

Supporting information

Energetic and economic assessment of sludge thermal hydrolysis in novel wastewater treatment plant configurations

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Section 1. Detailed information about the contribution of each factor (electricity, sludge management and coagulant) on WWTP operational costs without thermal hydrolysis for the four evaluated scenarios, including the sensitivity analysis.

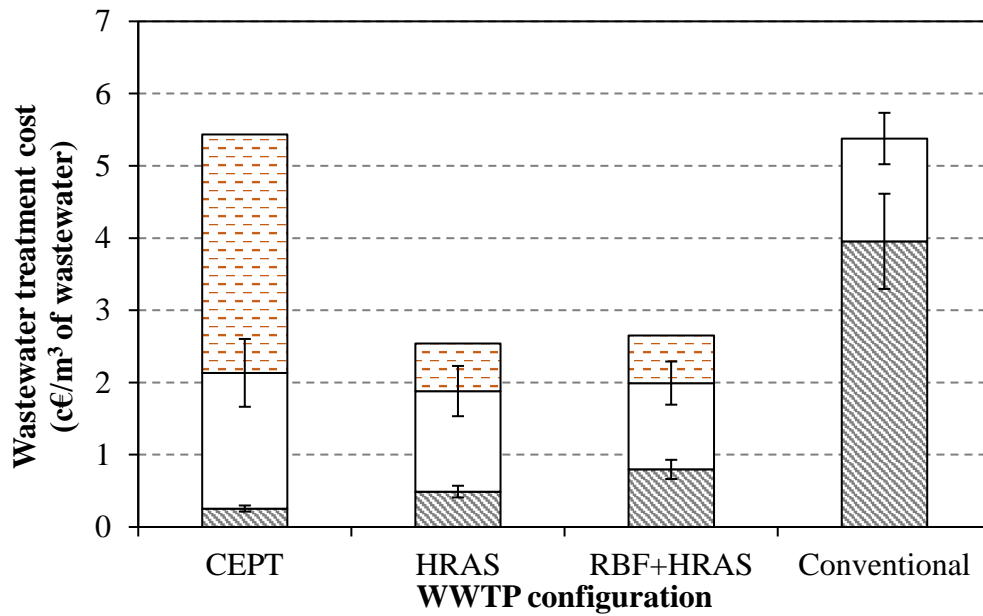


Figure S1. Contribution of electricity (▨), sludge management (□) and coagulant (▤) to the WWTP operational costs. Error bars represent the impact of a fluctuation of electricity cost (0.10-0.14 €/kWh) and sludge management cost (60-100 €/ton TS).

Section 2. Results for the sensitivity analysis for the payback section.

A sensitivity analysis was performed in order to assess the influence of a potential fluctuation of: i) the electricity cost between 0.10 €/kWh and 0.14 €/kWh and ii) of sludge management cost between 60 €/ton TS and 100 €/ton TS on the payback time of the thermal hydrolysis plants. The results showed that the fluctuation of sludge disposal cost is much more relevant than a fluctuation of electricity cost, which barely impacts the payback time for all the analysed WWTP configurations and its sizes. Therefore, Figure S2 shows the influence of electricity cost on the payback time and Figure S3 the influence of sludge management cost on the payback time for a thermal hydrolysis (TH) plant in a WWTP for 100,000 inhabitants equivalents; Figure S4 displays the influence of electricity cost on the payback time and Figure S5 the influence of sludge management cost on the payback time for a TH plant in a WWTP for 250,000 inhabitants equivalents; Figure S6 shows the influence of electricity cost on the payback time and Figure S7 the influence of sludge management cost on the payback time for a TH plant in a WWTP for 500,000 inhabitants equivalents and Figure S8 displays the influence of electricity cost on the payback time and Figure S9 the influence of sludge management cost on the payback time for a TH plant in a WWTP for 1,000,000 inhabitants equivalents. Whereas for the WWTPs for 100,000 and 250,000 inhabitants equivalents a hypothetical decrease in sludge management cost would substantially increase the payback time for a TH plant for not only the three novel scenarios but also for the conventional one, for the two biggest WWTP (500,000 and 1,000,000 inhabitants equivalents WWTPs) the payback time would be barely increased.

