

**1<sup>st</sup> International Conference Desalination and Environment**  
**29 October – 1<sup>st</sup> November**

**Water, Energy, Environmental protection**  
**The immediate needs of Human mankind.**

**Presentation of 3 patents respectful of environmental protection**

**Dr Isaac Behar**

**Biomass SynGas Energy**

**providing**

**• Pure Water production through OsmoGas<sup>®</sup> process for**

- Desalination** of sea water
- Drying** of various biomasses (including wastewater sewage sludge)
- Purification** of polluted water.

**• Renewable Energy production out of biomass through**

- Gasification** of various biomasses (Gasif-Pure<sup>®</sup> Process → production of SynGas (CO + H<sup>2</sup>))
- Cogeneration of heat & Electricity** by Syngas feeding a gas Engine connected to an alternator.
- Biomass liquefaction** → biomass heavy fuel easy to transport and stock.

Biomass heavy fuel → 2<sup>nd</sup> generation of liquid fuel



BIOMASS SYNGAS ENERGY

# OsmoGas<sup>®</sup> basic concept

## OsmoGas<sup>®</sup> (Osmotic process in the Vapor phase)

### Combines

A folded **Vapor Semi-permeable film** (yet waterproof),

A **Vapor proof** and **Waterproof boundary** (for instance Greenhouse wall),

An **Extractor**

A cold area to condense the vapor.

### Two types of OsmoGas<sup>®</sup> Modules :

Rectangular like (as shown in slide 3)

Cylindrical like (as shown in slides 4 & 5)

### Allowing

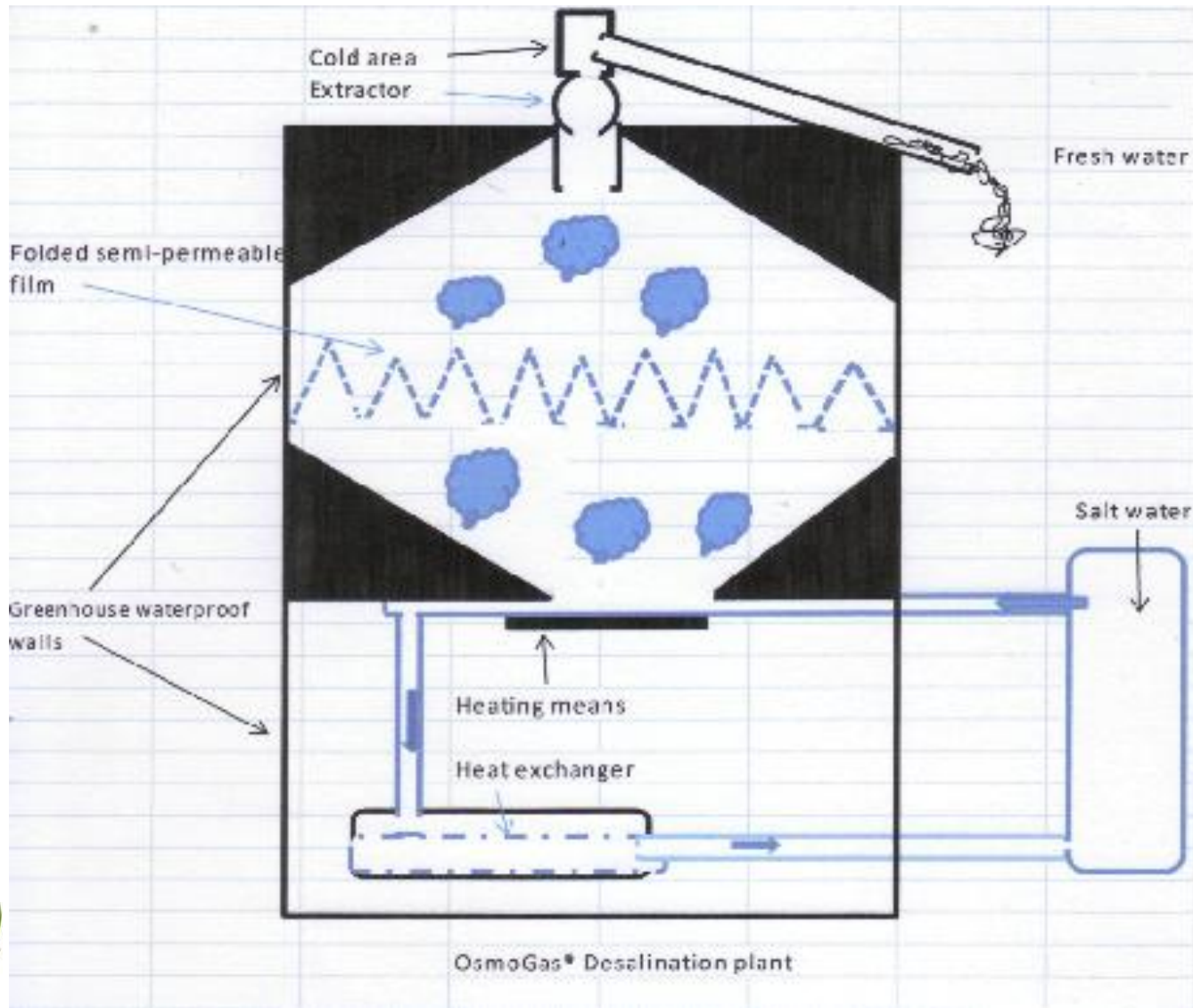
**Continuous fresh water production from salt water**

