



# Plenum Systems

By Scott Morell

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# Plenums

- "Jaubert's method" or "Monaco System"  
Developed by Dr Jean Jaubert at the University of Nice in 1989
- "Natural Nitrate Reduction" (NNR) Phrase  
coined by Bob Goemans

# Plenums

- *"I believe that a nearly complete recycling can be achieved in a reef tank equipped with a plenum. A coral community has been thriving for 5 years without any change of water in the tank I have been keeping for 17 years at the University of Nice. The tank had only 3 inputs: light, food and freshwater (compensation for evaporation). (Jaubert, 2002)"*

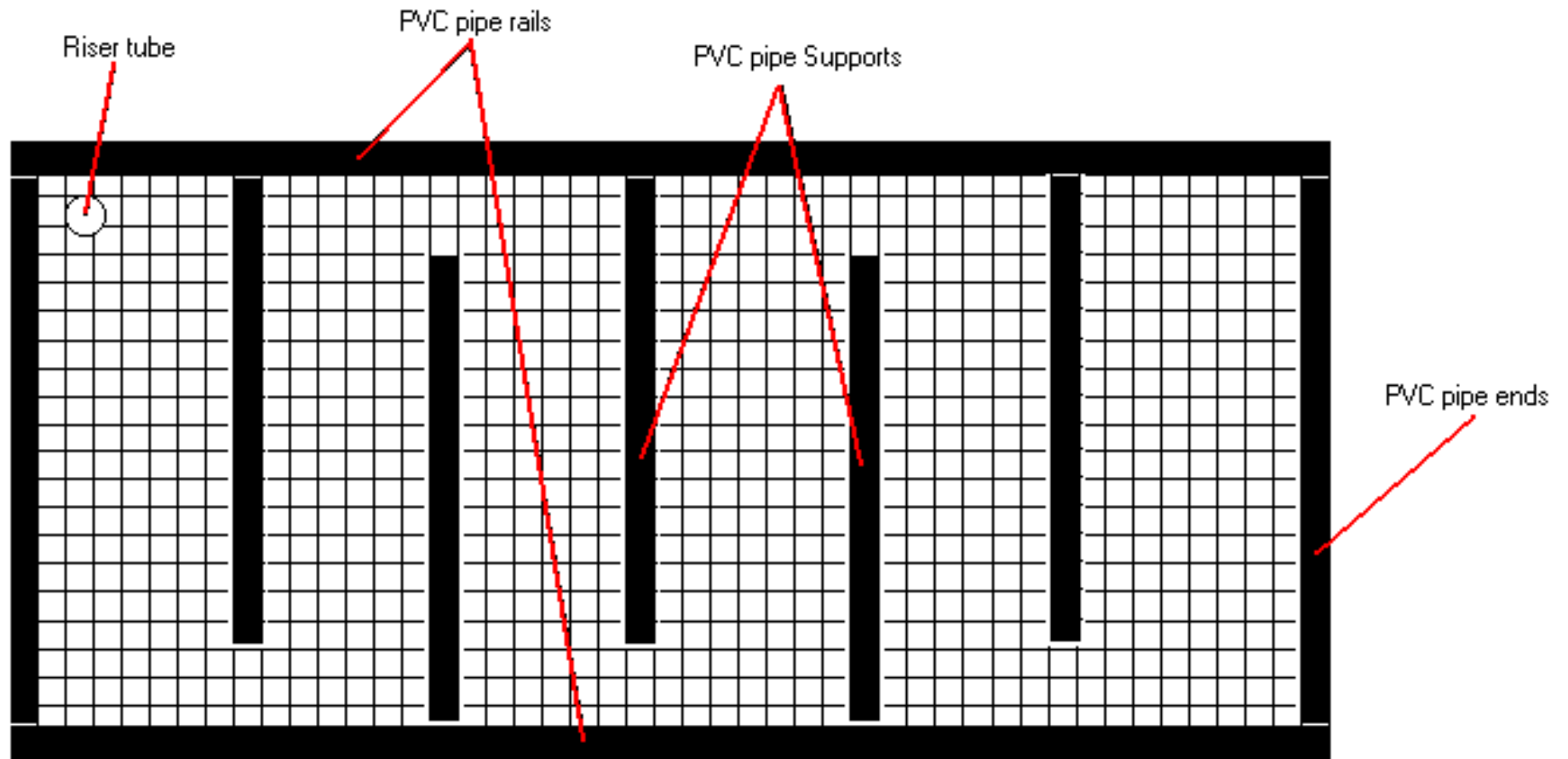
# Plenums

- Both nitrification and denitrification occur within a thick layer of gravel suspended over and in contact with a "void space" of water on the bottom of the aquarium.

