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Estimation of the energy consumption and carbon dioxide emissions associated to the life cycle of different materials

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Conclusions

- The main objective of this study was to establish the energy consumption and CO₂ emissions associated to the PVC production and to several applications of this polymer in the edification: windows, pipes, waterproofing sheets and electrical cables.
- In first case a PVC production plant from Hispavic/Vinilis in Martorell was chosen as reference.
- The energy consumption corresponding to the PVC production is equivalent to the european eco profile value (6.96 MWh/t).
- If the production of PVC and caustic soda is taken in account this energy consumption is lower than the ecoprofile one. (82% of the european average value to the production of 1 t of PVC).
- With the aim of estimating the impact of energy consumption and CO₂ emissions for different PVC applications, a methodology of environmental accounting was developed for those indicators. It consists in the estimation of its value in each of the stages of the life cycle of the element (extraction and production of raw materials, transport to production, production, transport to installation, installation, use, transport to landfill, disposal in landfill, transport to recycling and recycling).
- This methodology was applied to:
 - PVC, wood and aluminum windows
 - PVC, HDPE, cast iron, corrugated PE, corrugated PP, bioriented PVC and concrete pipes to water distribution and wastewater distribution
 - Roofing waterproofing sheets made of PVC, EPDM rubber and bituminous materials
 - Low tension cables with copper conductor and insulation made of PVC, XLPE and halogen free PE.
- The variation of the results with the utilization of recycled materials was analyzed when possible.
- The results obtained permit to compare the impact, related to the energy consumption and CO₂ emissions, caused by the use of different materials in these applications.

- The elements that presented lower energy consumption and CO2 emissions were:
 - PVC windows with a 30% of recycled materials
 - Bioriented PVC pipes in water distribution
 - Corrugated PP pipe with 80% of recycled materials (the CO2 emissions are lower for the corrugated PE pipe with 80% of recycled materials) in wastewater distribution
 - PVC waterproofing sheet with a 50% of recycled materials
 - Unipolar cables for electric distribution in low tension with copper conductor and PVC insulation, with a 25% of recycled materials
- This study applies a general scheme, but the results obtained are centered in the Iberian Peninsula, because several conditions were chosen for this area: electrical generation, climatic conditions.