# **Point of Entry/Point of Use** Water Treatment Systems

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Most common is a water softener.

the home).











# **POU System Styles**

- Personal water bottle with filter
- Pour through filter with pitcher
- ♦ Faucet Mounted Filter with diverter.
- ♦ Counter top manual fill system.
- Counter top system connected to sink faucet.
- Plumbed into sink faucet.
- Plumbed into separate tap.





















#### Regulation of POE/POU Devices

- Generally fall under the scope of the *Hazardous Products Act*.
- No specific regulation applicable to these devices under the Act.
- False or misleading claims prohibited under the Consumer Packaging and Labelling Act and the Competition Act, both administered by Industry Canada.
- Medical claims regulated by Medical Devices Regulations of the Food and Drugs Act.



#### What POE/POU Devices are Recommended?

- Health Canada does not recommend specific treatment devices
- Health Canada has worked closely with the NSF International to develop performance standards for water treatment devices.
- Units are certified as meeting the applicable ANSI/NSF health based performance standards.
  - There are six standards



## What POE/POU Devices are Recommended? (Con't)

NSF/ANSI 42 - Drinking Water Treatment Units-Aesthetics

NSF/ANSI 44 - Cation Exchange Water Softeners

NSF/ANSI 53 - Drinking Water Treatment Units-Health Effects

NSF/ANSI 55 - Ultraviolet Microbiological Water Treatment Systems

NSF/ANSI 58 - Reverse Osmosis Drinking Water Treatment Systems

NSF/ANSI 62 - Drinking Water Distillation Systems



## POE/POU Treatment Technologies

- ▲ Adsorption Filters
- Reverse Osmosis Systems
- Water Softeners
- Distillation Systems
- Ultraviolet Disinfection Products



# POE/POU Treatment Technologies

#### Adsorption

- Physical process occurring when liquids, gases, or dissolved or suspended matter adheres to the surface of, or in the pores of, an adsorbent medium
- Most commonly used technology
- Used to improve taste, smells, appearance (NSF 42)
- Generally more effective in removing organic chemicals than inorganic chemicals (NSF 53)
- Combined with other treatment processes



#### Limitations of Adsorption Carbon Filters

- Can become saturated with chemical contaminants which can be released in the water at high concentrations
- Bacterial growth a concern
- Use only on municipally treated water or other supply known to be microbiologically safe



#### **Limitations of Reverse Osmosis**

- A Reject water volume a concern.
- Membranes have different removal rates for turbidity, DOC, and colour (requires bench or pilot scale testing).
- Calcium hardness a concern.
- Barriers to micro-organisms such as Cryptosporidium, Giardia, bacteria and viruses vary with the membrane types (disinfectant required to maintain residual)



#### **Limitations of Ion Exchange**

- Increases the sodium concentration of water (individuals on sodium restricted diets should consult with their physician before consuming "softened" water.)
- Increases the aggressive nature of the water

## POE/POU Treatment Technologies

#### **Distillation Systems**

- Distillation systems heat water to the boiling point and then collects the water vapour as it condenses.
- Contaminants left as waste.
- Bacteria is destroyed by the heat



# Limitations of Distillation Systems

- Volatile organic chemicals may be carried over with the water vapour
- Limited water volume production
- Power consumption and noise



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## POE/POU Treatment Technologies

#### **Ultraviolet Treatment (UV)**

- UVdisinfection refers to disinfecting water with UV Radiation of 254 nm wavelength, a band of radiation located just beyond the visible light spectrum
- UV radiation is absorbed by the cells of microorganims
- UV radiation damages the genetic material in such a way that they organisms are no longer able to grow or reproduce, thus ultimately killing them

## Advantages of Using POE/POU UV Disinfection

- No chemicals are added to the water, therefore the water retains its natural flavour and odour
- There are no known health by-products
- The process is not affected by ammonia and pH
- The disinfection process is rapid, and therefore a "detention time" is not required

# Disadvantages of POE/POU UV Disinfection

- The process does not provide a residual to protect the water quality in the distribution system
- Secondary disinfection with chlorine required?
- More frequent sampling for bacteriological quality is typically required
- The equipment is generally considered as moderately complex and of fair to good reliability.



#### **Comparison with Chlorine**

#### Advantages of using chlorine

- Provides a residual disinfectant in the distribution system which protects the bacteriological water quality in the distribution system. (This is very important)
- Daily monitoring of the chlorine residual, when there are no known concern, can be used to indicate that the bacteriological quality is satisfactory.
- The equipment is generally considered as being simple to use and of good reliability.



#### Common Water Quality Problems

- Aggressive Water
- Arsenic
- Chloride
- Hard Water
- Hydrogen Sulphide
- Iron and/or Manganese
- Iron Bacteria



- Lead
- Sodium
- Sulfate
- Turbidity
- Uranium
- VOC
- Zinc



#### **Aggressive** Water **Potential Source** • - natural conditions in surface water **Problems** \_ metallic taste (first flush) deterioration of pipes \_ greenish stains (copper pipes) \_ lead poisoning (lead services, solder, brass) \_ Example of corroded piping copper poisoning (copper pipes) \_ Corrective Measure - make water less aggressive Restriction ٠ higher pH may result in precipitation of iron and manganese \_ increased colour and turbidity if not filtered \_ preferred treatment at source \_

#### Arsenic **Potential Source** • - naturally occurring - man made (dug well) • Problem - medical (symptoms depend on arsenic concentration and length of exposure) **Corrective Measure** • - construct a new well (drilled vs dug) \_ ferric hydroxide unit reverse osmosis (NSF 58) \_ activated alumina \_ distillation (NSF 62) \_





#### Hydrogen Sulphide **Potential Source** • - occurs naturally in groundwater - caused by plugging the air vent in drilled wells \_ electric hot water heaters **Problems** - rotten egg smell and taste tarnish silver and copper \_ corrodes plumbing \_ **Corrective Measures** check air vent \_ chlorination-filtration unit \_ \_ greensand filter (NSF 42) \_ aeration \_ disinfection of hot water heater replace/remove hot water sacrificial rod (hot water problem only) \_ Restriction • - removal of sacrificial rod voids heater warranty





# Lead

#### Potential Source

- piping (aggressive water)
- galvanized well liners (contain impurities)
- soldering
- Problem
  - lead poisoning
- Corrective Measure
  - raise pH (Langlier Index)
  - remove source of lead
- Comment
  - Lead not listed by NSF under common contaminant