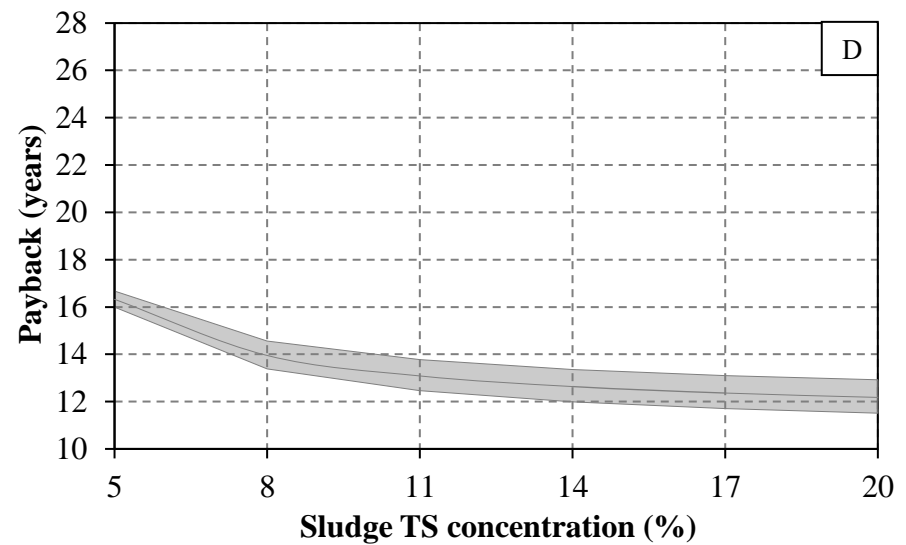
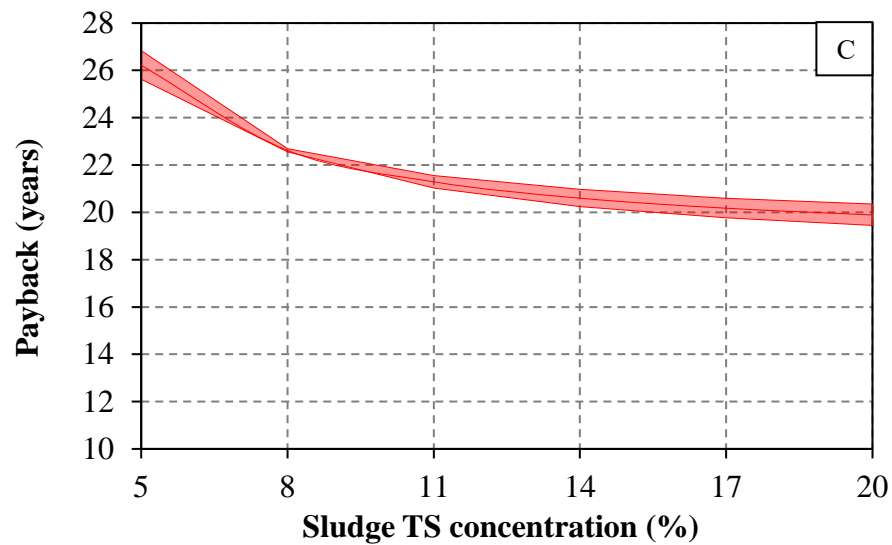
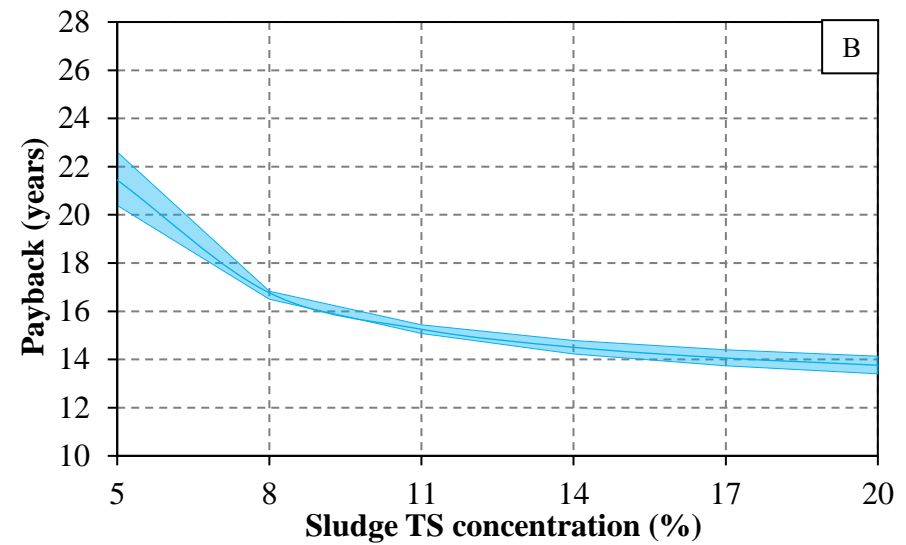
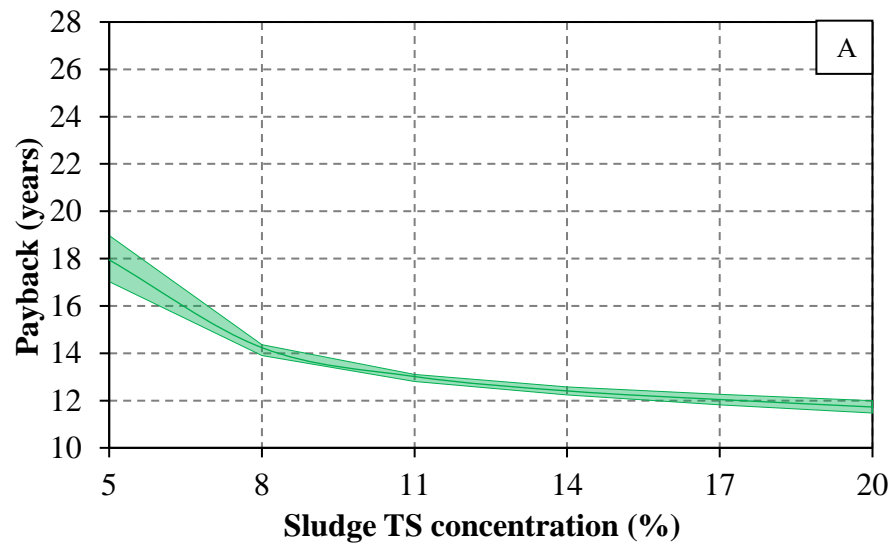


Figure S1. Influence of electricity cost between 0.10 €/kWh and 0.14 €/kWh on the payback time for a thermal hydrolysis plant in (A) CEPT, (B) HRAS, (C) RBF+HRAS II and (D) conventional scenario for a wastewater treatment plant for 100,000 inhabitants equivalents.

