper useful for corrugated boards is described in a patent assigned to Toppan Printing Co. Ltd (41). A silane coupling agent used in concert with other chemicals produces a paper product with water repellency, friction resistance and enhanced strength. The silane coating solubilizes during alkaline repulping facilitating fiber recovery.

## **RECYCLED PRODUCTS**

### **Paper Products**

Soft, bulky absorbent paper exhibiting good strength properties is made from a combination of CTMP, 20% high-temperature CTMP, and approximately 10% recycled fiber. These components form a pulp with a bulk of at least 5.5 cm<sup>3</sup>/g, with the HT-CTMP contributing absorption and liquid-dispersion properties (42). Another use for recycled paper and the process for making it is described in a patent assigned to Fort James Corp. Single-ply bathroom tissue with low sidedness, high softness and strength is the result of blending appropriate pulps with recycled fiber and adding strength additives and softeners during manufacture (43).

High quality newsprint can be prepared economically by adding a pre-flocculated filler to a pulp slurry containing at least 30% low-grade pulp selected from groundwood pulp and recycled pulp mixtures to form a paper web. A flocculated filler, such as calcium carbonate, reduces sheet bulk and increases porosity compared with the conventional non-flocculated addition of filler (44).

Used paper, adhesive and a coloring agent are combined to product a multi-purpose sheet for floor or wall surfaces in a Japanese patent (45). The wall/floor covering is effective recycling of used paper that can be prepared in a short time and which displays excellent adhesion to surfaces on which it is applied.

Oji Paper Co. incorporates used paper pulp in back layers of laminated white board packaging with excellent printability (46). The recycled fiber has a degree of water retention that complies with JAPAN TAPPI No. 26-78. Because a high percentage of the selected recycled fiber has an average length of 0.5 mm or more, no chemicals are required to meet strength standards for the container.

### **Non-Paper Products**

Several patents cited claim recyclability of packaging materials, containers, and corrugated paper-board pallets. A lightweight, force-resisting corrugated assembly is described in one patent (47). Uniform segments can be stacked together and shipped inexpensively as compact units that are assembled on site and secured by die-cut locking slots to create pallets or dunnage supports.

Waste paper and plastics are the main raw materials for concrete forms for architectural construction in a Japanese patent (48). The paper and plastic components are mixed and melted together to form a strong, water-resistant resin sheet that can be shaped appropriately for concrete building forms.

A method for producing activated carbon from urban waste has been awarded a world patent (49). Waste, including paper and packaging materials, wood, glass and metal, is dried under anaerobic conditions above 100°C, pyrolyzed, granulated and ultimately carbonized under anaerobic conditions. Carbonized material is purified by an acidic rinse and dried to obtain activated carbon.

A unique application of used paper is as a heat insulating material for molten metal. When mixed

with waste plastic and other non-combustible waste material, this waste paper composite serves as an additive in molten metal to prevent heat dissipation from the metal surface. The strength of the insulating metal is improved, waste material is efficiently used, and energy consumption is minimized (50).

Lightweight concrete blocks can be made with compressed recycled paper. Useful as building partitions, decorative bricks or as sub-flooring, these blocks have excellent insulating properties against heat and sound and can be attached to surfaces with conventional adhesives (51).

### **ENVIRONMENTAL PROCESSES/PRODUCTS**

A world patent (52) assigned to Novo Nordisk Biochem North America is innovative in its duplicity of function: enzymatically deinking and decolorizing printed paper. An integrated system uses a cellulase-based enzyme preparation to dislodge ink from the pulped slurry followed by decolorizing dyed fibers with lactase and an appropriate mediator in the presence of oxygen. The method is environmentally sound due to reduced chemical requirement and can be retrofitted into a process already used in the industry using conventional deinking equipment.

An enzyme exhibiting cellulolytic (endoglucanase) activity at alkaline pH isolated from the *acremonium* species has been patented both for its application in improving pulp drainage and for deinking recycled paper (53). Methods for producing the enzyme and a DNA construct encoding the enzyme as well as applications for stone-washing denim and for use as a laundry detergent are also covered by Novo Nordisk DK.

