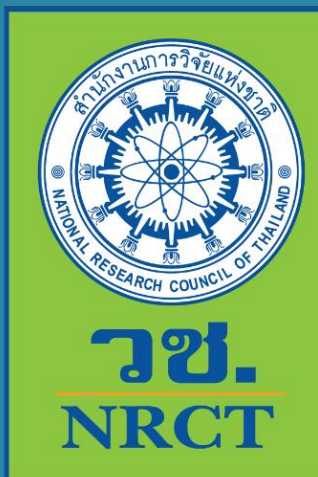


TANNINNOV

ENG
K M U T N B



KMUTNB
INVENTION TO INNOVATION

The tannin-protein complex

High-value product from waste facilitating wastewater treatment & water reuse

Tanninnov is a tannin product harvested from wastewater from palm oil extraction using an environmentally friendly process. **Tanninnov** has the properties of a fiber binder and has antioxidant effects. Therefore, it can be developed into other products such as tannin glue, animal dietary supplements, antioxidant packaging film, and an inhibitor of scale and corrosion in boilers.

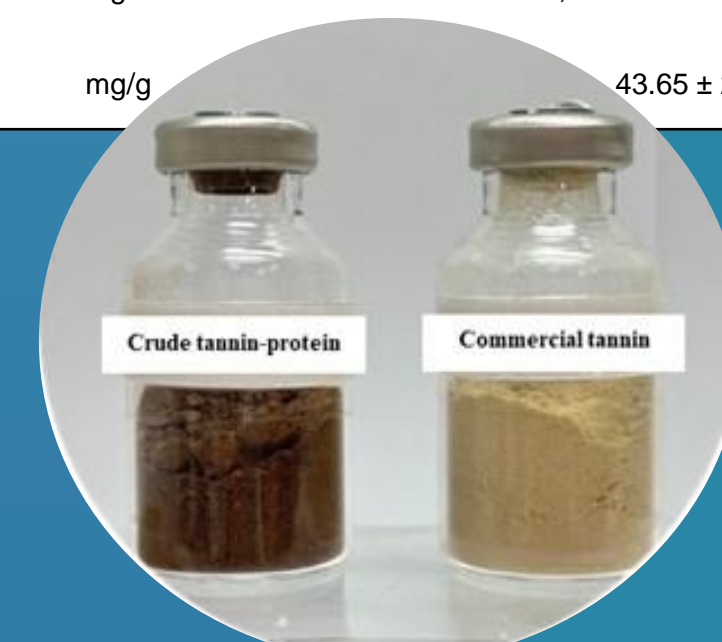
Wastewater

Treated water

Tannin harvesting is an important step that makes wastewater treatment from palm oil extraction technically and economically feasible.

TANNINNOV

Parameter	Unit	Tanninnov Crude tannin-protein complex
pH	-	9.52 ± 0.05
Tannin concentration (concentrate form)	mg/L	1,524.12 ± 35.34
Tannin content (dry product)	mg/g	16.79 ± 0.87
	%	1.68
Antioxidant activity	μmol Fe ²⁺ /g dried weight	51.50 ± 0.81
	μmol Fe ²⁺ / 100g dried weight	± 81 150.5
Protein concentration (concentrate form)	mg/L	3,659.46 ± 112.32
Protein content (dry product)	mg/g	43.65 ± 2.35



