Teating OMW at MIGAL Galilee Research Institute, Israel

Prof Uri Marchaim

MIGAL
Galilee Research Institute

MIGAL is an applied research institute & technology accelerator, located at the periphery of Northern Israel

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MIGAL
Galilee Research Institute

Established in 1979, **MIGAL** – Galilee Research Institute - is an **applied research organization** and a **center for technology development and training** specializing in the following fields:

Environmental Quality

Agriculture

Biotechnology

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Aims and Activities

Education - Human Resources Development

Academic development in cooperation with Tel-Hai College

Graduate students for Ph.D. & M.Sc.

Post-Doctoral Professional Training

Scientific Seminars and Conferences

Building Scientific & Technological Infrastructure

Basic Research

Economic Development & Generating Employment

Advance Agriculture development Northern R&D

Supporting local industry & Laboratory Services

Hi-Tech industry development

Absorbing immigrant Scientists

Maintaining Environmental Quality

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Experimental Farms

Northern R&D operates 10 Experimental Farms for agricultural research, at altitude range from -250 meters to +1100 meters in altitude with varying topographical & water supply conditions.

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Migal Agro Innovation

DEVELOPING AGRICULTURAL APPLIED KNOW HOW

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The Water-Technology Cluster

This cluster developed as an outcome from the SWAM [EU project] and the WE@EU. It is developing partnerships in several directions. One is Olive Oil Mills' wastewater treatment (MISSTOW [EU project]).

Mobile Integrated Sustainable System for Treatment of Organic Wastewater (MISSTOW)

An EU Eco-Innovation Project

The partners were:

Peleg-HaGalil , Israel

MIGAL, Israel

University of Patras, Greece

CETENMA, Spain

Average Composition of selected organic-rich wastewaters (mg/l)

	BOD_5	COD	TSS	TKN	TP
Winery	25,000	30,000	5,000	60	50
Olive Mill	70,000	250,000	20,000	500	90
Dairy	25,000	45,000	12,000	-	250
Brewery	30,000	40,000	1,000	-	100
Domestic	250	500	250	-	10

Objective

To test a new concept of a mobile integrated system for treatment of organic wastewater (MISSTOW) that cannot be processed by common treatment plant.

How does it look like in the Pilot scale?