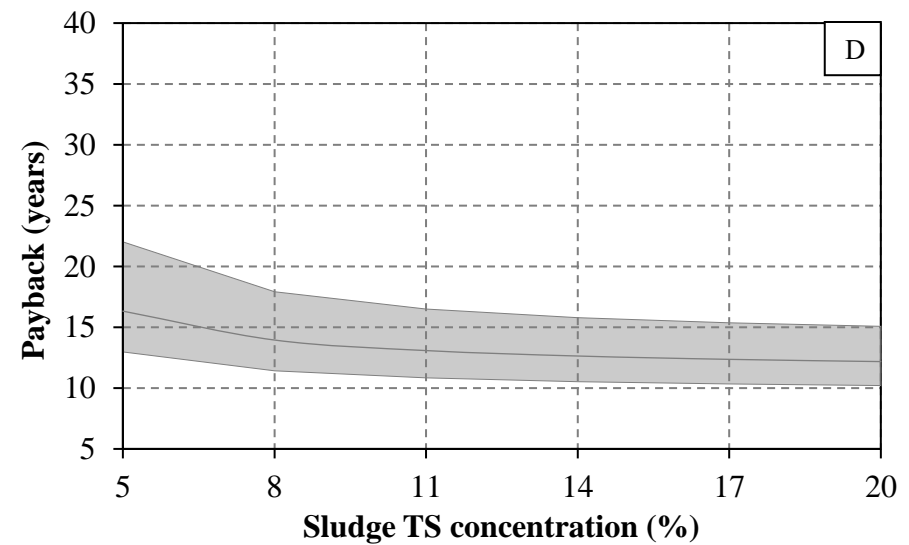
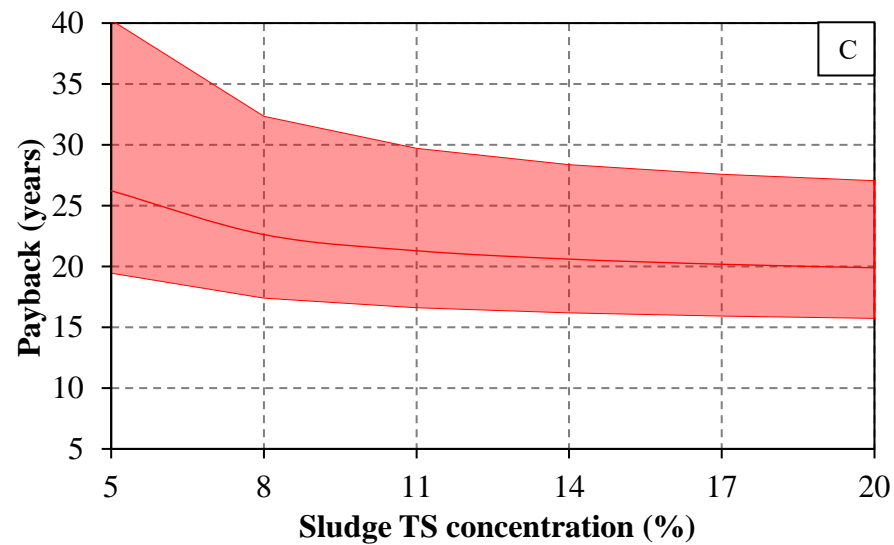
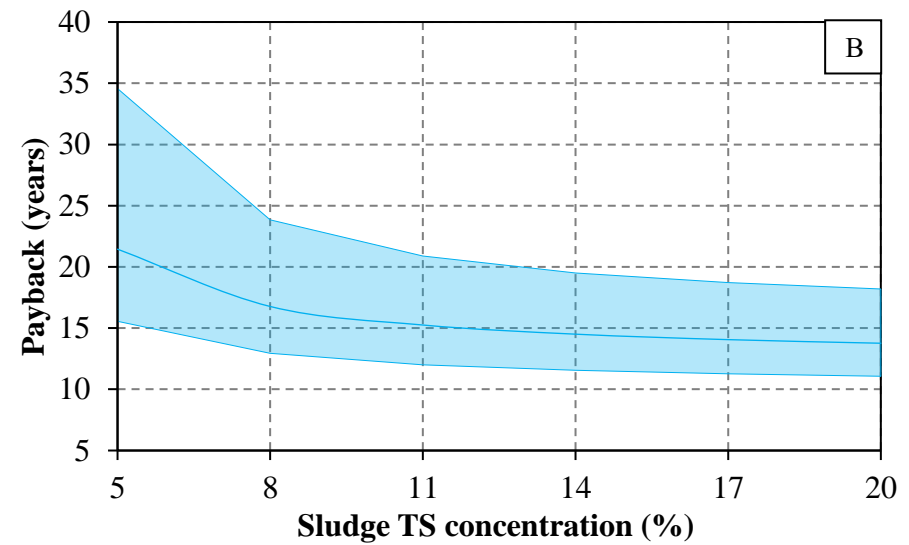
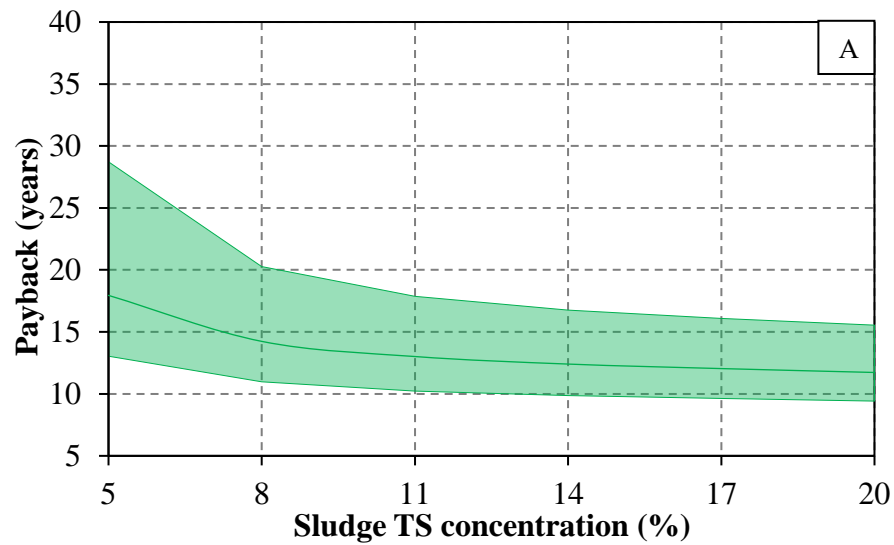


Figure S2. Influence of sludge disposal cost between 60 €/ton TS and 100 €/ton TS on the payback time for a thermal hydrolysis plant in (A) CEPT, (B) HRAS, (C) RBF+HRAS II and (D) conventional scenario for a wastewater treatment plant for 100,000 inhabitants equivalents.