**Continuous drying of wet biomass**

**Until total dehydration.**



# OsmoGas® New Patented Desalination Concept

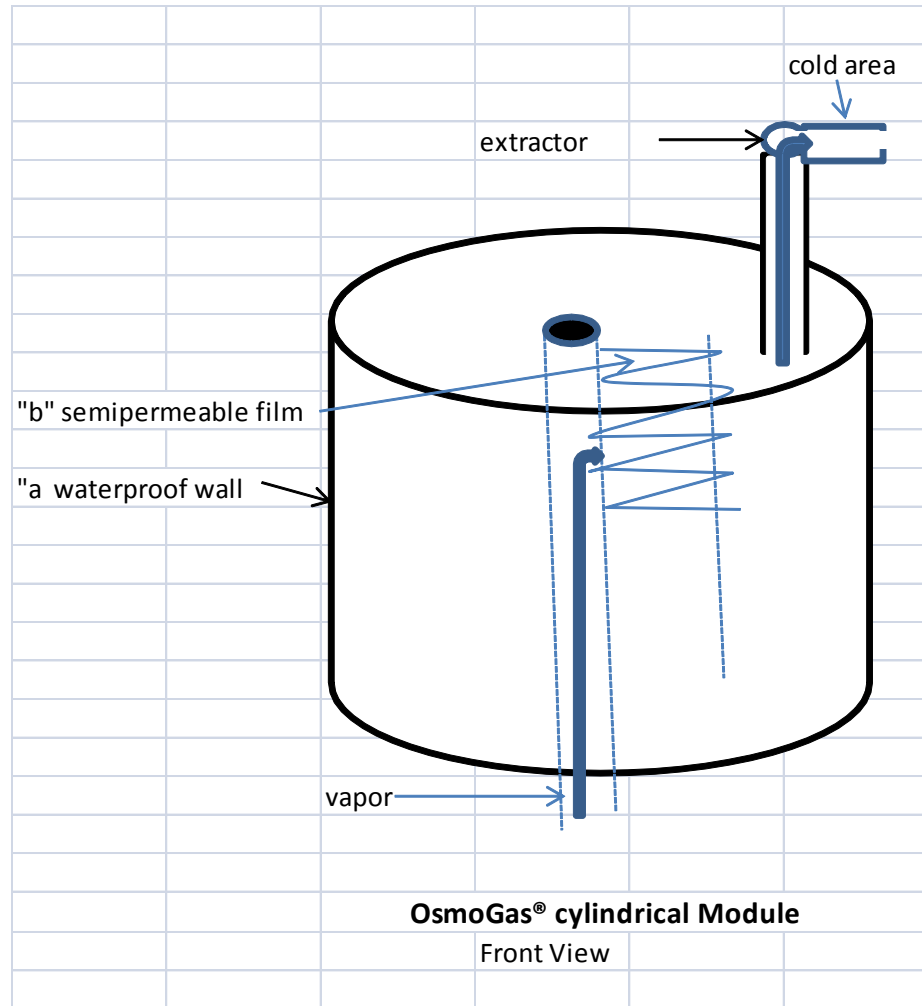


# Influence of water temperature on permeation

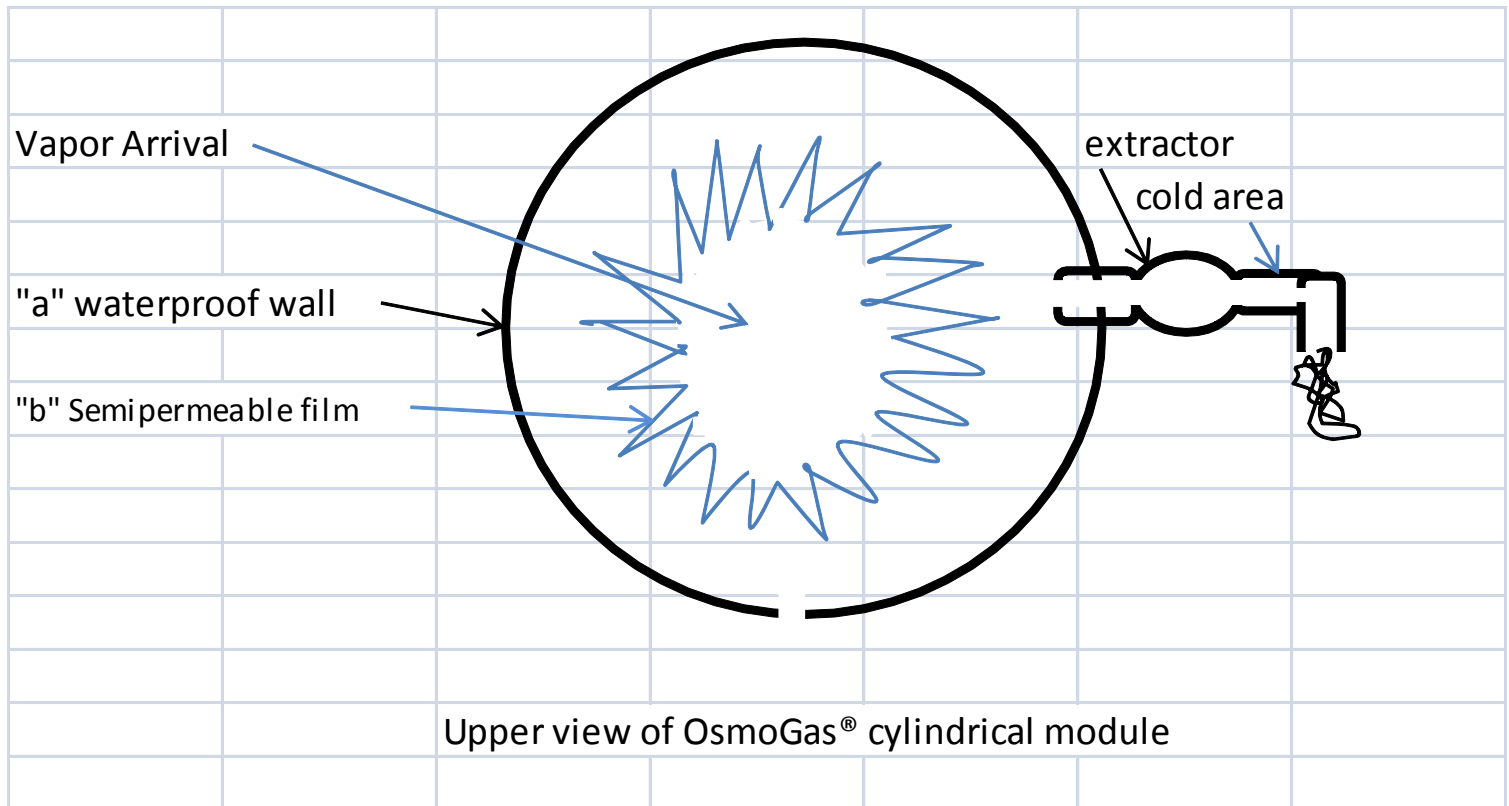
## Ongoing testing program



# OsmoGas<sup>®</sup> Cylindrical-like Module (1)



## OsmoGas<sup>®</sup> Cylindrical-like Module (2)





# Advantages of OsmoGas® patented concept (1)

1. The semi-permeable film is not in contact with the sea water or with the biomass to be dried → no fouling, no attack of the film.
2. Folded semi-permeable film increases tremendously the osmotic surface in both rectangular-like and cylindrical-like modules → increase of osmosis kinetic, of drying yield and of fresh water production yield.

## Rectangular-like module :

Plane surface 2m x 3m → 6m<sup>2</sup> . Folded film 2m high every 5cm → 480m<sup>2</sup>

## Cylindrical like

(D : .30 m H : 1m) outer surface .30m x 1m → .94 m<sup>2</sup>. Folded film every 5° → 19m<sup>2</sup>

(D: 2m H: 3m ) Outer surface → 18.8m<sup>2</sup>. Folded film every 5° → 410m<sup>2</sup>

