CLAIMS

1. A process for recycling by separating the constituents of aluminized, plastified and cartoned packaging comprising:

A. Step A: Separation of cellulose from cartoned, aluminized and plastified (ECAP) packaging, in the following sequence:

A.a Shredding of the packages resulting in crushed dirty shreds (RTS);

A.b Washing of the dirty shreds (RTS) with vigorous agitation in water at room temperature and retention of the shreds, separating the water with dirt, which after closed-loop recirculation undergoes filtration and removal of dirt (SRF), returning the recovered water (ARE) for re-use in the washing, and the clean shreds (RTL) with polymeric composition rich in polymer/aluminum, are removed and led to the disaggregation step;

A.c Disaggregation of the shreds (RTL) by shear action obtaining paper pulp which, as the shaking occurs, disintegrate and the cellulose fibers of smaller size and density than the resulting residue, aided further by the vortex formed by the shaking, pass through the screen where they lose speed resulting in a concentrated residue of polymeric composition rich in polymer/aluminum (RPA), substantially free of cellulose, which is directed to the A.d drying step and the cellulose pulp suspension (PC) passing to the outer side of the screen, decants and is removed from the process and is directed to step A.e;

A.d The residue of polymeric composition rich in polymer/aluminum (RPA) goes to the stage of drying, either indirectly by slightly superheated steam or by saturated steam, or directly by hot air or combustion flue gases and once dried, the residue of polymeric composition rich in polymer/aluminum (RPA) goes to the separation and isolation of aluminum and polymer in step B;

A.e Filtration of the cellulose pulp suspension (PC), where the cellulose pulp (PC) is drained and directed to step A.f and the filtrate, which is cellulose-free filtered water (AFIC), returns to step A.c, constantly recirculating and feeding the disaggregation; And

A.f The cellulose pulp (PC) undergoes partial drying to yield dry cellulose (CES) or is led directly to the step of the production of sheets of paper (FPA) or bleached cellulose (CEB); and

B. Step B: Separation and isolation of aluminum and polymer contained in the residue of the polymeric composition rich in polymer/aluminum (RPA), with the following sequence:

B.a. Dissolution of the residue of polymeric composition rich in polymer/aluminum (RPA) in a solubilizing solvent (SOLV) of the alkanes family of low to medium boiling point in liquid state independently of its boiling point, associated with stirring or movement, operating at 100 to 105° C., below the softening temperature of the polymer, at atmospheric pressure or at pressure higher than atmospheric pressure when the solvent has low boiling point, with concentration of the polymer in the solution during its residence time starting from 2 seconds, with drainage of the polymer-rich concentrated solution (SPC) which is directed to step B.d. and separating the aluminum sheets impregnated with polymer and solvent (FAIP);

B.b. Washing of impregnated aluminum sheets (FAIP) with dissolving solvent (SOLV) and concomitant drainage for removal of the polymer-rich concentrated solution (SPC) that is directed to the step B.d. and separating the aluminum sheets impregnated with solvent (FATS);

B.c. Washing of the aluminum sheets (FATS) with washing solvent (SL) chosen from low-boiling point alkanes among others the dissolving solvent itself (SOLV), with drainage to remove the polymer-rich concentrated solution (SPC) to the step B.d. and with final separation of the aluminum foil (FA) by drying and evaporation and subsequent condensation of the solvent, which returns as the hot recovered dissolving solvent (SOLVQ) to the dissolution process, step B.a.;

B.d. Separation of the solvent from the polymer is obtained by cooling the solution to 50 to 70° C. and separating the polymer from the polymer-rich concentrated solution (SPC) by hot filtration under pressure of 1.0 to 10 bar, with the concentrated polymer in slurry form (PFP) going to raise the concentration of the slurry through further filtration, step B.e. and the hot recovered dissolving solvent (SOLVQ) going to further dissolution stage, step B.a.;

B.e. Filtration with washing of the slurry (PFP) under pressure, where most of the residual solvent of the hot recovered dissolving solvent (SOLVQ) is exhaust and returns to the process of dissolution, step B.a. and the resulting cake, with characteristic of a crumbled wet powder impregnated with dissolution solvent;