Recycled pulp obtained from used absorption products is converted into a plant growing medium in a European patent. Reclaimed fiber is mixed with clay granules, sand and compost to create a moisture-retaining medium useful for home or commercial gardening. Most importantly, it diverts a large source of material from landfill (54).

A unique approach to recycling paper is featured in the patent awarded to Kenneth Watkins. A multi-ply paper web is made using post-consumer newsprint or office paper as the base sheet and an upper or lower ply is bonded to the intact printed paper. The outer ply covers the printing resulting in paper suitable for writing or packaging grades. Because the base ply is not repulped, water and

energy are conserved. The upper and lower plies can be dry formed saving more water and eliminating effluent (55).

A zero liquid discharge papermaking process using recycled paper is proposed in Hoffman Environmental Systems' patent. Slurried pulp is subjected to a washing process that separates solid contaminants from the cellulosic fiber. Dissolved solids subsequently can be removed from the cleaned pulp and reduced to solid material by evaporation; condensate from the evaporation is recirculated into the cleaning process (56).

## **ANALYTICAL METHOD**

A novel method for detecting and identifying contaminants contained within a sample uses infrared radiation (57). Samples are scanned and analyzed at two temperatures and the infrared radiation measured at each temperature. The difference between the two measurements is compared with the difference obtained from a reference material containing a known substance. The contaminant can be identified based on this temperature difference. The method is suitable for detecting the presence of stickies or toners in recycled paper. The patent claims the method is more efficient than conventional methods for measuring contaminants and can be applied to the identification of other contaminants (57).

## **PATENTS CITED**

1. Hebert, R.; McKenzie, M. Pressurized deinking module with vent line. Assigned to Beloit Technologies Inc. US 6073774 (June 13, 2000).
2. Gommel, A.; Kemper, M. Flotation for cleaning fiber suspension of used paper for recycling uses. Assigned to Voith Sulzer Papiertechnik Patent GMBH. DE 19831530 (March 30, 2000).
3. Lutz, M.S.; Purton, D.G.; Soik, M.R. Screen media for use in pulp slurry in screening apparatus. Assigned to J&L Fiber Services Inc. WO 9961697 (Dec.2, 1999).
4. Franko, A.; Greenwell, K.E.; Willmeth, D.; Door seal for a pressure screen or gravity screen separation chamber. Assigned to Fluid Quip Inc. WO 9963194 (Dec. 9, 1999).
5. Daisen KK (Assignee). Vertical concentrated washing machine for ink removal of printed paper. JP 2000064186 (Feb. 29, 2000).
6. Locke, R.E.; Prentice, G.N.; Vitori, C.M. Reducing wax content and enhancing quality of recycled pulp from OCC and waste paper. Assigned to Inland Paperboard and Packaging Inc.; Thermal Black Clawson. US 6053439 (April 25, 2000).
7. Ji, K.R. et al. Method for recycling old corrugated containers. Assigned to Korea Research Institute of Chem Technology. EP 967321 (Dec.29, 1999).
8. Oji Paper Co. (Assignee). Braille printing method for paper carton. JP 11301090 (Nov. 2, 1999).
9. Lynch, G.M.; Ostroff, S. Method and apparatus for recycling cores. Assigned to CSI Core Specialties Inc. CA. US 6051092 (April 18, 2000).
10. Kurimoto Iron Works Ltd. (Assignee). Biaxial extruder for bulk reduction of wastes. JP 11342497 (Dec. 14, 1999).
11. Harkki, P. et al. Recycling of liquid carton waste material or other similar waste material. Assigned to Corenso United Ltd OY. WO 200009771 (Feb. 24, 2000).
12. Lin L. Extracting paper pulp and aluminium foil paper from waste aluminium foil paper. CN 1219627 (June 16, 1999).
13. Mihara Ryoju Eng KK (Assignee). Waste paper recycling machine for making. JP 2000017591 (Jan. 18, 2000).
14. Pfalzer, L. Processing used paper takes a fraction with a high wood content through water extraction. Assigned to Voith Sulzer Stoffaufbereitung, DE 19827188 (Feb 24, 2000).
15. Jones, W.C. Recyclable article packaging system. Assigned to Emerging Tech Trust. US 6073761 (June 13, 2000).
16. Ishibashi, Y.; Sawai, M. Method for deinking. Assigned to Kao Corp JP. US 6077389 (June 20, 2000).
17. Nippon Shokubai Co. Ltd. (Assignee). Ink removing agent for regeneration of newspaper, magazine, and papers. JP 11323754 (Nov. 26, 1999).
18. Mitsui Chem Inc. (Assignee). Deinking agent for recycling waste paper. JP 11323753 (Nov. 26, 1999).

