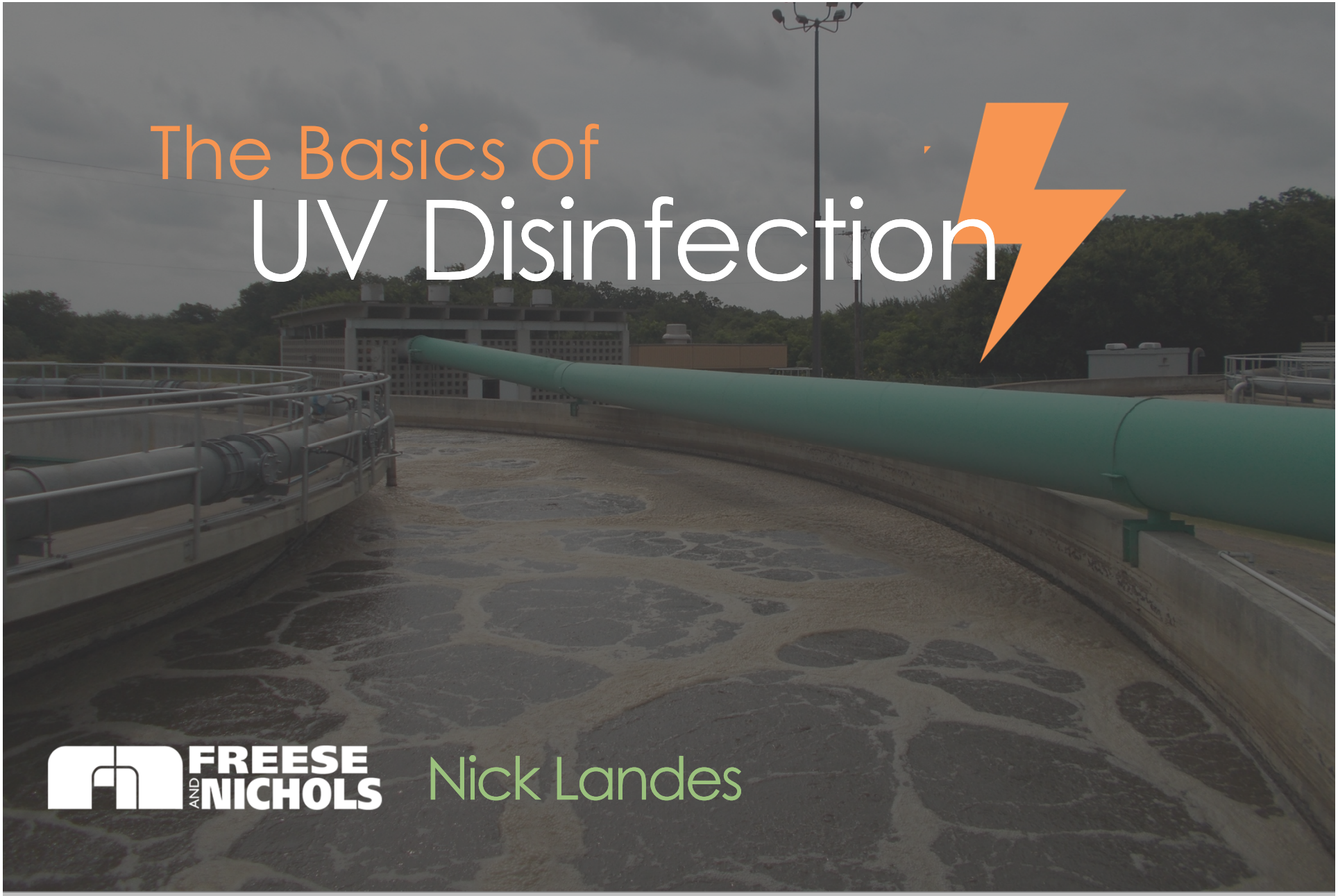


The Basics of UV Disinfection

FREESE AND NICHOLS

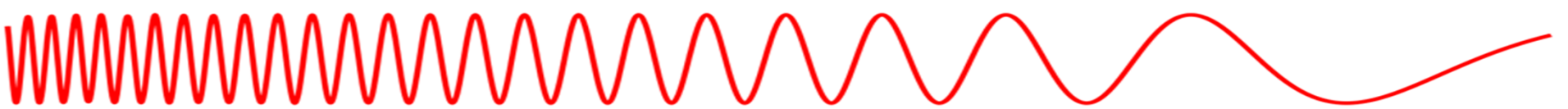
Nick Landes

