

POU/POE Technologies  
Available For Compliance  
Requirements

# Contaminants

- Inorganic Chemicals
- Synthetic Organic Chemicals
- Radium & other Radionuclides
- Microbials (POE Only)
- Volatile Organics (POE Only)

# ANSI/NSF Standards

- Std 44 – Water Softeners
- Std 53 – Filters - Health Effects
- Std 55 – UV Systems
- Std 58 – RO Systems
- Std 62 - Distillers

# Types of POU Products

- Personal Water Bottle
- Pour through Pitcher
- Countertop connected to Sink Faucet
- Faucet attached Filters
- Plumbed In Units
- Plumbed In Units with Separate Faucet



# INORGANIC CHEMICALS

# Inorganics Inculded in these Standards

Arsenic, Asbestos, Barium, Cadmium,  
Copper, Fluoride, Chromium (Hexavalent  
& Trivalent), Lead, Mercury, Nitrite &  
Nitrate, Radium 226/228, Selenium

# POU/POE Technologies for Inorganics

- Water Softener – Barium & Radium Only
- Media Filters – Arsenic, Asbestos, Lead, & Mercury
- RO – All Inorganics
- Distillers – All Inorganics Except for Asbestos & Radium (Not covered presently in Std 62)

# POU Products Certified for Inorganic Reduction By NSF Intl

Type	# of Companies	# of Products
Softeners (POE)	3	43
Media Filters		
Asbestos	12	61
Lead	23	101
Mercury	10	37
RO Units for most Inorganics	23	86
Distillers	3	24

# POU Reverse Osmosis systems and Filters



# POU Distillers

# ANSI/NSF Standard 62

- Chemical Reduction with TDS Reduction as Surrogate
  - Arsenic, Barium, Cadmium, Chromium, Copper, Lead, Nitrite and Selenium
- Fluoride and Mercury not included and must be tested separately to make the reduction claim

# Automatic Feed Single Effect

- Most POU distillers fall into this category of Automatic feed single effect
- Can vary greatly in size, design and controls
- Produce about one gallon of distilled water per 3 kilowatt/hours of electricity
- Can be water or air cooled

# Automatic Feed Single Effect



# SYNTHETIC ORGANIC CHEMICALS

# Synthetic Organic Reductions Included in Standard 53

- Chloroform Reduction as a surrogate for these synthetic organics:

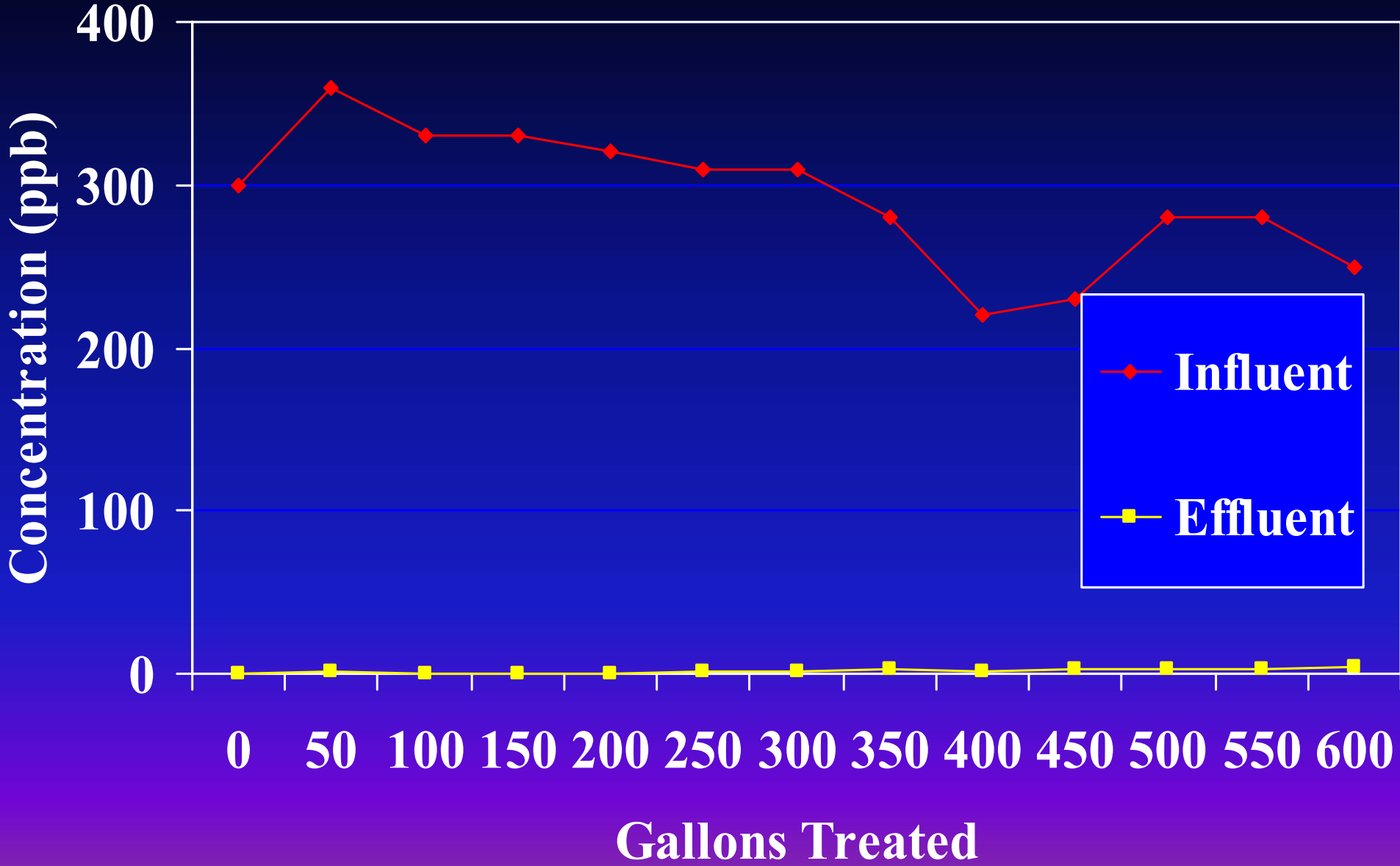
Alachlor, Atrazine, Carbofuron, 2,4-D, Dibromochloropropane, Dinoseb, Endrin, Ethylene Dibromide, Heptachlor, Heptachlor Epoxide, Hexachlorocyclopentadiene, Lindane, Methoxychlor, Pentachlorophenol, Simazine, 2,4,5-TP (Silvex) along with several volatile organics

- The Following can be tested by itself separately:  
Chlordane, PCBs, Toxaphene

# Surrogate Testing With Chloroform

- 300 ppb chloroform in the influent water to be reduced to below 15 ppb in the effluent water during the entire test.
- A unit with end of life indicator is tested for 120% of its claimed life.
- An example of an actual test of a unit with a claimed life of 500 gal with a shut off device is shown here.

# Life Test



# Products Certified by NSF Intl For Organics

- For Synthetic Organics Reduction (by VOC surrogate test):
  - 16 companies and 58 products
- For Chlordane, PCBs, & Toxaphene Reduction Claims:
  - 2 companies and 20 products

# RADIONUCLIDES

# Radium Reduction By Ion Exchange

➤ Relative affinity of ions for cation resins:

Radium      13.0

Barium      5.8

Calcium     1.9

Magnesium  1.67

Sodium     1.0

# Radium & Barium Reduction

- 33 Water Softeners made by 3 companies have been certified for such reduction by NSF Intl
- A steady state of operation is achieved for Radium sorption when a Softener is operated in normal fashion
- Radium never breaks through before Hardness in all of the experiments conducted by Dennis Clifford and his coworkers. This has also been substantiated by Vern Snoeyink's work at University of Illinois