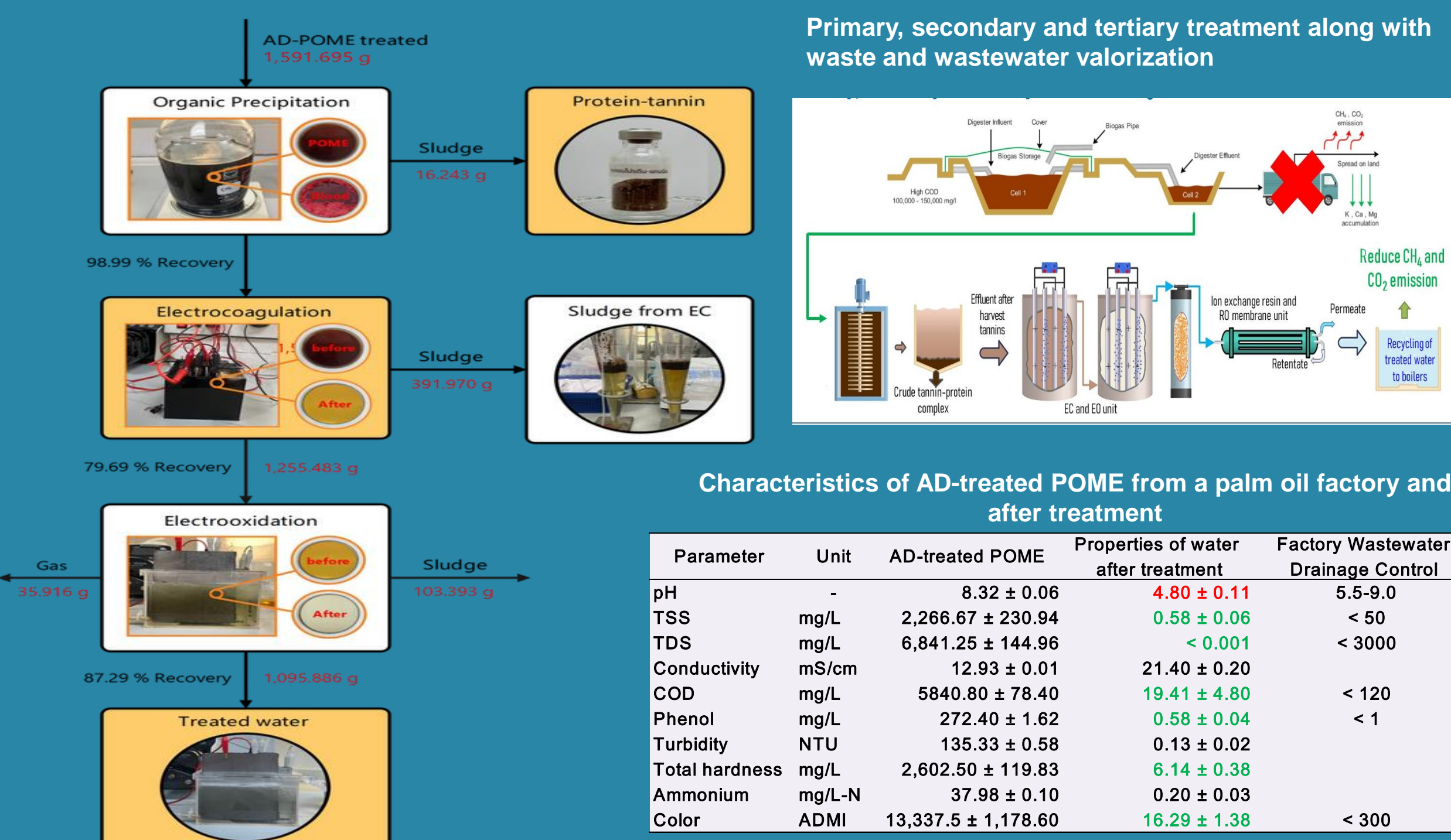
This resulted in a reduction of 15,240 tons of CO₂ eq per year and the treatment and recycling of water for use in the factory.