The full system in a winery

The system in move

misstow

The problem of Olive Oil Wastewater

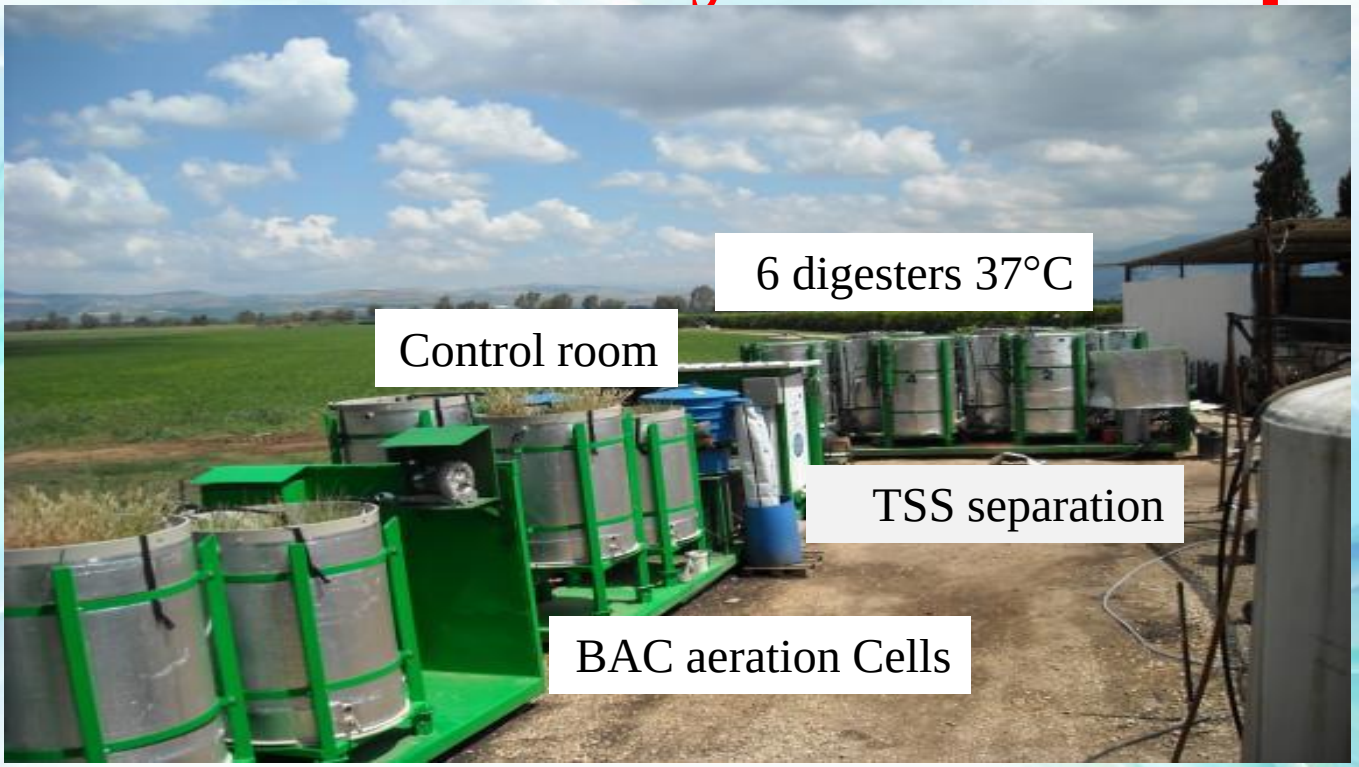
Olive mills' wastewaters constitute a serious pollution problem, because of the recalcitrant character of the high organic content that cannot be disposed to common wastewater treatment plants, leading to serious environmental contamination.

It was experienced in the last year that 2 main Sewage Treatment Plants [WWTP] in northern Israel (Carmiel and Libnim) were stop operating for nearly 3 months during and after the olive harvesting session.

This project main goal was to show proof of concept of the Mobile Integrated Sustainable System and serve the mills at their location.

The Problems caused by OMW

The full system description



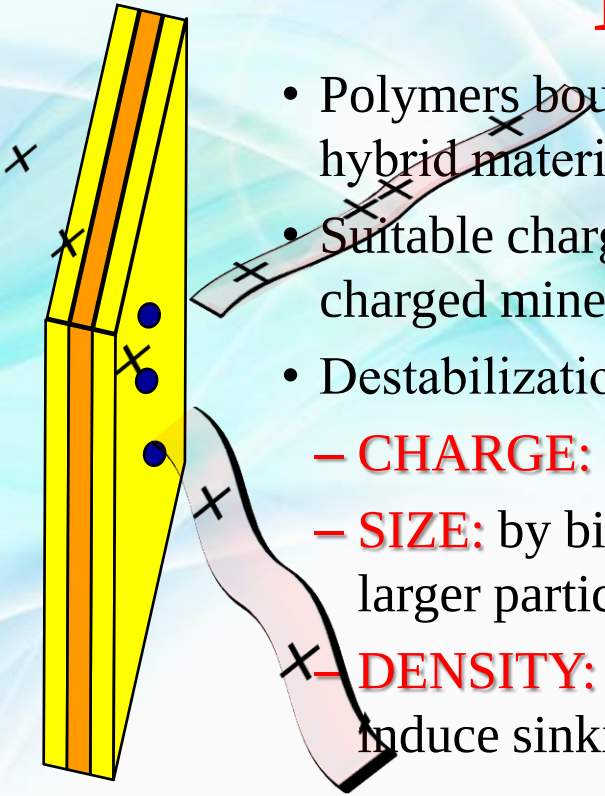
Movie

Suspended Solids

- One of the parameters that make olive mill wastewater (OMW) difficult to treat, is the high content of suspended solids.
- OMW Values range between 10000-100000 mg/L (thus… in some cases 10% of the weight might be suspended solids!)