B.f. If the washing solvent (SL) is not the same as the dissolving solvent, the cake is washed with a small volume of washing solvent (SL), chosen from low boiling alkanes, or 96° GL ethanol which will remove large part of the solvent impregnated in the cake, obtaining the blend of solvents (MDS) and the wet polymer powder (PPU) goes to step B.i.,

B.g. Separation of the small volume of blend of solvents (MDS) by distillation with return of the hot recovered dissolving solvent (SOLVQ) from the bottom of the distillation column for a new dissolution, step B.a., the recovered washing solvent (SLR) from the top of the distillation column returns to a new washing;

B.h. If the dissolving solvent has a low boiling temperature, the impregnated cake is already the wet polymer powder (PPU) with no trace of high boiling solvent;

B.i. The wet polymer powder (PPU) is dried and the final dry polymer powder (PPS) product is obtained and the residual solvent vapors are condensed and the hot recovered dissolving solvent (SOLVQ) is returned to a new dissolution, step B.a.

2. The process according to claim **1**, wherein the dissolving solvent (SOLV) has a boiling point preferably above 60° C.

3. The process according to claim **1**, wherein the dissolving solvent is hexane.

4. The process according to claim **1** wherein the dissolving solvent is kerosene or mineral oil.

5. The process according to claim **1**, wherein the dissolution occurs at a temperature from 100 to 105° C.

6. The process according to claim **1**, wherein the washing solvent (SL) is hexane.

7. The process according to claim **1**, wherein the washing solvent (SL) is ethanol 96° GL.

8. An operation process, in order to carry out the step B, contained on the claim **1**, wherein the following equipment:

E.B.a. Dissolution of the Residue of polymeric composition rich in aluminum/polymer (RPA) in an equipment having an inclined trough (CAI) in the form of a ladder with curved lower surface, where the residue (RPA) is fed at the top, in the flow through the trough, total dissolution of the polymer occurs and at the end of the trough the suspension of aluminum in polymer solution falls on a screening conveyor belt (CTL) where the drained solution initially recirculates through the pump of polymer-rich concentrated solution (BSPC) and through the filter of polymer-rich concentrated solution (FSPC) and at the end draining the polymer-rich concentrated solution (SPC) which is directed to step E.B.d. and separating the aluminum sheets impregnated with polymer and solvent (FAIP);

E.B.b. Washing of the impregnated aluminum sheets (FAIP) on the continuation of the screening conveyor belt (CTL) with a spray of dissolving solvent (SOLV) and concomitant draining of the polymer-rich concentrated solution (SPC) initially by gravity and then by vacuum through the vacuum chamber (CAV) which is directed to the step E.B.d. and separating the aluminum sheets impregnated with solvent (FAIS);

E.B.c. Washing of the aluminum sheets (FAIS) in the continuation of the screening conveyor belt (CTL) with the spray of washing solvent (SL) with draining of the polymer-rich concentrated solution (SPC) initially by gravity and then by vacuum through the vacuum chamber (CAV) which is directed to step E.B.d. and separating the aluminum sheets (FA) which are dried in the lower dryer (SEI) heated by low pressure saturated steam and the impregnated solvent is separated by evaporation and subsequent condensation in the solvent condenser (COS), which returns as the hot recovered dissolving solvent (SOLVQ) to the respective dissolution processes, step E.B.a;

E.B.d. Separation of the polymer solvent from the polymer-rich concentrated solution (SPC) by hot ultrafiltration under pressure of 2 to 10 bar, using a ultrafiltration separator (SU) with the post-cooled polymer in slurry form (PFP) going to the press-filtration, step E.B.e. and the hot recovered dissolution solvent (SOLVQ) going to a new dissolution operation, step E.B.a;

E.B.e. Filtration of the slurry (PFP) that goes to a subsequent filtering by pressing, in a press filter with washing (FPL), where most of the hot recovered dissolving solvent (SOLVQ) is exhausted and returns to the process of dissolution, step E.B.a. and the resulting cake, having the characteristic of a crumbled powder is washed with a small volume of washing solvent (SL), which removes all of the impregnated solvent in the slurry, separately obtaining a small volume of solvent blend (MDS) and wet polymer powder (PPU); and

E.B.f. Separation of the small volume of solvent blend (MDS) by distillation in solvent simple distiller (DSS) with return of hot recovered dissolving solvent (SOLVQ) from the bottom of the distiller (DSS) to a new dissolution, step E.B.a., the recovered washer solvent (SLR) from the top of the distiller (DSS) is returned to a new washing and the wet polymer powder (PPU) is dried in a polymer dryer (SEPO) and the final dry polymer powder (PPS) is obtained, and the residual solvent vapors are condensed in the solvent condenser (COS) and the hot recovered dissolving solvent (SOLVQ) is returned to a new dissolution, step E.B.a.