19. Mitsui Chem Inc. (Assignee). Manufacture of polyoxyalkylene polyol used as surfactant, deinking agent. JP 2000038443 (Feb. 8, 2000).
20. Bhatia, S. Method for deinking paper which contains non-impact ink. Assigned to Imagex Technologies Inc. US 6022423 (Feb.8, 2000).
21. Toshiba KK (Assignee). Image erasing apparatus in printer, copier. JP 11316527 (Nov. 16, 1999).
22. Koyo Kasei KK (Assignee). Removable ink for felt pen used to produce signboard(s). JP 2000063717 (Feb.29, 2000).
23. Yoshida Seibutsu Kenkyusho KK (Assignee). Recovery of laminate material of empty foodstuff packaging container. JP 2000037673 (Feb.8, 2000).
24. Evans, T.D.; Francis, R.C. Peroxide, oxygen, or peroxide/oxygen brightening of chemical and mixed waste pulps for use in papermaking. WO 9960201 (Nov. 25, 1999).
25. Tubergen, K.R.; Wong Shing, J.B. Hydrophilic dispersion polymers of diallyldimethyl ammonium chloride and acrylamide for the clarification of deinking process waters. Assigned to Nalco Chemical Co. US 6019904 (Feb.1, 2000).
26. Pohlen, A. Separation and removal of stickies from pulp containing used paper for recycling. Assigned to Dullinger, H.; Kern, G. and others. EP 989229 (March 29, 2000).
27. Fredriksson, B. Separation of a fiber fraction by screening. Assigned to Sunds Defibrator Ind. WO 200012811 (March 9, 2000).
28. Haellstroem, H.; Sikkar, R.; Struck, O. Production of paper, with improved drainage and retention effects. Assigned to Akzo Nobel NV; Eka Chem AB. WO 9955962 (Nov. 4, 1999).
29. Lintec Corp (Assignee). Water soluble or water redispersible psa. JP 11323292 (Nov. 26, 1999).
30. Bott, R.H. and others. Pressure sensitive adhesive for repositionable notes... Assigned to Air Products Polymers LP; Air Prod & Chem Inc. EP 990688 (April 5, 2000)
31. Oji Paper Co. (Assignee). Adhesion sheet for stamps. JP 2000044900 (Feb.15, 2000).
32. Nippon Synthetic Chem Ind Co. Separate paper coated with resin...used for pressure and thermosensitive adhesive labels. JP 11323795 (Nov. 26, 1999).
33. Nippon Synthetic Chem Ind. Co. (Assignee). Separate paper used in pressure sensitive adhesive labels. JP 11323791 (Nov. 26, 2000).
34. Oji Paper Co. (Assignee). Manufacture of base material for releasing papers used for adhesive label, seal and adhesive tape. JP 11290777 (Oct. 26, 1999).
35. Oji Paper Co. (Assignee). Adhesive tape release paper used for packing adhesion label. JP 11291407 (Oct. 26, 1999).
36. Nippon Seishi KK (Assignee). Printing paper with non-sticking barrier layer. JP 11286893 (Oct. 19, 1999).
37. Wang, B. Hot melt adhesive having controllable water solubility. Assigned to Ato-Findley Inc. US 6034168 (March 7, 2000).
38. Tilkirson, E. Method for enhancing the anti-skid or friction properties of a cellulosic fiber. Assigned to Vinings Industries, Inc. US 6074530 (June 13, 2000).
39. Dockal-Baur, J.; Holik, H.; Selder, H. Disinfection of used paper materials. Assigned to Voith Sulzer Papiertechnik Patent GMBH. EP 990733 (April 5, 2000).
40. Kim, Y.C. et al. Changing microscopic structure of cellulosic materials. Assigned to Korea Res Inst Chem Techonology. WO 200015668 (March 23, 2000).
41. Toppan Printing Co. LTD. (Assignee). Multi-stage impregnated/coated paper and its production. JP 11315496 (Nov. 16, 1999).
42. Nordqvist, B.; Wallenius, H. Bulky absorbant paper containing CTMP ...or recycled fiber. Assigned to SCA Hygiene Paper AB SE. US 6068764 (May 30, 2000).
43. Awofeso, A. and others. Soft single-ply tissue. Assigned to Fort James Corp. US 6051104 (April 18, 2000).
44. Harvey, R.D.; Mabee, S.W. Preparing paper web for paper manufacture comprises adding preflocculated filler to pulp slurry. Assigned to