Key methodology

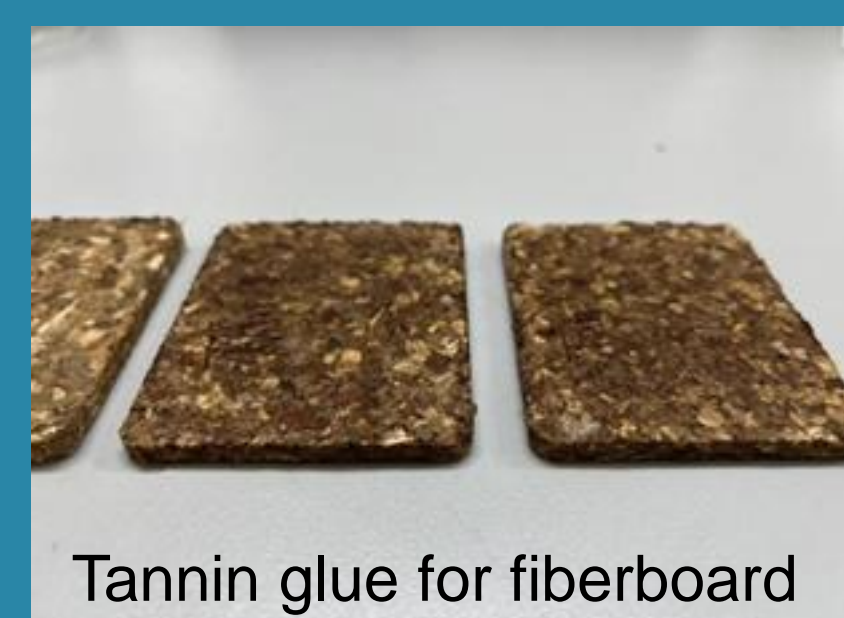
Organic precipitation, Electrocoagulation, Electrooxidation

Examples of products developed

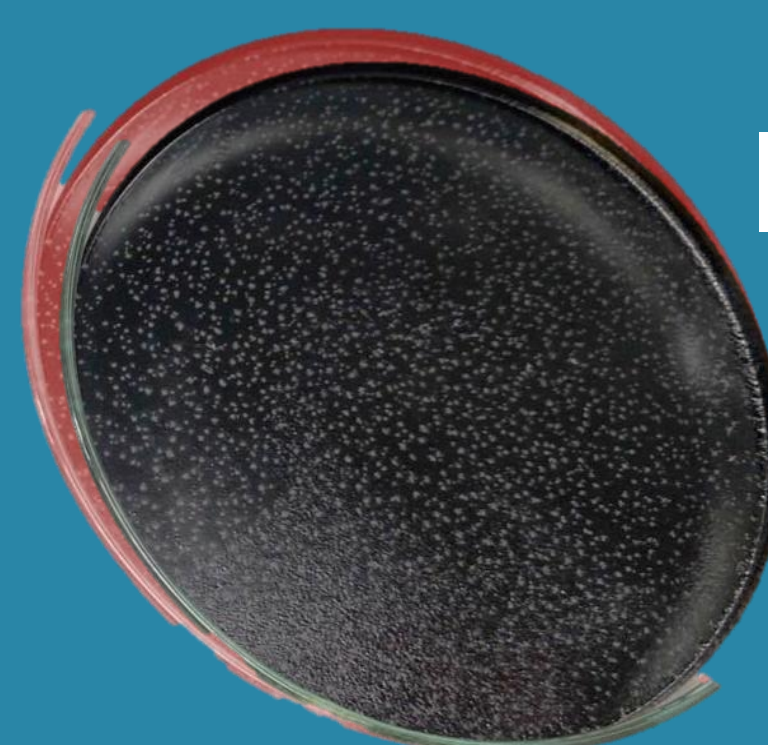
from Tanninnov



Property	Binderless fiberboard	Fiberboard with Tanninnov as organic adhesive
Modulus of rupture (MPa)	0.667 ± 0.056	10.588 ± 1.057
Modulus of elasticity (MPa)	69.86 ± 0.81	1,446.67 ± 112.47
Thickness swelling after 1 h (%)	89.883 ± 0.677	38.135 ± 3.526
Water absorption (%)	216.67 ± 17.54	70.38 ± 7.63



Tannin glue for fiberboard



Tanninnov packaging biofilm

Tanninnov packaging biofilm: An antimicrobial biofilm made from Tanninnov, designed to extend the life of the products liable to oxidation. It is environmentally friendly and biodegradable.