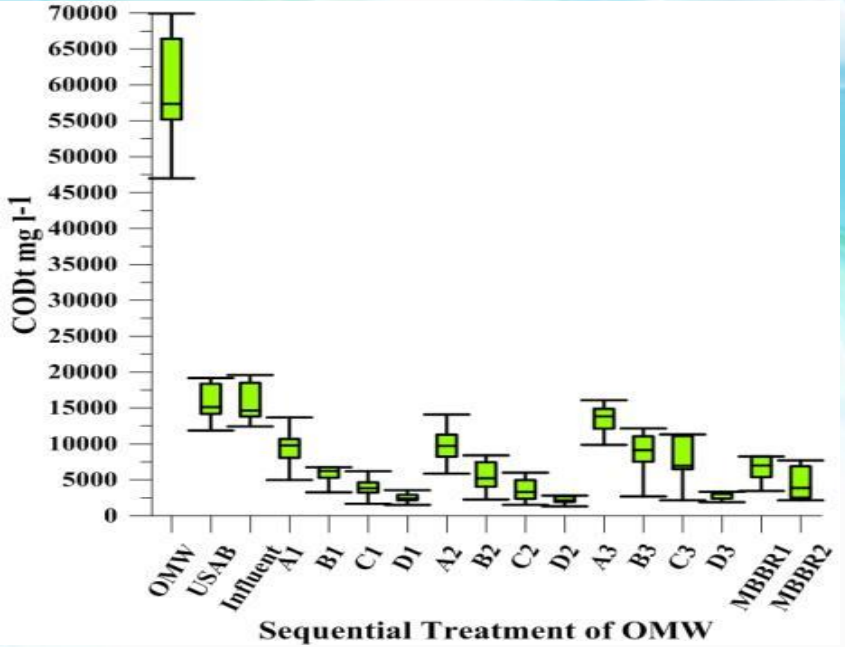
Such large amounts of dispersed colloidal material (erroneously defined as *"suspended"* solids), clog filtering devices, bioreactors and wetlands- requiring pre-treatment

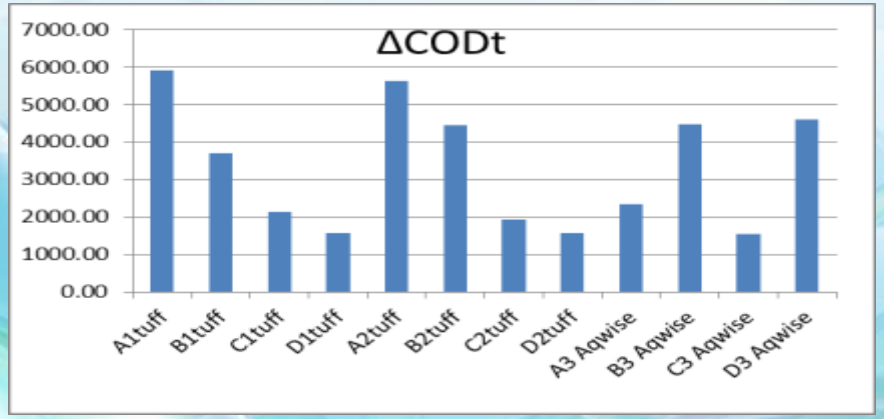
Nanocomposites



- Polymers bound to non-organic materials (as clay minerals) make hybrid materials known as “nanocomposites”
- Suitable charged polymers may bind electrostatically to negatively charged minerals, exposing remaining positive charges to the effluent
- Destabilization of the colloidal dispersion might be achieved, since…
  - CHARGE: The positive charges may neutralize anionic colloids
  - SIZE: by binding several colloids together, (charged and neutral) larger particles are created- reducing the relative drag force
  - DENSITY: Bulk density of the clay act as an anchor that might induce sinking and separation

