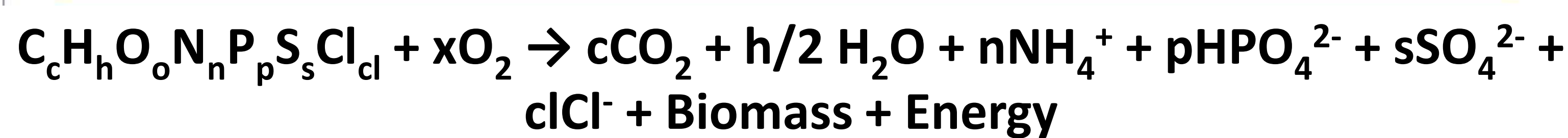
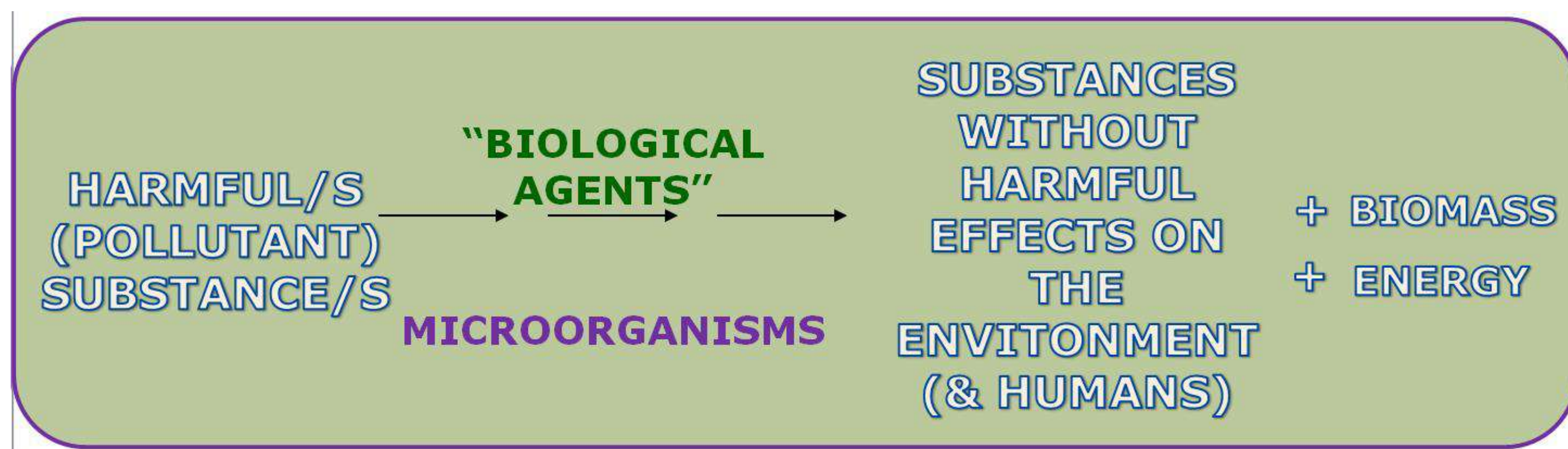


# MICROBIAL BIOREMEDIATION OF RESIDUAL HEAVY OIL WASTE FROM POWER PLANTS (SERBIA) AND ITS REUSE: EXAMPLE OF CIRCULAR ECONOMY