Vapor Semi-permeable film used in OsmoGas® technology is a breathable, continuous film, constituted of block copolymers consisting of a sequence of polyamide and polyether segments. It is not a micro-porous film.

It is industrially produced for other applications such as protection of wooden houses, combining water resistance and allowing housing structures to breath, thus avoiding mildews in the walls. Also used for medical uses :

**Bacteria and viruses cannot cross the continuous membrane.**



## Advantages of OsmoGas® Patented Concept (2)

**OsmoGas® process has many advantages compared to RO and other desalination techniques.**

1. Use of Free Greenhouse effect.
2. Sea water circulating rapidly → No salt concentration: "*Brine disposal is a real environmental problem*" (Lenntech, RO specialized company).
3. Sea water pre-treatment can be simplified; Water runs through large pipes, not tubular membranes.
4. No possible pollution of fresh water; Bacteria, viruses and other polluting elements cannot cross OsmoGas® vapor semi-permeable continuous membrane.
5. Combination of Sun Energy & OsmoGas® process is Easy.
6. Other Energies could be added to increase Fresh water yield. (Fossil, Wind, Atomic energy)
7. **Combination with Gasif-Pure® cogeneration electric plant**  
→ **Free desalination heat energy.**

**OsmoGas® process has other possible applications :**

1. Purification of polluted water,
2. Drying of brine produced by RO → reduction of RO pollution.
3. Drying of wastewater sewage sludge → **negative value biomass fuel.**

**Improvements of other membrane technologies,  
probably transposable to OsmoGas® process.**



# Gasification & Cogeneration of Electricity & heat

Gasification : conversion of biomass polymers into SynGas ( $H^2 + CO$ )

Process to replace combustion  $\rightarrow CO^2$

Cogeneration : SynGas fuelling a gas Engine coupled with an alternator

$\rightarrow$  Electricity + Heat

## Difficulties of Biomass Gasification :

- Production of Tar  $\rightarrow$  damage of gas Engine
- Production of particles if use of rapid heat transfer fluid ("Flash Gasification").

## Gasif-pure<sup>®</sup> Gasification process solved both problems

A 2m x 4m Gasif-pure<sup>®</sup> double level reactor can process 5T/H of biomass.

In cogeneration it produces 5MW Electricity & 10MW Heat. Yield 85%

Investment cost 10M€.