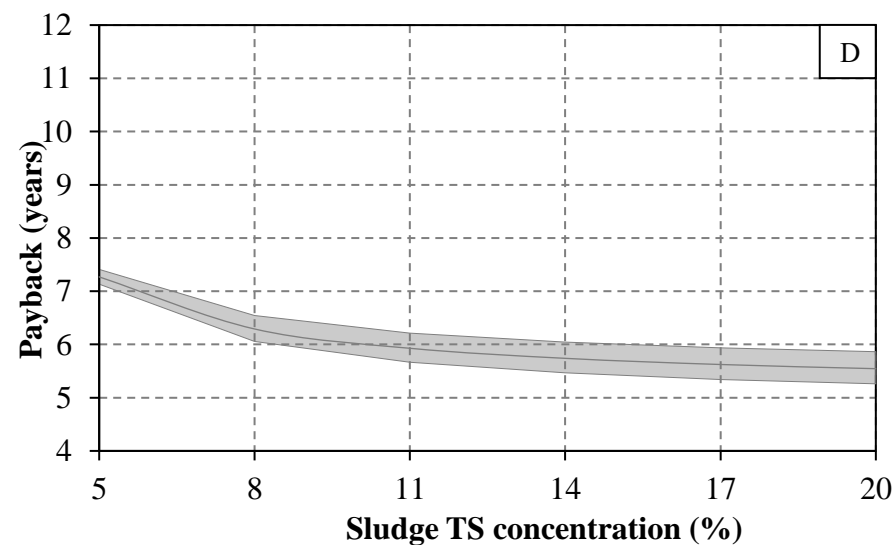
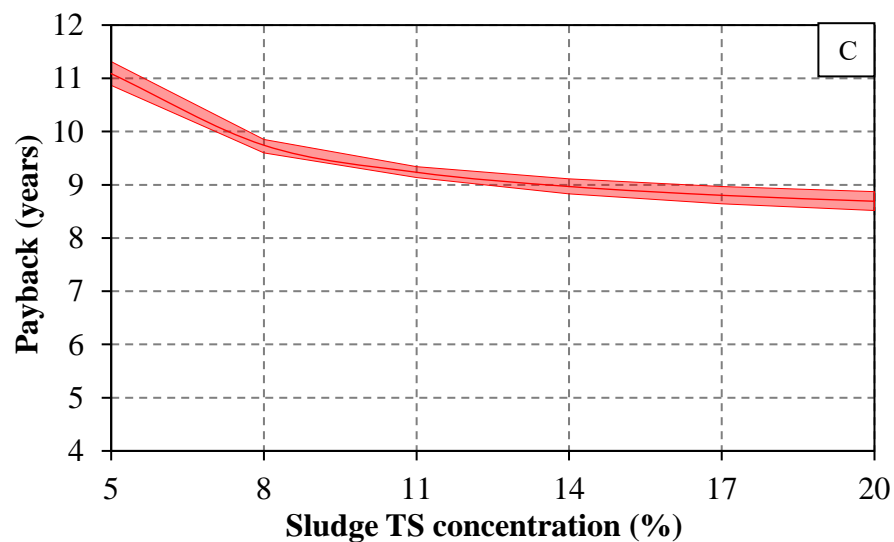
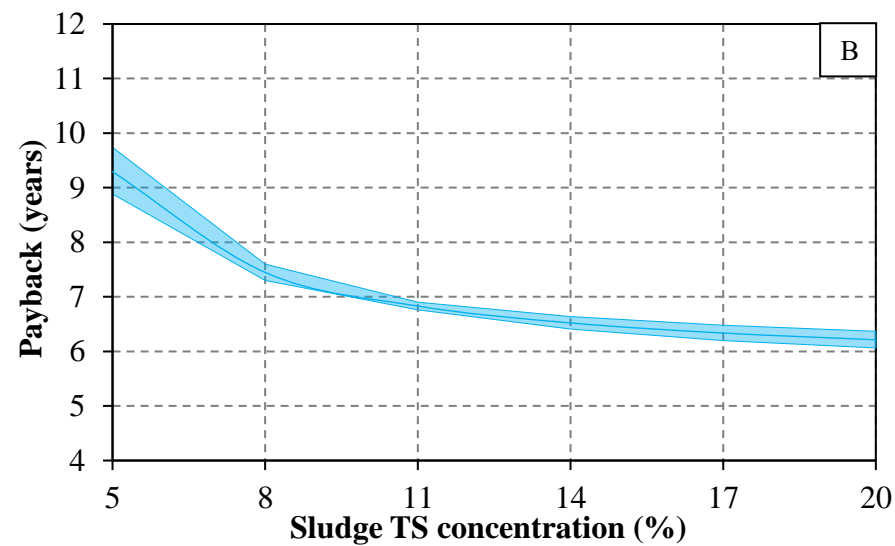
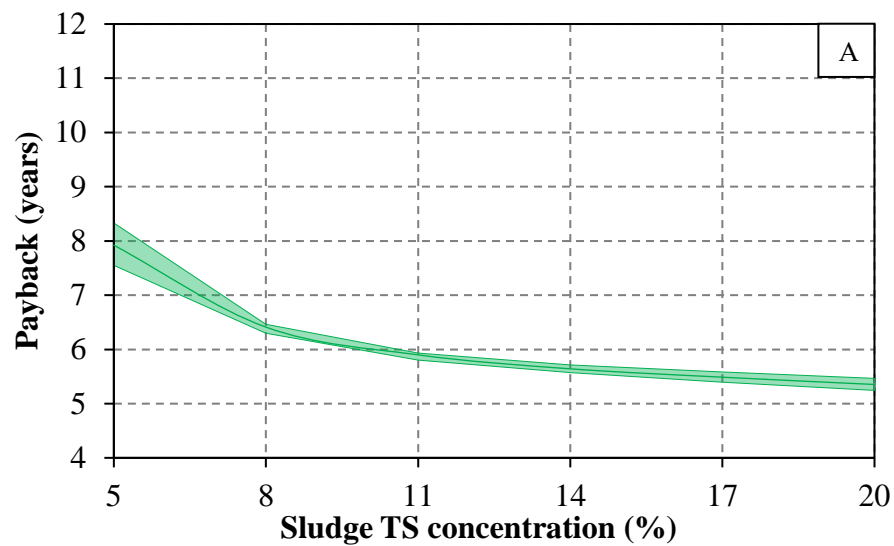


Figure S3. Influence of electricity cost between 0.10 €/kWh and 0.14 €/kWh on the payback time for a thermal hydrolysis plant in (A) CEPT, (B) HRAS, (C) RBF+HRAS II and (D) conventional scenario for a wastewater treatment plant for 250,000 inhabitants equivalents.