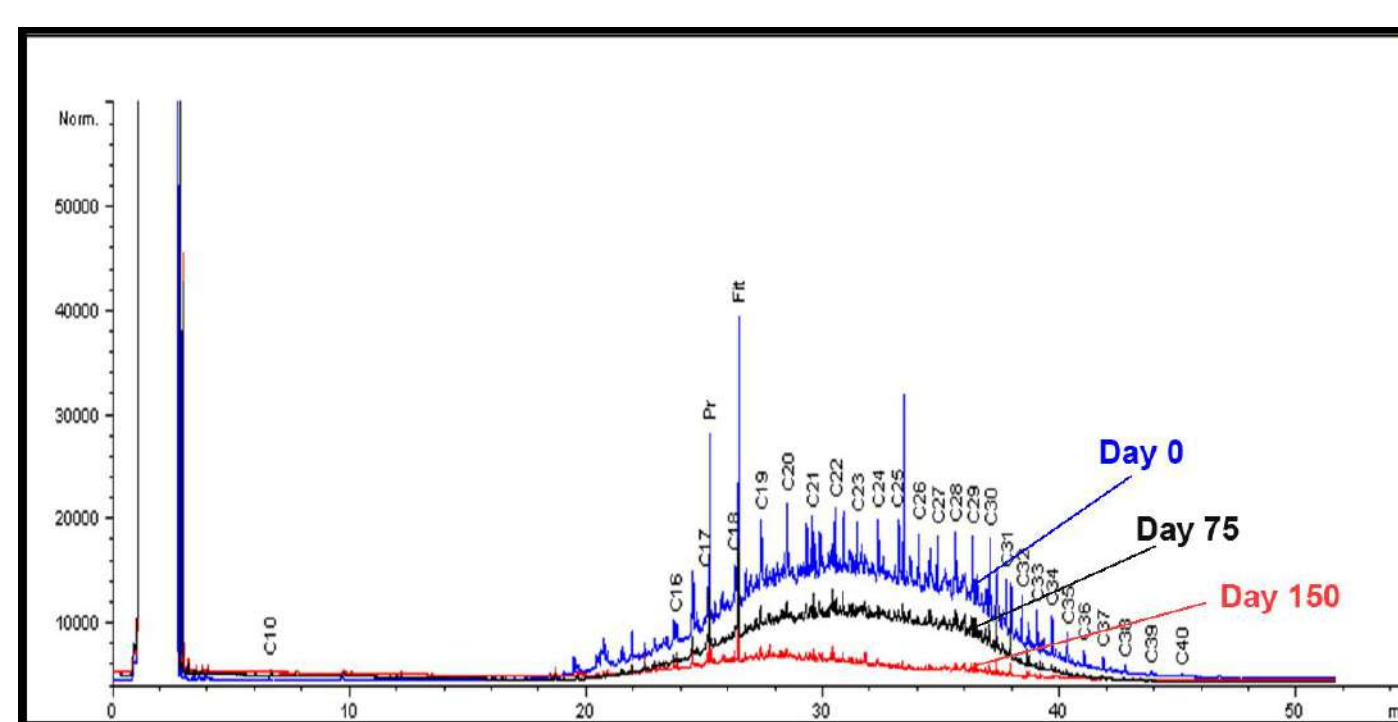
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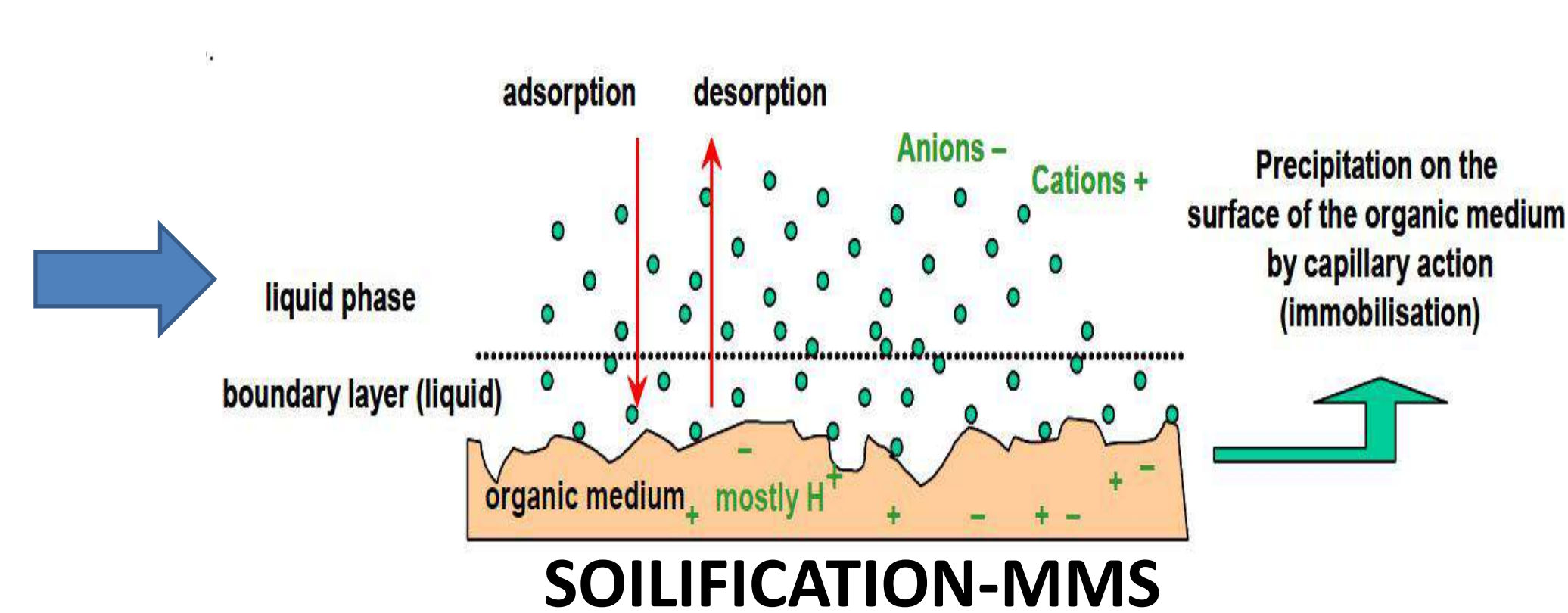
In this study the *ex-situ* bioremediation of waste heavy residual oil fuel was examined. Microbial consortium was isolated from the polluted site at Belgrade Heating Plants and was added to the **projected biopile**. The nutrients, aeration and periodic mixing was used during process. The biopile was **inoculated** and **biostimulated** for 150 days. As a result, the total petroleum hydrocarbons (TPH) decreased by approximately 80 times. Also, the content of **humic acids** increased which indicated the **beginning of pedogenesis phase – soil formation (soilification)**. Level of humic acids during process at the end is higher about 40%. Also, bioremediation microorganisms from the inorganic matrix (river sand) generate clay minerals (content increases by about 50%) which are characteristic of the soil. At the same time, due to the generation of organic acids, the concentration of carbonate minerals from sand (calcite and dolomite) decreases. All these indicators confirm the efficiency of bioremediation and the simultaneous formation of **man-made-soil (MMS)** as new resource for agriculture, landscaping and reforestation. The obtained soil was used for the stabilization of municipal waste as an overlay at this time.