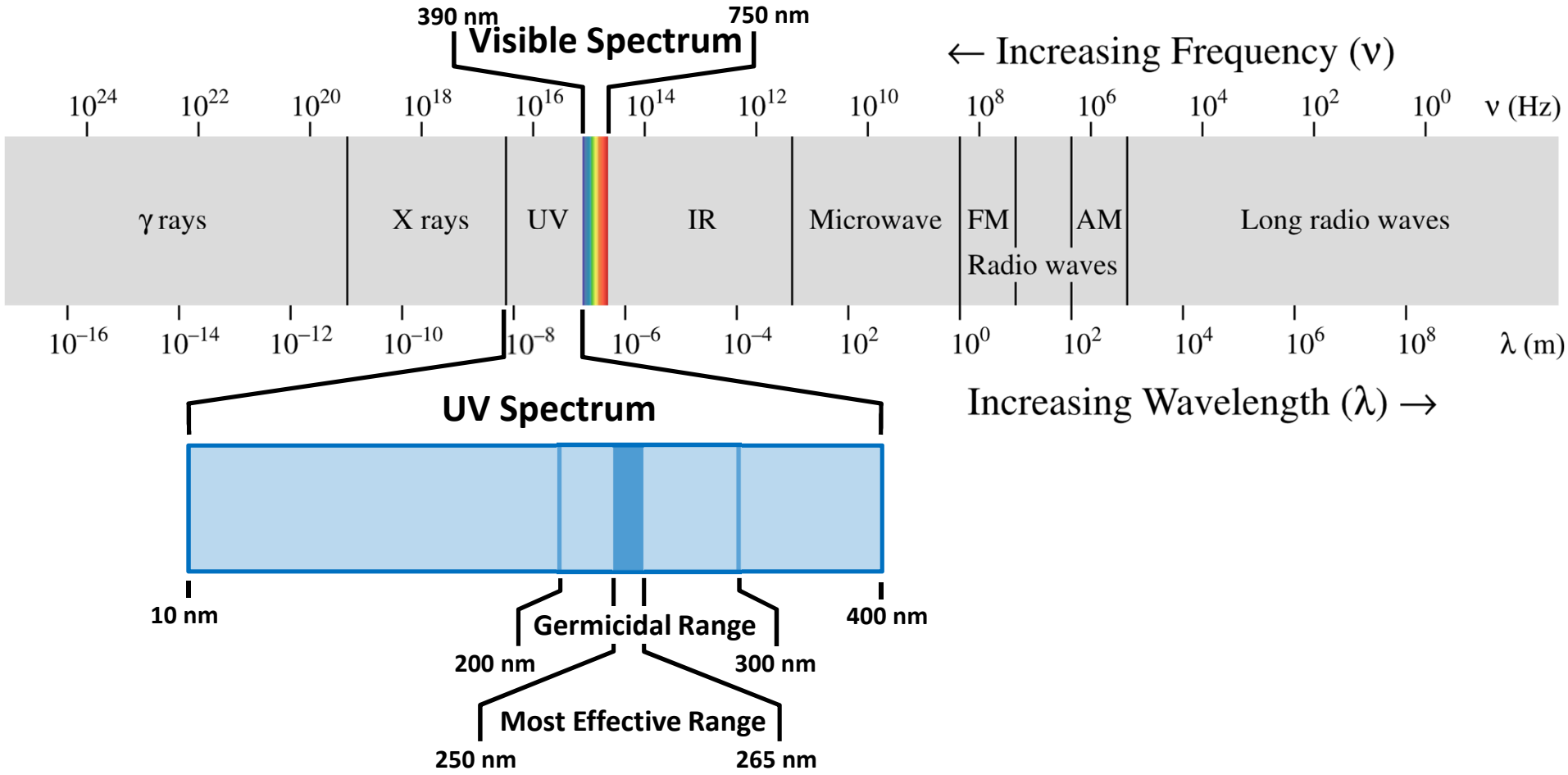
March 20, 2019

Agenda

- What is UV
- How does UV Disinfect
- Types of UV Systems
- Design Considerations