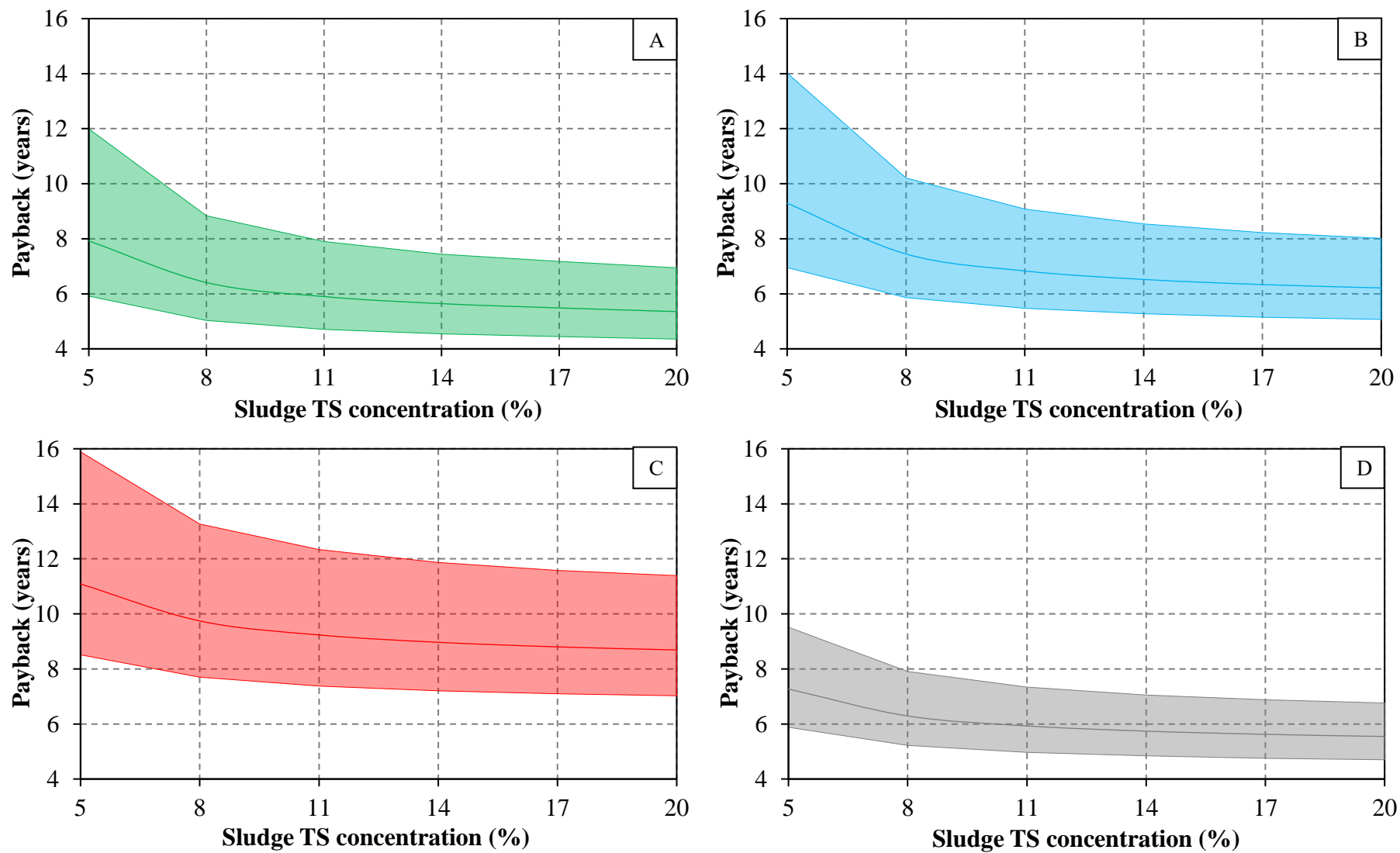


Figure S4. Influence of sludge disposal cost between 60 €/ton TS and 100 €/ton TS on the payback time for a thermal hydrolysis plant in (A) CEPT, (B) HRAS, (C) RBF+HRAS II and (D) conventional scenario for a wastewater treatment plant for 250,000 inhabitants equivalents.

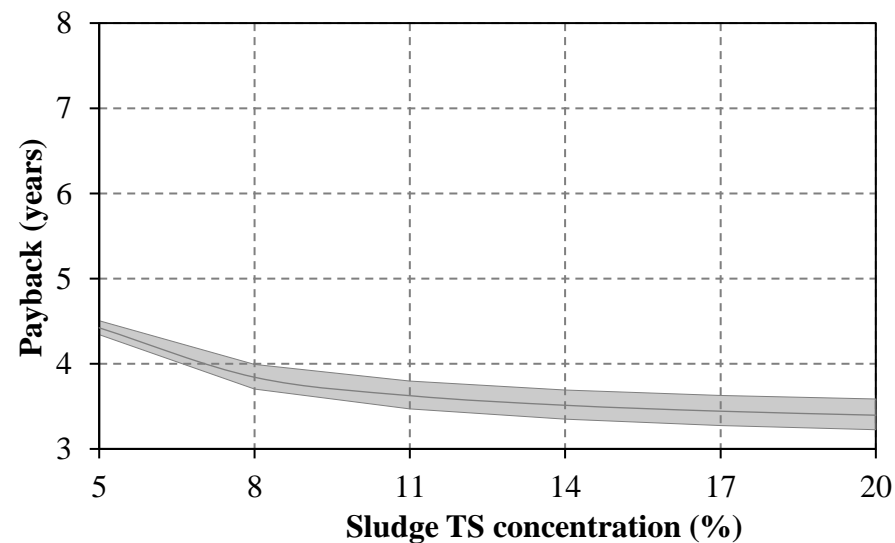
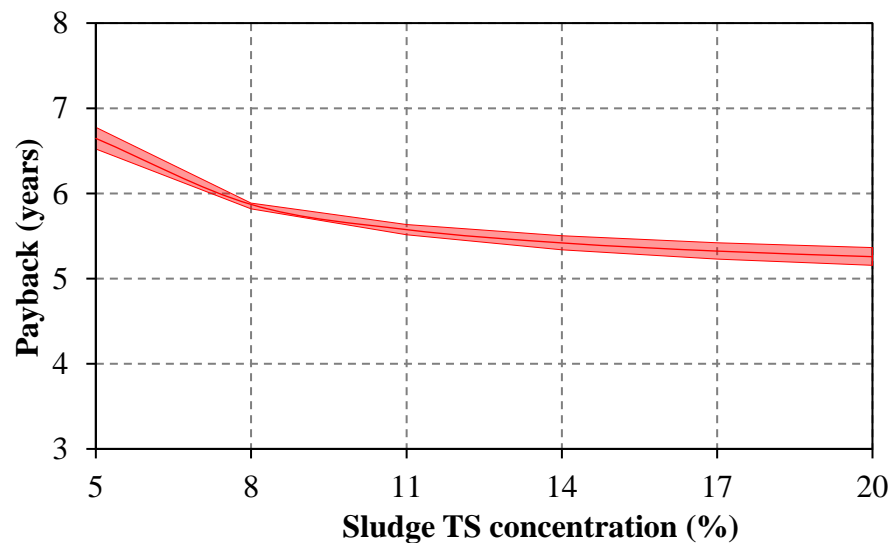
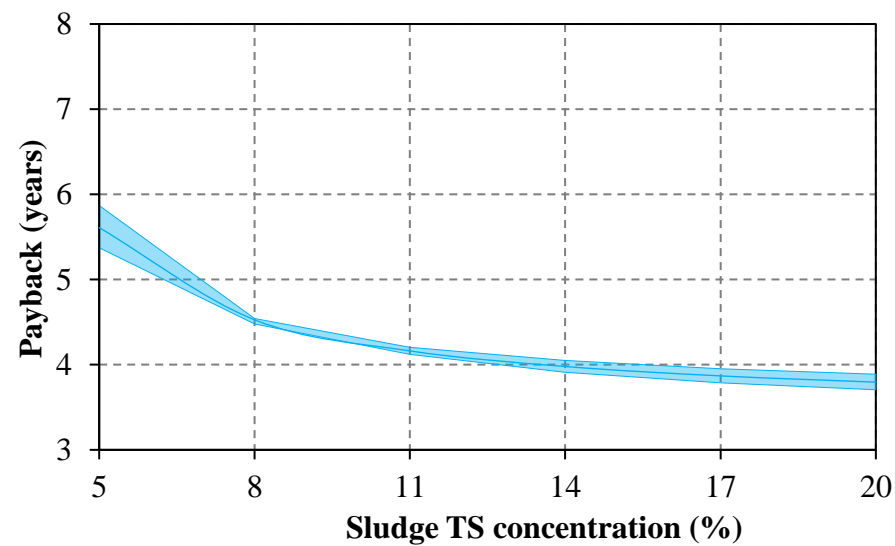
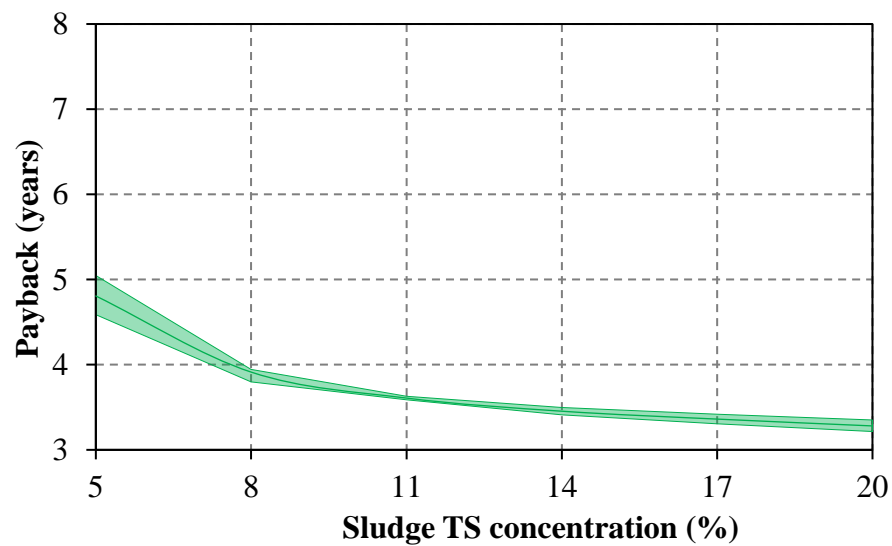