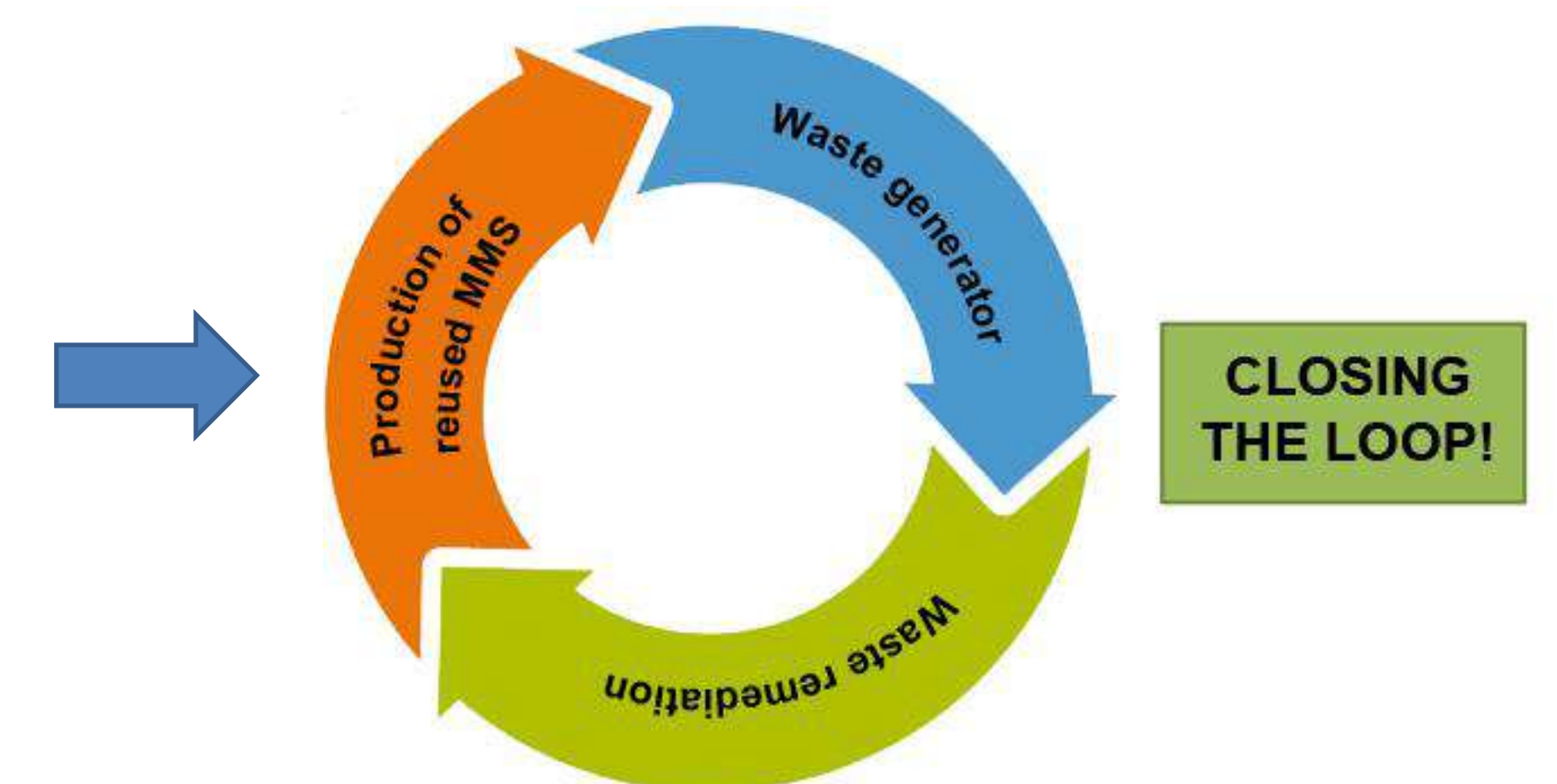
- POLLUTANTS-RESIDUAL HEAVY OIL WASTE
- “BIOLOGICAL AGENTS”-SELECTED & ADAPTED MICROBS ISOLATED FROM WASTE
- SUBSTANCES WITHOUT HARMFUL EFFECTS- HUMIFICATED MATERIALS IN REUSE
- BIOMASS-SMALL MASS OF BACTERIAL CELLS



EFFICIENCY ~ 95 %



SOILIFICATION-MMS



„After the bioremediation procedure (*ex/in situ*), the contaminated material (soil or water) does not represent hazardous waste, but material that has its own use value and can be reused, e.g. by returning it to the place from where it was taken (excavated) before applying the remediation procedure or as a bioactive material in the recultivation of degraded land (municipal landfills, surface mines, anti-erosion works, etc.).“ – Ministry of Environment Protection of Republic of Serbia

**Bioremediation that generates some useful material is a great example of a CIRCULAR ECONOMY that is different from the usual ones (such as aluminum can recycling, paper, etc.).**

## References

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