Pellets price 65€/T., Electricity sold on the Grid 125€/MW., Heat price 25€/MW

## RETURN ON INVESTMENT (ROI)

Electricity & Heat sold  $\rightarrow$  2.3 years

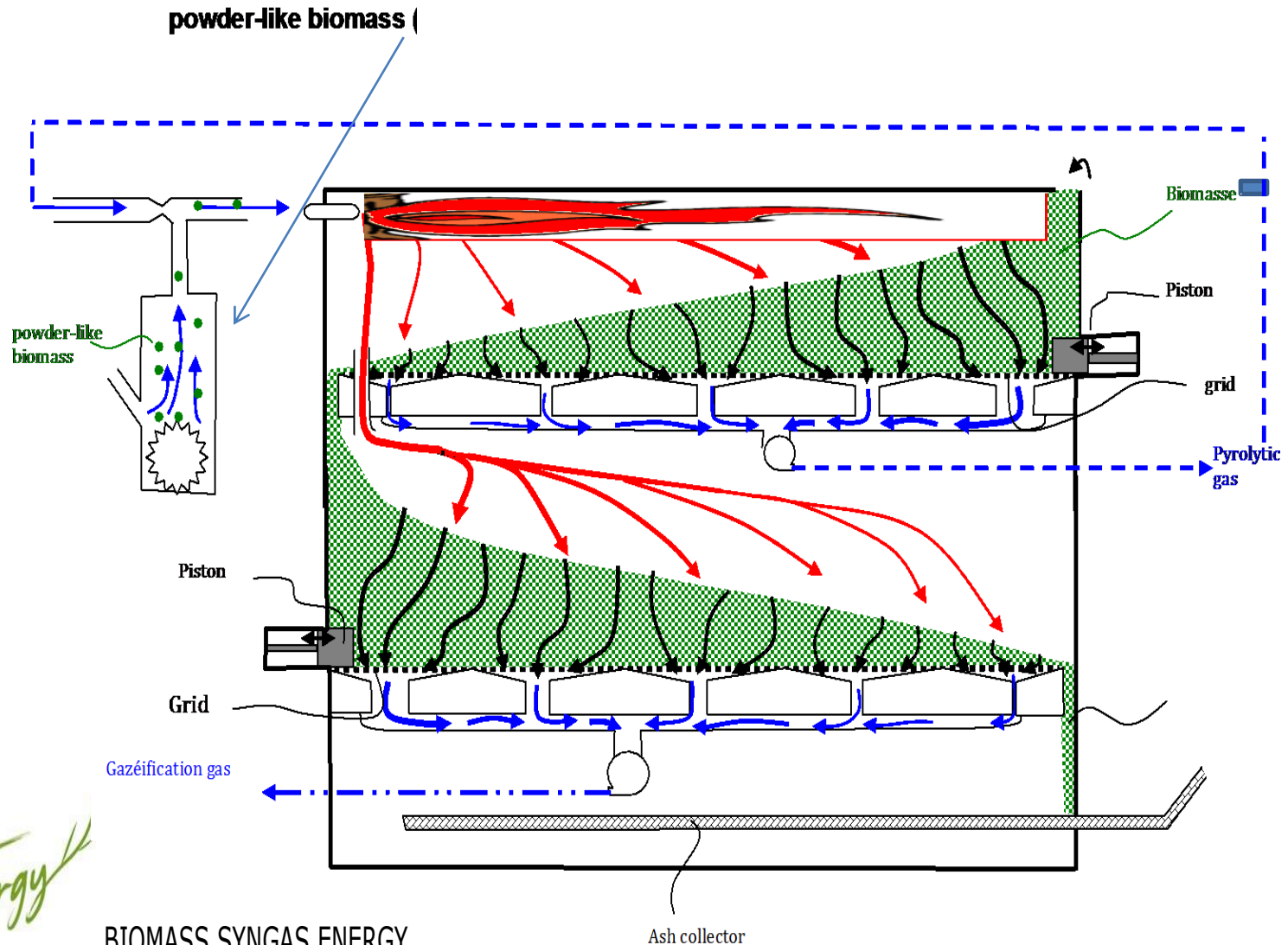
Only Electricity sold  $\rightarrow$  4.02 years

Extra income over following 16 years for a standard 20 years contract 69,7M€

**Heat, a possible free Energy sub-product of Electric Production.**



**Double level Gasif-Pure® Gasification Reactor for Solid & powder-like biomass**  
**Tar pollution of SynGas, solved by Gasif-Pure® pyrolytic gas cracking,**  
**Particle pollution (when flash gasification) solved by combining solid and powder-like biomass.**



# Combined Gasif-Pure® Gasification and Liquefaction reactor.

## Biomass Liquid Crude Oil produced by Flash Pyrolysis

It can be produced by a Combined Gasif-Pure®  
**Gasification /Flash Pyrolysis** Reactor.