Figure S5. Influence of electricity cost between 0.10 €/kWh and 0.14 €/kWh on the payback time for a thermal hydrolysis plant in (A) CEPT, (B) HRAS, (C) RBF+HRAS II and (D) conventional scenario for a wastewater treatment plant for 500,000 inhabitants equivalents.

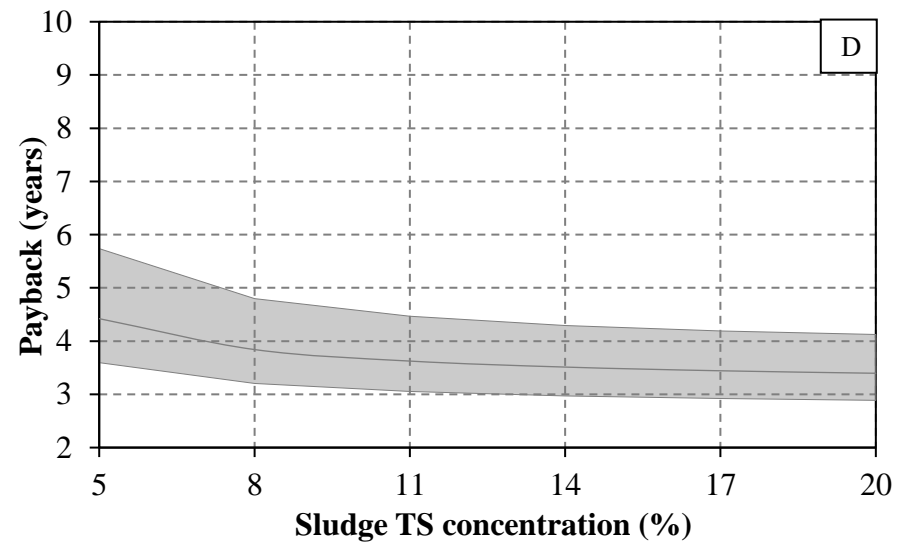
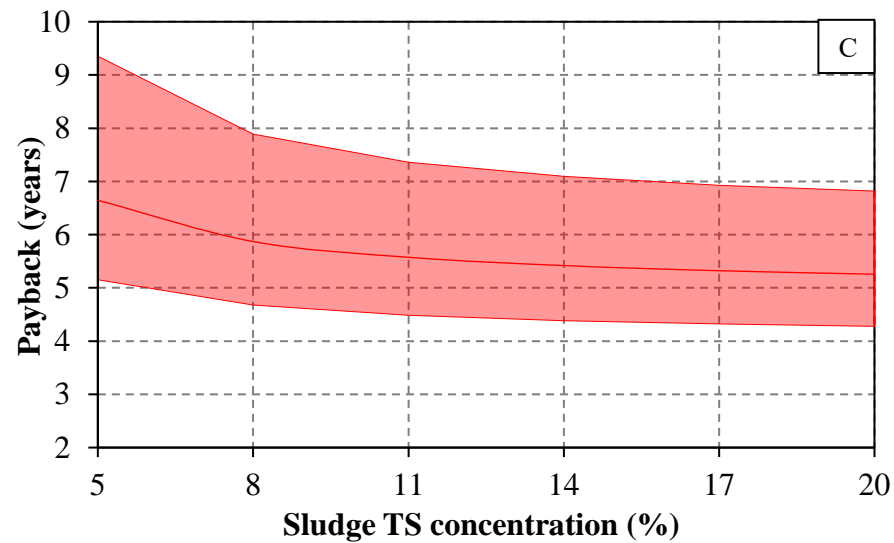
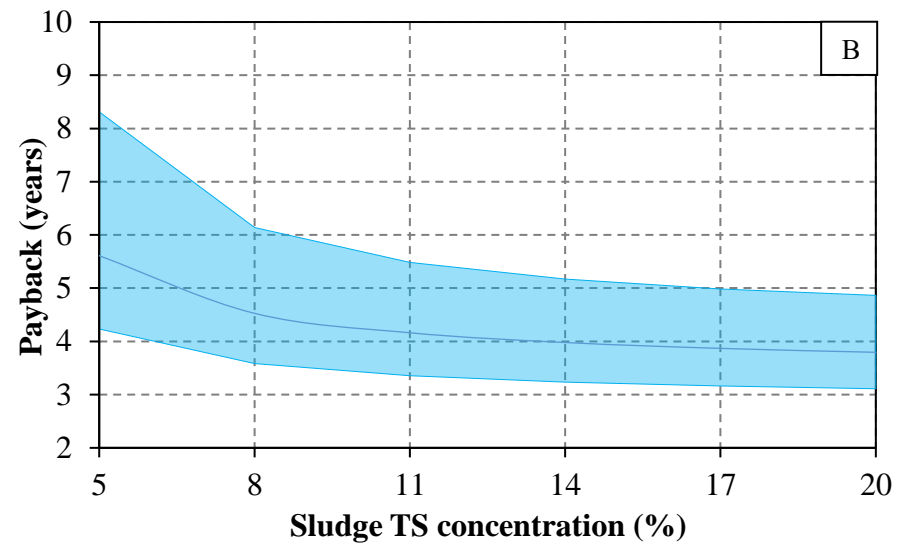
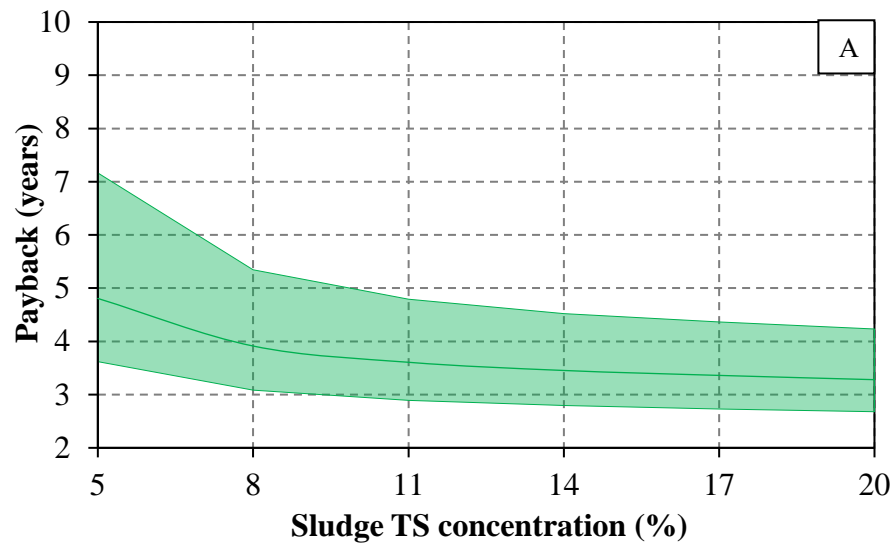