Grain Processing Corp. EP 994216 (April 19, 2000).

45. Taktani M (Assignee). Multipurpose sheet for affixing to floor or wall surfaces. JP 2000032855 (Feb. 2, 2000).

46. Oji Paper Co. (Assignee). White board with excellent printability used for packaging. JP 11323768 (Nov. 26, 1999).

47. Ogilvie, M.O. Jr.; Olvey, M.W.; Whatley, P.M. Force resisting corrugated assembly. US 6029582 (Feb.29, 2000).

48. Konishi, M. (Assignee) Concrete form work compound for earthwork, architectural construction. JP 2000027431 (Jan. 25, 2000).

49. Berman Y. Preparation of activated carbon from urban wastes of food, paper products and packaging plastic products, wood... and metal. Assigned to Berman, Y. and Katz, R. WO 200000429 (Jan. 6, 2000).

50. Seki Shoten KK (Assignee). Heat insulating material for molten metal – is obtained from used paper. JP 3004270 (Jan. 31, 2000).

51. Muramoto, M. (Assignee). Lightweight concrete blocks manufacture method. JP 11292583 (Oct. 26, 1999).

52. Franks, N.E. Deinking and decolorizing printed paper. Assigned to Novo Nordisk Biochem North America. WO 200015899 (March 23, 2000).

53. Anderson, L.N. et al. Enzyme preparation with endoglucanase activity. Assigned to Novo Nordisk A/S DK. US 6071735 (June 6, 2000).

54. Odekerken GCMN. Wood pulp used as plant growing medium. NL 1008483 (Sept.7, 1999).

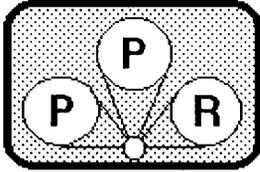
55. Watkins, K.S. Jr. Paper web and process for making the same. US 6030497 (Feb. 29, 2000).

56. Hoffman, R.P. Method of papermaking having zero liquid discharge. Assigned to Hoffman Environmental Systems Inc. US 6071380 (June 6, 2000).

57. Forester, W.K.; Lobbes, T.J. Method of identifying a substance by infrared imaging. Assigned to Western Michigan University Board of Trustees. US 6062726 (May 16, 2000). ■

#### Key to Abbreviations

CN = Canadian patent  
DE = German patent  
EP = European patent  
FR = French patent  
JP = Japanese patent  
US = United States patent  
WO = World patent



# PROGRESS IN PAPER RECYCLING

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## Other Publications Available

### **Progress in Paper Recycling:**

- *2000-2001 Directory of Recycled Pulp & Paper Mills*
- *Management & Control of Wax and Stickies*
- *Paper Recycling Challenge:*
  - ▶ *Volume I, Stickies (out of print)*
  - ▶ *Volume II, Deinking & Bleaching*
  - ▶ *Volume III, Process Technology*
  - ▶ *Volume IV Process Control & Mensuration*

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## *Coming in Future Issues*

- Track stickies in a papermill
- Toner agglomeration
- Semiannual conference review
- Benchmark of deinking performance

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## *Cover Design*

Cover depicts celebration of our Anniversary, as well as a New Year and a New Millennium. Enjoy!! Have a champagne and take time to smell the roses. Of course, do not forget to recycle whenever you can.

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