Biomass Crude Oil is easier to transport and stock.

It can be transformed into selected second generation liquid fuel by applying fossil oil refinery technologies to Biomass Crude Oil .

### •Gasification functioning

VB & VC Closed

Vg opened

### • Flash Pyrolysis functioning

Vg Closed

V B & VC opened

## Combined Reactor

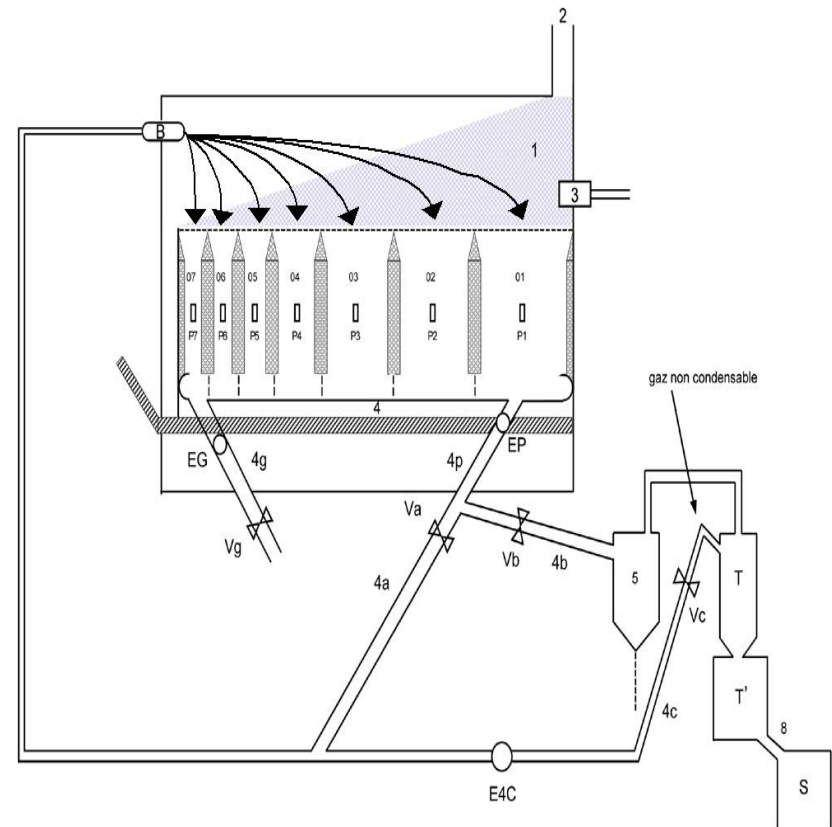


Fig. 4

## Presentation of Isaac Behar (IB)

- **A Scientist by education** ( PHD – CNRS – France).

More than 20 patents bare my name as inventor or co inventor in different industrial fields .

- **An industrial manager by experience** having spent my whole career in several industries where I have been in charge of R&D, Quality Control, Strategic Development, CEO.
- **An Entrepreneur by experience and gust**, having created several Start Up companies one of them having been

### An international Success Story.

In 1971 I started Coflexip as CEO on behalf of large Industrial French Groups (Total, ELF, IFP, Steel industry) to industrialize a new , innovative breakthrough flexible pipe concept, to produce offshore oil.

- **Initial Turnover 0 → \$100M in 10 years**
- **subsidiaries set up in ABU Dhabi, Brazil, GB, Japan, Singapore, US.**
- Some years ago Coflexip merged with Technip, the largest French Engineering Company.
- **Merged company occupies 75% of the world market which grew constantly**

### My new Challenge

**Develop rapidly to the industrial stage the three patents I own**

**Thus contributing to human mankind needs**

**Water & Energy in compliance with Environmental Protection**



# **Water, Energy, Environmental protection. Available opportunities**

- **Participate in an international R&D consortium to develop the 3 patented technologies and acquire rights.**
- **Invest in Biomass Syngas Energy and share exclusive rights on all patents.**
- **Acquire non exclusive patent rights on one or several patents.**

**IF INTERESTED**

**Mail your option to**

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BIOMASS SYNGAS ENERGY

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