Figure S6. Influence of sludge disposal cost between 60 €/ton TS and 100 €/ton TS on the payback time for a thermal hydrolysis plant in (A) CEPT, (B) HRAS, (C) RBF+HRAS II and (D) conventional scenario for a wastewater treatment plant for 500,000 inhabitants equivalents.

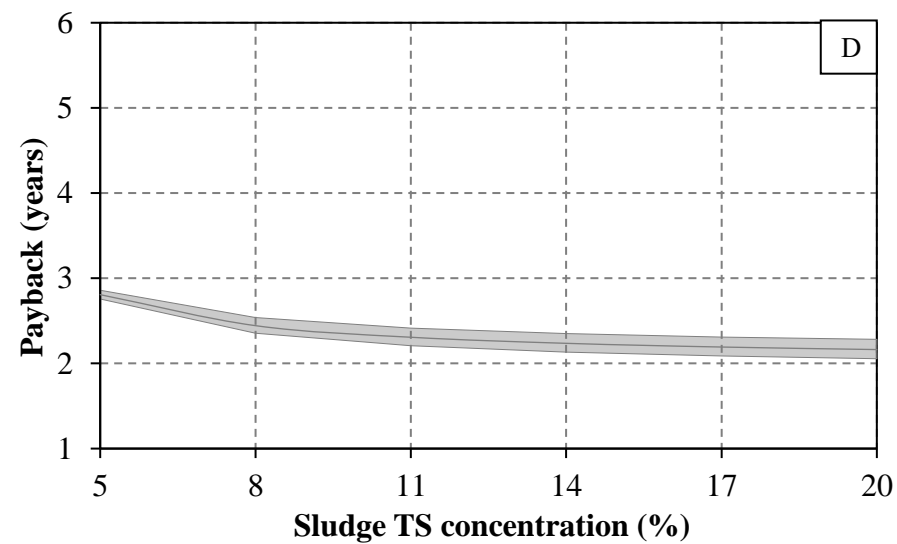
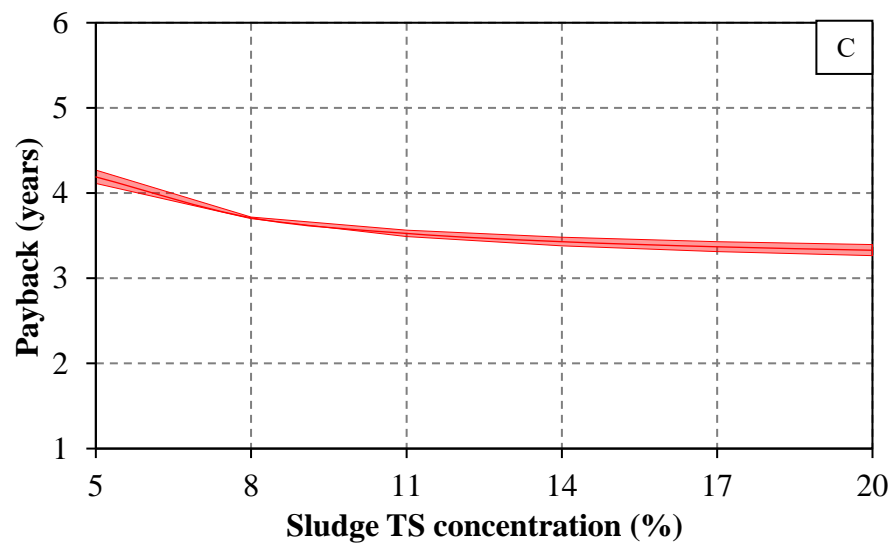
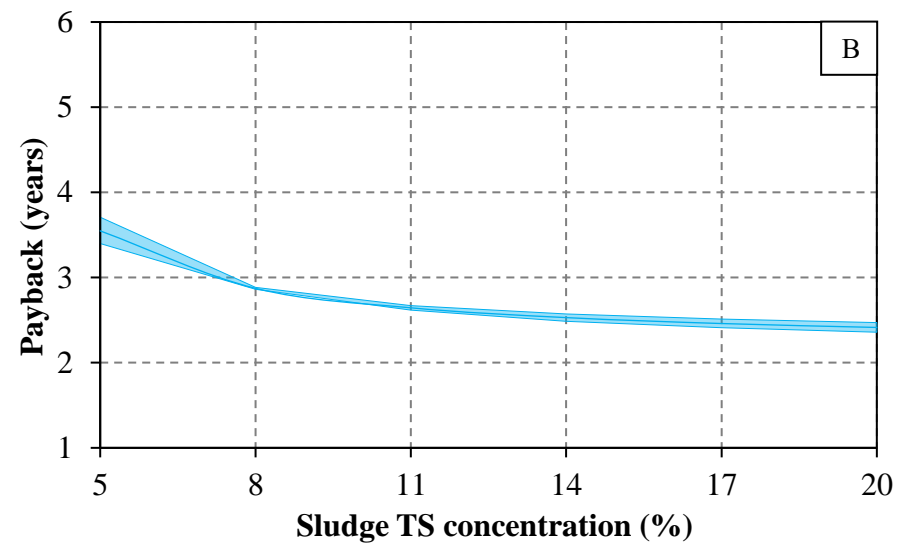
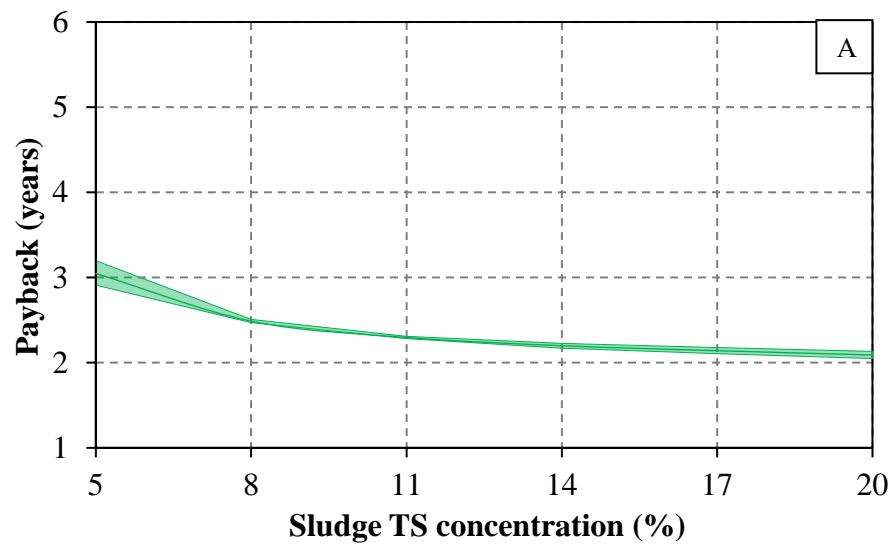