9. An operation process, in order to carry out the step B.a., contained in claim **1**, wherein, first alternative, the following equipment:

E.B.a.1. Immersion of the Residue of polymeric composition rich in aluminum/polymer in a dissolving solvent (SOLV) in a screening conveyor belt (CTL), with stirring by means of moving jets of recirculating solvent through a bottom solution filter (FSPC) and a bottom solution recirculating pump (BSPC) with concentration of the polymer in the solution during its residence time, with drainage through the sieve, by gravity of the polymer-rich concentrated solution (SPC), letting the aluminum sheets impregnated with polymer and solvent (FAIP) to emerge from the solution, being said aluminum sheets retained and isolated on the screening conveyor belt (CTL).

10. An operation process, in order to carry out the step B.a., contained in claim **1**, wherein, second alternative, the following equipment:

E.B.a.2. Dissolution of the Residue of polymeric composition rich in aluminum/polymer (RPA) with a dissolving solvent (SOLV) in a Hildebrand extractor (EH), with draining by gravity of the polymer-rich concentrated solution (SPC), letting the aluminum sheets be impregnated with polymer and solvent (FAIP) as they emerge from the solution.

11. An operation process, in order to carry out the step B.d., contained in claim **1**, wherein, in its alternative form, the following equipment:

E.B.d.1. Separation of the solvent from the polymer is obtained by cooling the solution in a heat exchanger (RSTC) and by filtration in a press filter (FFP) and which is reheated in the solvent heater (AQS).

12. An operation process, in order to carry out the complete process of separating the aluminum in its alternative form, through the steps E.B. and E.C., according to claim **1**, wherein, the following equipment: B. Step B. Obtaining of aluminum film (FIA) separated from the polymer-rich solution (SPC):

E.B.A. Positioning of the residue of polymeric composition rich in aluminum/polymer (RPA) and contained in a perforated basket (CP) inside a dissolution tank (TQD) so that in its position inside the vessel it does not touch the bottom of the vessel, hold on supports in the wall and then the tank is closed; The tank (TQD) has two different heating systems, both fed with saturated steam: the first system consists of a thermosiphon (TSF); and the second system with a steam jacket at the bottom of the tank; it is connected to a reflux condenser (CR) having control of temperature, pressure and water flow in the reflux condenser and has a bottom valve;

E.B.B. Transfer of the dissolving solvent (SOLV) with temperature in the range of 100-105° C. from the solvent tank (TS) to the dissolution tank (TQD) until fully cover the residue of polymeric composition rich in aluminum/polymer (RPA) contained in the basket (CP) and the dissolution of the polymer-rich polymeric composition is initiated, by feeding

steam in the thermosiphon (TSF) connected to the dissolution tank (TQD), occurring the heating and vaporization of the solvent inside the tube bundle, and consequently, displaces a liquid column responsible for the upward displacement of the liquid solvent and its circulation through the shreds of the residue of polymeric composition rich in polymer/aluminum returning to the bottom and re-feeding the tube bundle; The circulation is maintained for 1 to 5 minutes when occurs the partial evaporation of the solvent that is condensed in the reflux condenser (CR) returning to the tank and at the end the polymer-rich concentrated solution (SPC) is drained by the bottom valve, passing through the in-line filter (FL) to the solvent condenser tank (TCS) and goes to the step E.B.F;