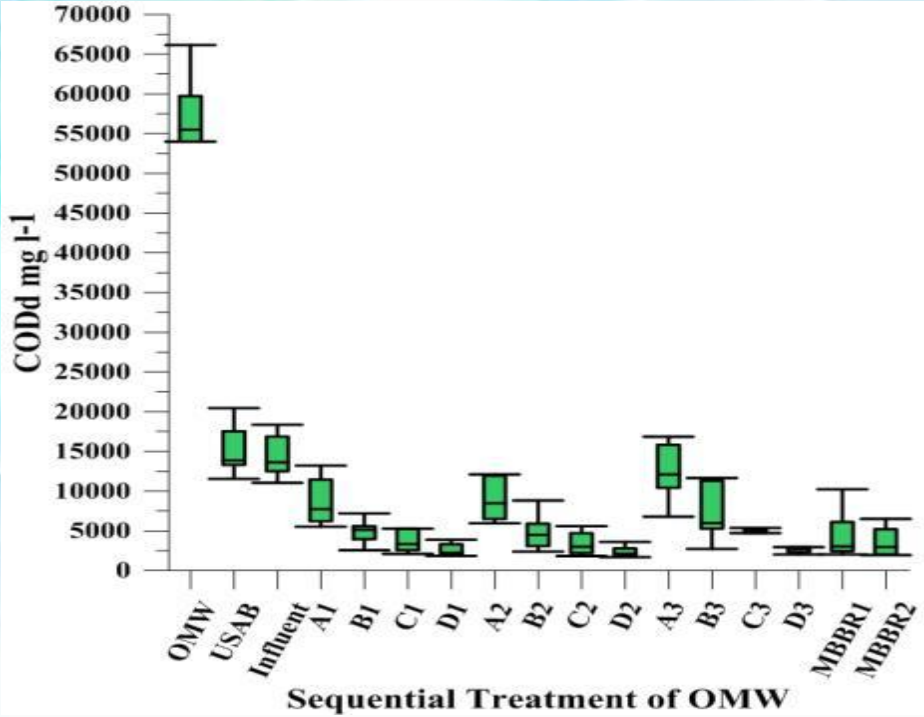
System Performance: CODt Removal

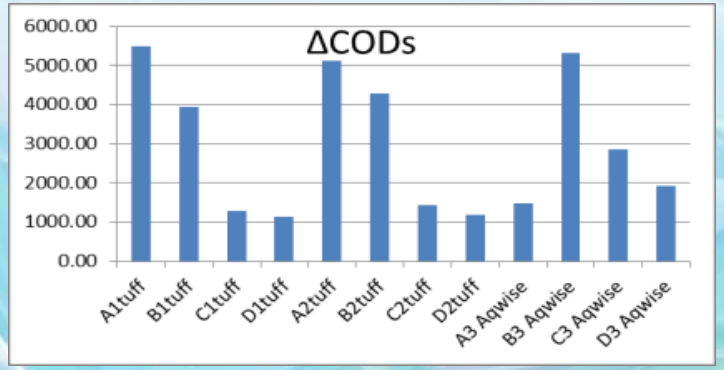




- **Most of the CODt removal occurred in the UASB.**
- **The AC system reduced the COD to pre-determined threshold value 60% of the time.**
- **The tuff substrate performed better than plastic.**