Figure S7. Influence of electricity cost between 0.10 €/kWh and 0.14 €/kWh on the payback time for a thermal hydrolysis plant in (A) CEPT, (B) HRAS, (C) RBF+HRAS II and (D) conventional scenario for a wastewater treatment plant for 1,000,000 inhabitants equivalents.

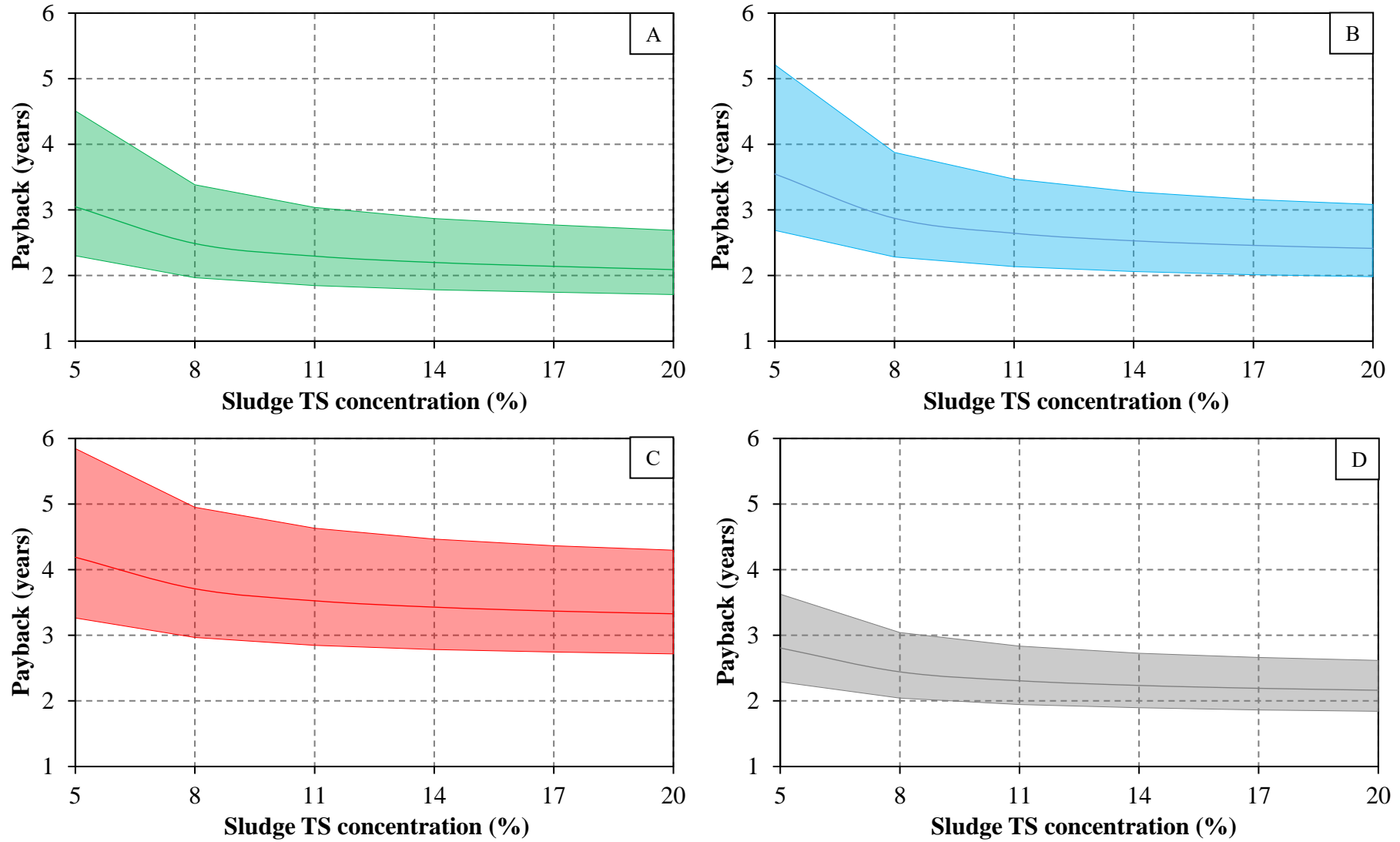


Figure S8. Influence of sludge disposal cost between 60 €/ton TS and 100 €/ton TS on the payback time for a thermal hydrolysis plant in (A) CEPT, (B) HRAS, (C) RBF+HRAS II and (D) conventional scenario for a wastewater treatment plant for 1,000,000 inhabitants equivalents.