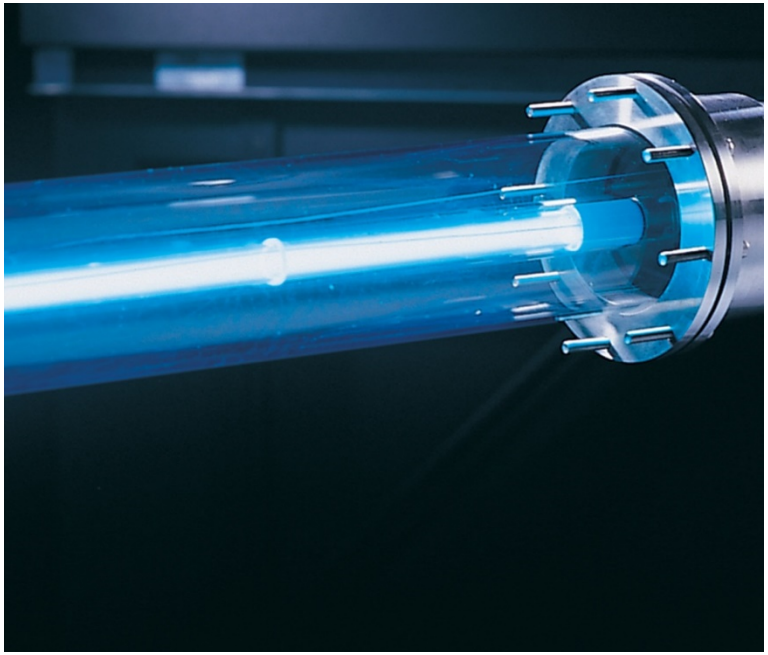
What is Ultraviolet Energy



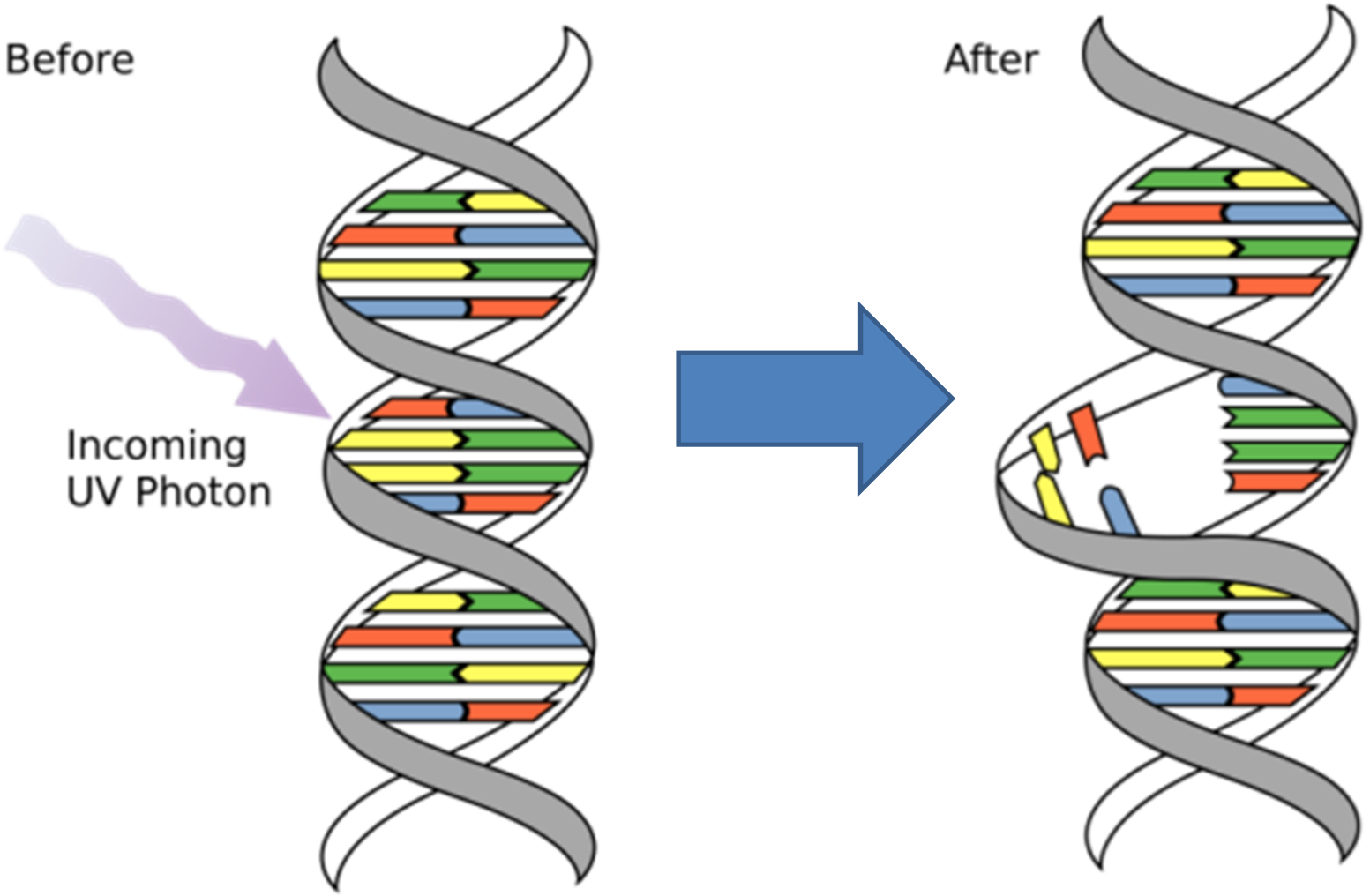


What do we make UV?

- Mercury vapor charged by electric arc inside lamp
- Ionized mercury vapor emits UV irradiation

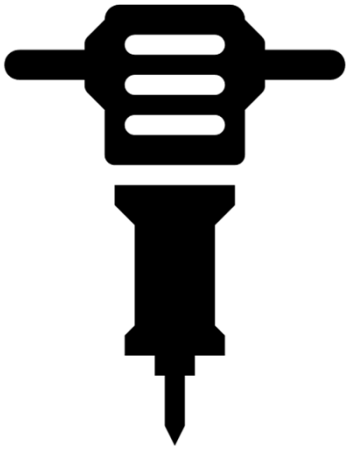


How does UV Disinfect?



UV versus Chemicals

UV Disinfection



Physics

"Newer" (1910)