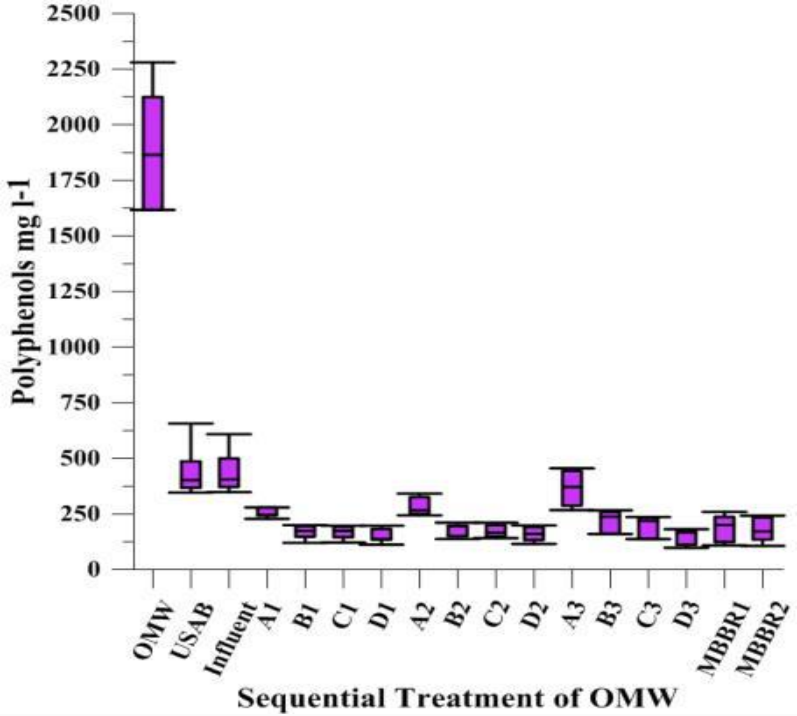
System Performance: CODd Removal

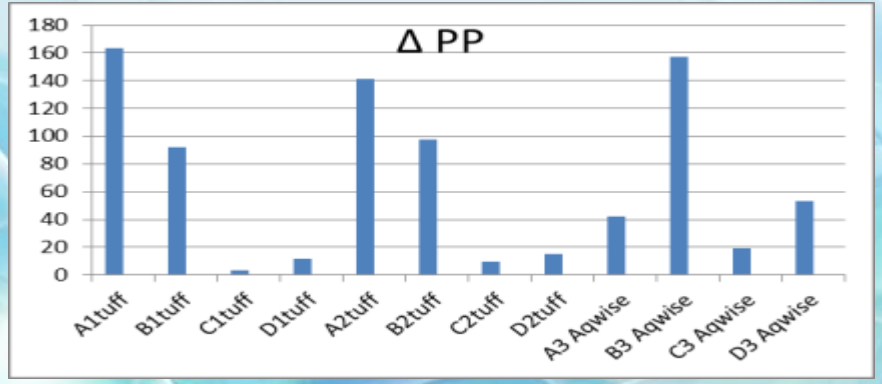




- **Due to efficient pretreatment procedure there is a small difference between CODt & CODd**

System Performance: Polyphenols Removal





- **The aerated cells exhibited limited efficiency in PP removal.**

Combating Clogging: Hoist-Sack solution

- The hoist-sack solution can efficiently reduced the biofilm by aeration outside the cell.

- After 4 weeks of rest the sacks and the tuff are ready for reuse.

Final Goal: Recycle & Reuse of OMW & WW

- We were conducting lysimeters study to evaluate the impact of treated OMW on soil and plant quality.

Results in short

We made some progress and demonstrated that OMW can be treated successfully but we still facing several challenges. The Hydraulic Retention Time was not short enough to enable working at several mills and “use the mobility”. At the present, the OMW treated by MISSTOW can be drained to common treatment facility but cannot be reused directly because of high COD & salinity (SAR) (according to regulations).

Research on thermophilic digestion of OMW

The proposed pilot plant aims to upgrade and implement our experience in an economic approach. We aim at giving services to mills' owners, thus these small enterprises will not invest in their facility. It puts together the processes of settling, anaerobic digestion to produce biogas for use as electricity and heat for the Municipal Sewage Plant, where locating the system, and finally the BAC technology of bio-aerated polishing stage.

Current stage of work

We began with 4 digesters of 20 liters each and now we are operating a system for 2 harvesting seasons with 2 digesters of 4 m^3 each.

Thank you !!!

Prof Uri Marchaim

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