# POE Water Softeners



Series 3000  
Remote Monitor

SERIES  
4000



# POU Products For Radionuclides Reduction

- POU RO & POU IE recognized by EPA as Available Compliance Technologies for Small Systems for the Reduction of Radium and all the other Radionuclides
- Many POU RO have been certified for Radium Reduction by NSF (147 products by 33 companies)
- No Known POU IE Products currently in the Market. Also No Protocol in Std 53 or Std 44
- No Protocol for other Radionuclides in any of the Standards at this time

# MICROBIOLOGICAL CONTAMINANTS

# Microbiological Purification

- New Comprehensive ANSI/NSF Standard for all Microbial Issues in Development
- Cyst Reduction Covered in Std 53
- Std 55 & Std 62 Cover Specific Aspects of Microbial Issues
- Std 55 recently updated using MS2 as a surrogate for validation of UV Units
- Std 62 uses *B.subtiles* as a surrogate to validate the capability of a distiller

# EPA Guide Standard & Protocol

- Drafted in 1987. Covers Halogenated Resin, UV, and Ceramic Filters. Has become the reference Guide in this area
- Uses *Klebsiella terigena*, a mixture of polio & simian rota viruses, and Giardia (Crypto) Cysts as Test Organisms
- Requires reduction of 6 logs of bacteria, 4 logs of viruses, and 3 logs of cysts under a set of operating conditions of water quality and sequence of cycles and sampling

# Standard 55 – UV Units

- Uses MS2 Bacteriophage and Verifies the UV Dose at the set point to be no less than 40 mJ/sqcm for Class A Performance. Requires the use of UV Sensors for sounding an alarm when not effective
- This Dose level has been universally accepted as capable of yielding more than 4 log Inactivation of Viruses, 6 logs of bacteria, and 3 logs of Crypto & Giardia
- Units certified for Class B are to be offered only for Aesthetic Improvement

# UV Units Certified by NSF Intl

- Only 5 POE products made by 3 companies have been listed as of now.
- No POU Products carry such certification
- Certified POE Products have been verified to be operable at flow rates ranging from 8 to 18 gpm, appropriate for single home point of entry applications

# Purifier Protocol Testing

- Outside the Standard Related Activity, NSF and many Universities such as U of AZ and U of S FL offer Performance Tests using the Guide Protocol as the general Basis
- Shown are the Actual Data from tests done by U of AZ on a POU Distiller Product & a POU UV Product

# Purifier Test Data- Distiller

- BACTERIA >99.9999  
E.coli, S.typhimurium,  
S.dysenteriae, C.jejuni,  
Y.enterocolitica,  
V.cholerae, M.fortutium,  
K.teregena
- VIRUSES >99.9999  
HAV, Adeno type2,  
Polio, Simian rota >99.99
- CRYPTO >99.9

# Purifier Test Data- UV UNIT

- BACTERIA >99.9999  
E.coli, S.typhimurium,  
S.dysenteriae,  
V.cholerae, K.teregena
- VIRUSES >99.999  
Polio & simian rota
- CRYPTO & GIARDIA >99.9

# Volatile Organics

- EPA's Limitation is to use only POE for VOC Reduction due to concerns about dermal and inhalation related risks
- There are no POE units tested and certified for VOC Reduction by any of the testing agencies at this time

# POE Water Filters

**ESD518**



**IRONFILTER**



**ETF2100**



# Other Technologies

- POE Aeration for Radon and other Volatiles
- POE Anion Exchange for Nitrate & Arsenic Reduction
- MTBE Reduction at POU & POE
- POE Ozonation for Microbials
- POE Fine Filtration for Microbials
- POE Halogenated Resin for Microbials

# Advantages of POU for Compliance

- Lower Cost in Small Systems
- Independently Tested & Certified Products
- Speed of Implementation
- Shifting of Capital Cost Burden to Mfr/Dealer
- Availability of Trained and Certified Personnel for Installation and O&M

# Conclusions

- POU & POE Technologies –Mostly miniaturized versions of Central Treatment
- Several Technologies available for each of the Contaminants
- Well Developed Conservative Protocols used in Testing these Products
- Many Small & Large Companies involved in this Area
- Standards & Certification Programs provide high Level of Credibility