No residual

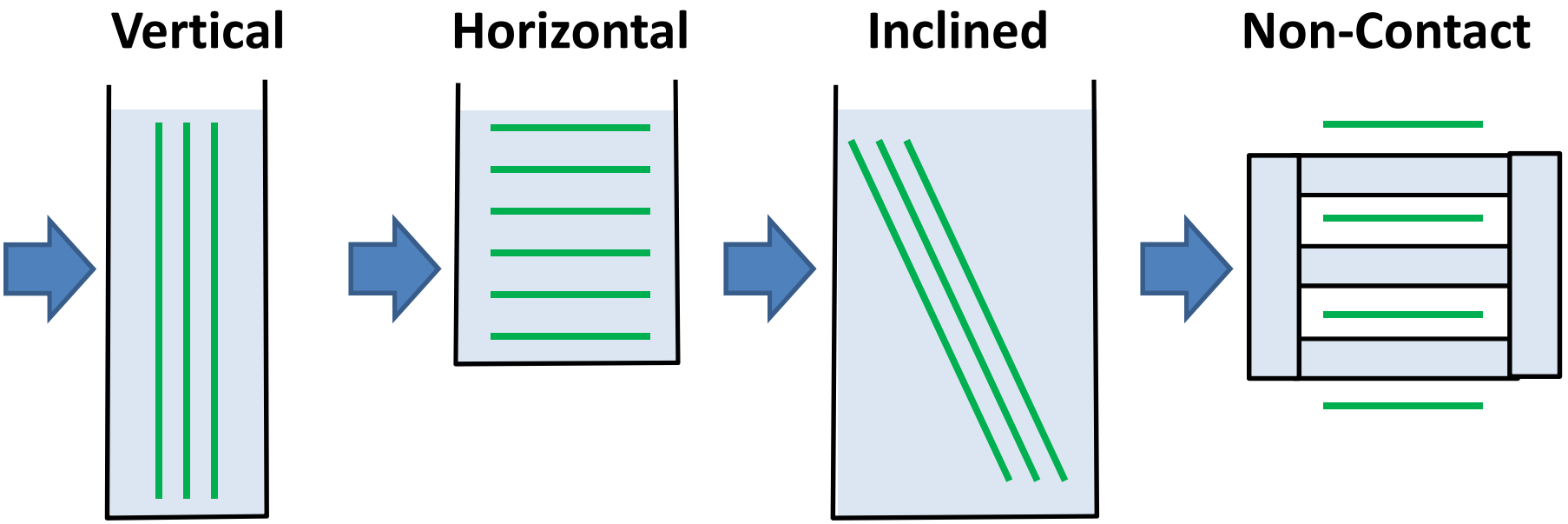
Chemical Disinfection

Chemistry

Older (1890)