E.B.C. Solvent from the solvent tank (TS) is again transferred to the dissolution tank (TQD) on a level below the bottom of the basket (CP) and the washing is started, now feeding steam to the jacket of the dissolution tank, occurring heating of the solvent contained in the bottom of the vessel, and rising of the vapors, passing through the basket, proceeding to the reflux condenser (CR), said operation being kept at the pressure corresponding to the dissolution temperature and the solvent condensate being kept at a temperature slightly below the saturation temperature percolating through the contents of the basket and which, upon coming into contact with the upward stream of vapors, absorbs heat in a way that, being hot, and on flowing down upon the shreds, wash the residue of solution of polymeric composition rich in polymer that still cover the aluminum, said solution being then transferred to the space below the base of the basket, obtaining complete and continuous washing of aluminum and finally is transferred, with help of internal pressure, the diluted polymer-rich solution (SPD), through the valve at the side of the tank (TQD), to the diluted solution tank (TSD) containing its own reflux condenser, positioned above the tank (TQD) which will feed a new residue of polymeric composition rich in polymer/aluminum, complemented by new or recovered solvent;

E.B.D. Once all liquid solvent has been transferred from the dissolution tank (TQD), after washing, and the bottom outlet of the dissolution tank (TQD) being closed, the vacuum is initially drawn through a vacuum system (SV) which directs the vapor to the reflux condenser (CR) and from there to the atmosphere, and keeping the tank heated with steam in the jacket and then to a purge operation of the residual vapors contained in the

dissolution tank, which are drawn by a stream of nitrogen for purge (NPP) to the reflux condenser (CR) and from the condenser to the atmosphere;

E.B.E. After, the dissolution tank (TQD) is opened, the basket (CP) is withdrawn and after removal of the aluminum film (FIA) pieces free from polymer-rich polymeric composition, returns to step E.A.b. and the recovered aluminum is directed to processing in a melting and casting furnace or other stage;

E.B.F. The Polymer-rich concentrated solution (SPC) contained in the condenser tank (TCS) is subjected to heating in order to distil part of the solvent and the vapors are passed to the reflux condenser (CRS) which transfers the hot recovered dissolving solvent (SOLVQ) to the solvent stock tank (TES) which feeds the dissolution tank (TQD) to give the resulting solution (SR) containing polymer-rich polymeric composition with higher viscosity and can then be sent to step E.B.G. or to steps C.1.a., C.2.a., C.3.a., C.4.a. or C.5.a; and

E.B.G. The resulting solution (SR) containing polymer-rich polymeric composition with higher viscosity, from which the solvent was partially removed, is subjected to dragging by saturated steam (VAS), which is performed at a temperature close to the softening temperature of the polymer-rich polymeric composition and employing in this operation direct saturated steam and indirect steam with temperature of the steam injected into the jacket of the tank (TCS) kept close to that of the injected saturated steam; the vapor stream from this operation flows to a condenser where the condensed water is drained and the solvent vapors exit at the top of this first condenser (CD1), passes to a second condenser (CD2) where condensation of the solvent occurs, flowing, still hot, to the solvent stock tank (TES) which refeed the dissolution tank (TQD) with hot recovered dissolution solvent (SOLVQ); This step has its solvent elimination control adjusted to different processes for recovery of the polymer-rich polymeric solution (SPC), according to its final form; in the form of film, powder or pellets.

13. The process according to claim **12**, wherein, realization of step E.C., in its alternative form, using the following equipment:

C.1 In the form of precipitate

E.C.1.a. The resulting solution (SR) containing polymer-rich polymeric composition with higher viscosity is cooled and precipitated in ethanol (AE) under agitation and with indirect cooling in precipitation tank (TPP);

E.C.1.b. The precipitated polymer is filtered through a filter (FIL), separating the obtained powder, then is transferred to a tank with water (TA) where will occur the elimination of the solvents;

E.C.1.c. The solvent is removed using direct heating with steam (VA), the dragged solvent vapors are directed to a condenser (COND) and then to a decantation tank (TDE) to proceed to the separation of the immiscible phase and the supernatant solvent;

E.C.1.d. The aqueous phase is subjected to distillation to separate recovered ethanol (AER) dissolved therein in ethanol distiller (DESA), and the organic phase, which contains a greater quantity of the dissolving solvent is further distilled in the dissolving solvent distiller (DESH), recovering from this mixture the dissolving solvent (SOLVQ) and also a little of ethanol partitioned and in equilibrium with the dissolving solvent in a phase equilibrium; and

E.C.1.e. The resulting polymer is filtered in the filter (FIL) and dried in a conventional dryer (SEC) to give the dry precipitated polymer (PPS).