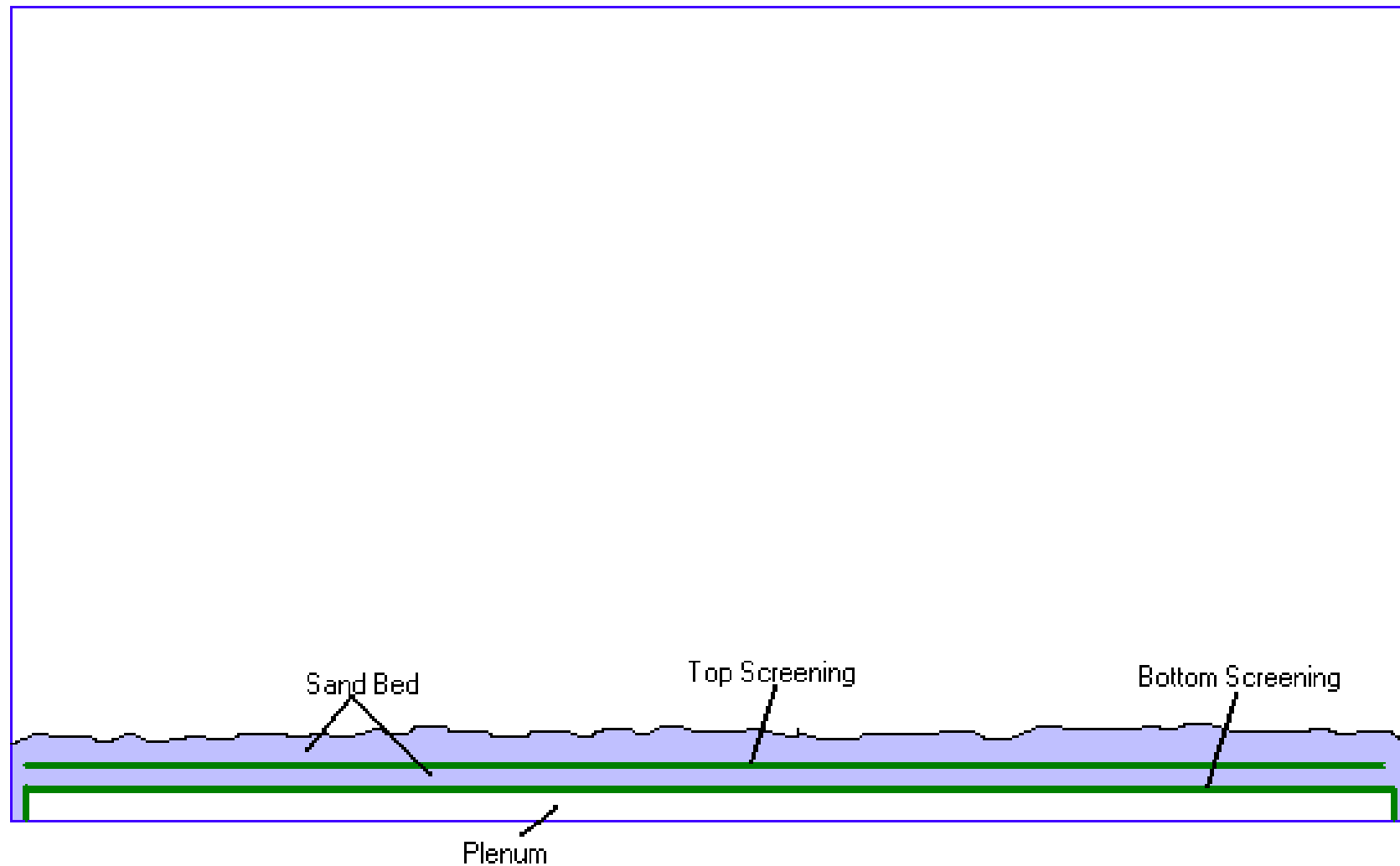
# Plenum Construction

- Plenum Frame covered with fiberglass screening
- 2 inches of a coarse substrate 1 to 5 mm in diameter
- Layer of fiberglass screening
- 2 more inches of a coarse substrate 1 to 5 mm in diameter

# Plenum Construction



# Plenum Construction



# Plenums - How do they work???

- The tank water is positively charged
- The substrate is negative with increasing magnitude with depth
- The plenum water has slightly positive charge
- This difference of potential slowly moves the water through the anoxic zones of the plenum.

# Plenums

- Assimilatory denitrification (Fair)
  - occurs in anaerobic areas
  - nitrate is reduced 'only' to that of ammonium, no further
- Dissimilatory denitrification (Best)
  - occurs in zones having a small amount of oxygen (anoxic)
  - fully oxidizes nitrate back to nitrogen gas

# Plenums – Things to keep in mind

- Keep 75% of the substrate exposed
- Use a coarse sand like Caribsea Crushed coral or Sea-Flor Special Grade. Avoid the fine sand trap
- Substrate should be an average of 4 inches thick.

# Plenums – Links

- Plenum Calculator - [www.garf.org](http://www.garf.org)
- Salt Corner – [www.saltcorner.com](http://www.saltcorner.com)
- FAMA - [www.famamagazine.com](http://www.famamagazine.com)

# Plenums – Books & Magazines

- *The New Wave: Aquarium Husbandry-A More Natural Approach* (Goemans/Gamble)
- *Live Sand Secrets* (Goemans)
- Sand Mail column in *Freshwater And Marine Aquarium* -  
[www.famamagazine.com](http://www.famamagazine.com)

# Plenums

- Pros –
  - Able to keep critters that will normally decimate the Life in a DSB
- Cons –
  - Ugly (So build a remote plenum)