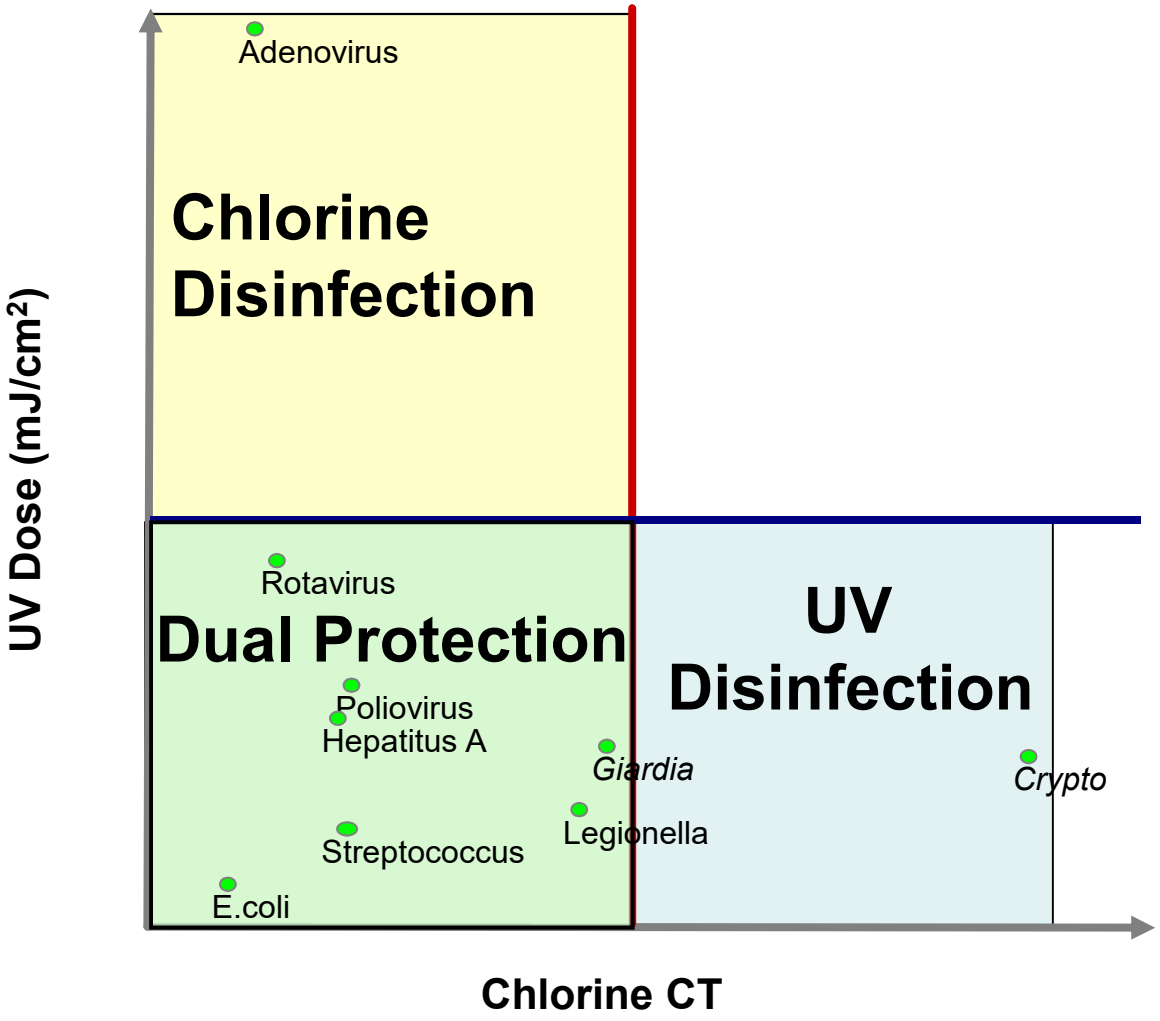
Residual

Types of UV Systems



Design Considerations

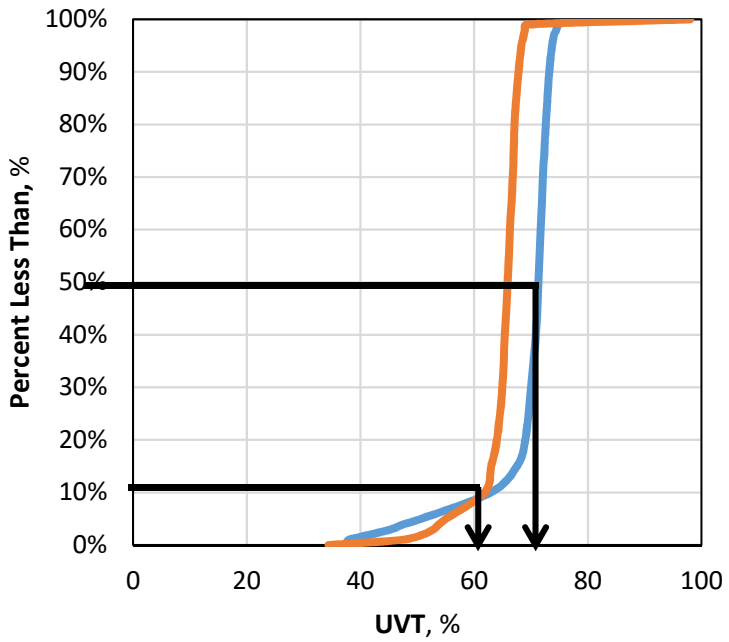
- What are your Target Microorganisms?



Source: Keep, Terry (2013). Advances in UV Technology for 4-Log Virus Disinfection of Groundwater

Design Considerations

- UV Transmittance



Inorganic Compounds	Compounds Found in Wastewater
Bromine	Dyes and coloring agents
Chlorine	Humic acids
Chromium	Lignin sulfonates
Cobalt	Extracts from leaves
Iodides	Orzan S
Iron	Phenolic compounds
Manganese	Sunblock PABA
Nickel	Tea, Coffee
Sulfates	Carbamide compounds
Stanous Choride	Sodium Thiosulfate

