COMMON CONTAMINANTS

There are five types of contaminants you want to remove from municipal tap water:

- **Volatile Organic Compounds** (pesticides, herbicides, etc.)
- **Heavy metals** (Lead, Mercury, Aluminum, Cadmium, Chromium, Copper)
- **Bacteria and viruses** (Giardia and Cryptosporidium)
- **General Sediment**
- **Fluoride**

In terms of personal health **Chlorides & VOCs** are the most toxic contaminants commonly present in municipally treated drinking water.

PROBLEMS WITH EXISTING WATER FILTER SYSTEMS

- There is really no need for elaborate filtration systems like reverse-osmosis or distillation because they
  - Are expensive
  - Are not needed when filtering tap water
  - Remove useful minerals from water
  - Give water a ‘flat’ taste due to the lack of minerals and oxygen.

- Moreover there is 60% wastage in reverse osmosis process.

FEATURES OF THE SUGGESTED FILTER

- Compact design
- Unique
- Cost efficient
- Portable
- No boiling required
- Easy to maintain
PROCESSES USED

Stage 1: Chemical Stage I
Stage 2: 5 Micron filter
Stage 3: Pre Filter Carbon
Stage 4: 1 Micron filter
Stage 5: Chemical Stage II
Stage 6: Ultra-violet lamp
Stage 7: Post filter carbon
Stage 8: 0.2 Micron filter
Stage 9: Refrigeration

DESIGN

Features:

- Material used: Plastics to make it light and corrosion free.
- Top down design to take advantage of gravity.
- Flexible design so that containers can be easily removed and put back.
- Easy to carry.
- Can be customized
STAGES

STAGE 1: CHEMICAL STAGE I

In this stage the raw water is treated with chlorinating agents which may be anything such as Calcium hypochlorite, Sodium hypochlorite, chlorine dioxide or halazone tablets.

Advantages:

✔️ Eliminates slime bacteria,moulds, & algae that grow commonly in water supply reservoirs
✔️ Destroys pathogens causing water borne diseases like cholera, typhoid, dysentery etc
✔️ Affordable and is easily available for disinfection.

STAGE 2: 5 µM CANDLE

Function: Polypropylene filter for removal of sand, silt, dirt and rust particles. Impure water will enter from outside and pure water will be collected inside.

Caution: Maximum water temperature 65°C

STAGE 3: PRE FILTER CARBON

This carbon filter removes from the water and make it safer.

➢ Odors, bad tastes
➢ Chlorine, pigments, agricultural chemicals and detergents.
➢ Carcinogens like THMs
➢ Dissolved organics and chlorine effectively
➢ Heavy metals like Mn, As, Pb, Hg etc.
Type of Activated Carbon used

- Granular activated carbon
- Grain size-12x40

- Due to its high degree of micro porosity, just one gram of activated carbon has a surface area of approximately 500 m².
- These micro pores provide superb conditions for adsorption to occur, since adsorbing material can interact with many surfaces simultaneously.
STAGE 4: CHEMICAL STAGE II

- **Treats:**
  
  i. Tap Water
  ii. Hand Pump Water
  iii. Overhead Tank Water

- Ensures hygienic quality, effective bactericidal activity in water.
- Disinfects water from Bacteria, Fungi, Yeasts, Algae, some Viruses and protozoa.

**Composition of Chemical Stage II**

- P-Dichloro sulfamoyl benzoic acid
- Ion-exchange resin
- Silver beads

**Benefits**

i. Improves taste of water
ii. Prevents scaling in side pipe lines.

STAGE 5: 1 µM CANDLE

**Function:** Polypropylene filter for removal of finer sand, silt, dirt and rust particles.

- *E. coli* is removed because the pore size is small enough to capture the *E. coli*.
- In addition, a significant fraction of total coliform and fecal coliform are removed.

**Caution:** Maximum water temperature 65°C
**STAGE 6: ULTRA-VIOLET LAMP**

- Removes disease-causing bacteria, viruses, algae, fungi, and protozoa from water.
- High doses of UV light at a wavelength of 254 nanometers destroys pathogenic microbes by disabling their reproductive process.
- UV light deactivates the bacteria for 72 hours.

**STAGE 7: POST FILTER CARBON**

This filter:

- Rejects the objectionable taste and odor to enhance the quality of the final drinking water.
- Absorbs gases in the treatment of flatulence, indigestion, dyspepsia and intestinal distension.
- Reduces the amount of arsenic in drinking water upto 40 - 70%.
- Removes 99% of the chlorine and organic chemicals.
STAGE 8: 0.2 µM FILTER

STAGE 9: REFRIGERATION

Steel Tumbler
Earthen Pot
Sand & Gravel
PROTOTYPE

TECHNICAL SPECIFICATIONS

Flow rate: 10 liters per hour
Position of pump with respect to base - same level as top
MULTI SITUATIONAL USE

- Can be used in homes with UV to give maximum pure water.
- Can be taken for camping by detaching U.V.
- Can be used in villages to save millions of lives at almost no cost.

Hence it targets every kind of customers and can be part of your live which you can carry with you anywhere.

COST BREAK-UP

Utility 1

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>PRICE (in Rs)</th>
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<tbody>
<tr>
<td>5 um candle (5 cm)</td>
<td>30</td>
</tr>
<tr>
<td>Resin + Chemicals</td>
<td>30</td>
</tr>
<tr>
<td>1 um candle (5 cm)</td>
<td>35</td>
</tr>
<tr>
<td>UV-lamp</td>
<td>250</td>
</tr>
<tr>
<td>Carbon</td>
<td>25</td>
</tr>
<tr>
<td>0.2 um candle (5 cm)</td>
<td>35</td>
</tr>
<tr>
<td>Containers(6)</td>
<td>100</td>
</tr>
<tr>
<td>Nozzles, washers, sealent</td>
<td>20</td>
</tr>
<tr>
<td>Teflon Tapes</td>
<td>5</td>
</tr>
</tbody>
</table>

Total: 268

Utility 2

When taken for camping, or used in villages where there is no source of electricity and similar situations:

<table>
<thead>
<tr>
<th>component</th>
<th>price</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 um candle</td>
<td>30</td>
</tr>
<tr>
<td>resin + chemicals</td>
<td>30</td>
</tr>
<tr>
<td>1 um candle</td>
<td>35</td>
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<tr>
<td>carbon</td>
<td>12.5</td>
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<td>pipes, containers(6)</td>
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<tr>
<td>.2 um candle</td>
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<tr>
<td>nozzles, washer, sealent</td>
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<tr>
<td>teflon tape</td>
<td>5</td>
</tr>
<tr>
<td><strong>total</strong></td>
<td><strong>268</strong></td>
</tr>
</tbody>
</table>
OPERATION AND CLEANING

- Can work with or without electricity making it dual purpose.
- Each process is fully detachable and hence can be cleaned and replaced even by the user.
- Water enters into candle from outside and hence candle can be easily cleaned, increasing the life of the candle.