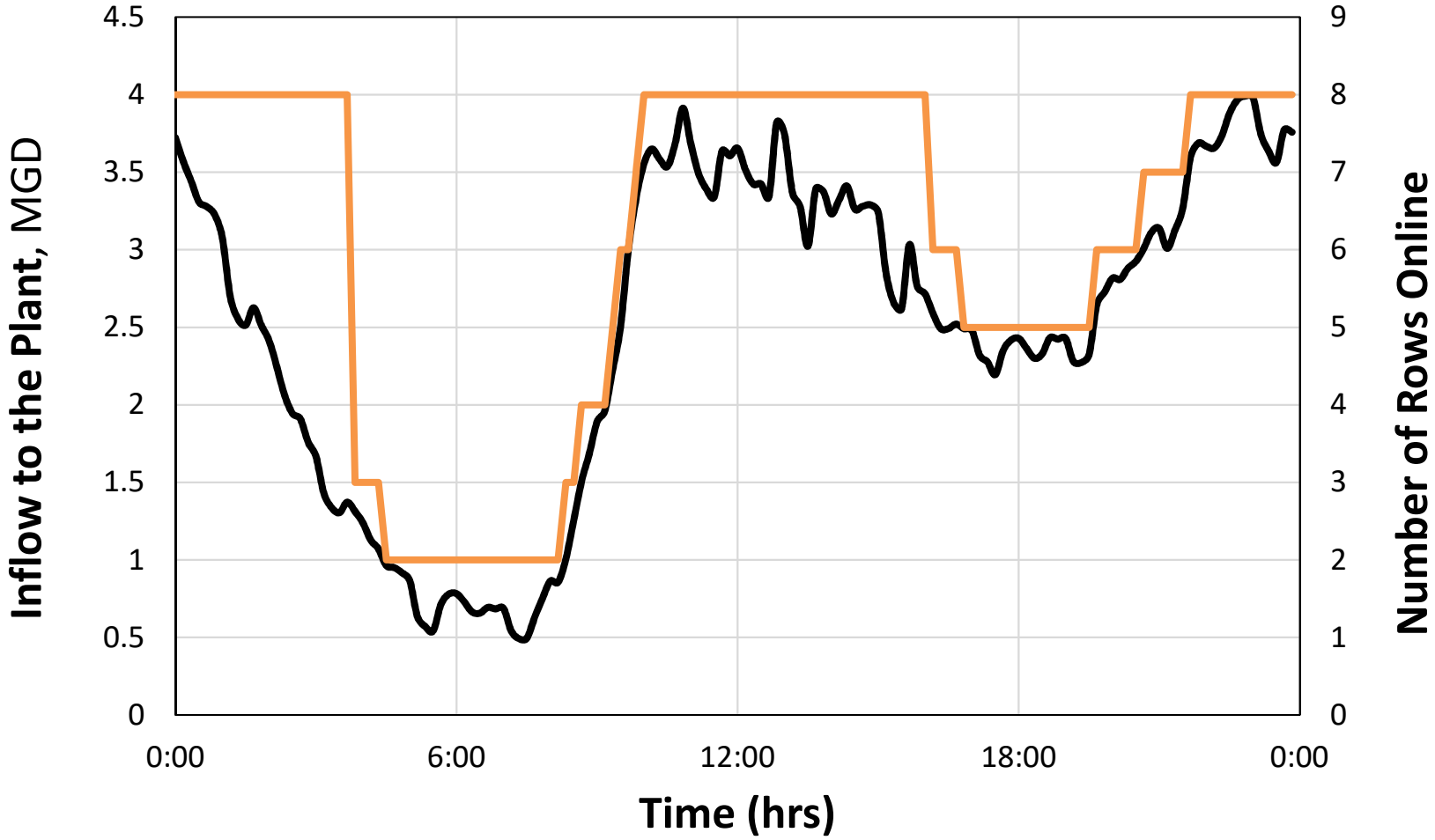
Source: Sakamoto, G. (1999). UV Transmittance, Trojan Technologies, Inc.

Example for 34 MGD System

UVT	60%	75%
Lamps	96	64
Max Power Draw, kW	100	65
Cost	$820k	$540k

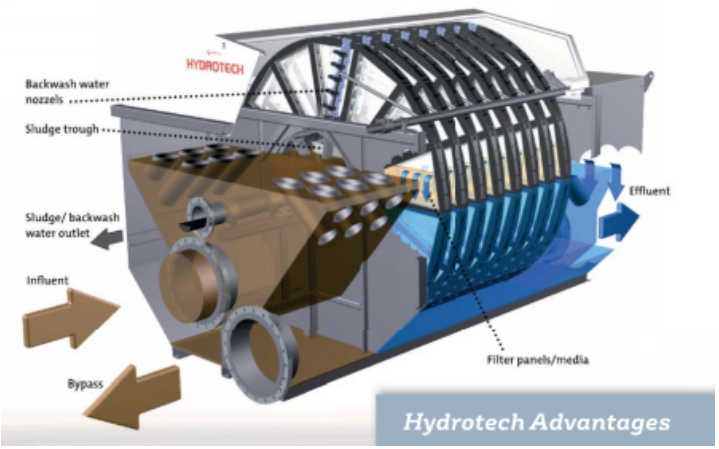
Design Considerations

- Flow Patterns



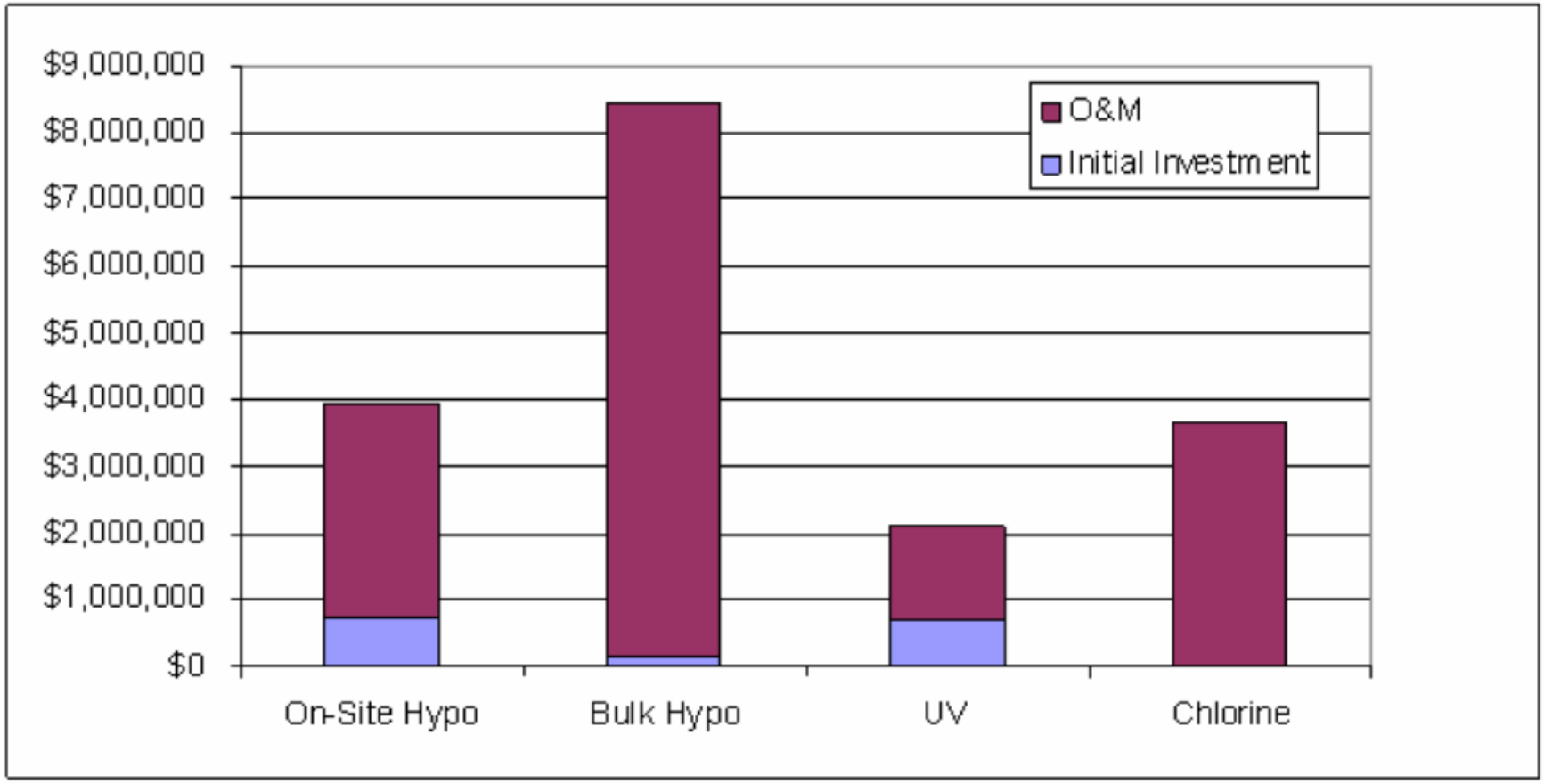
Design Considerations

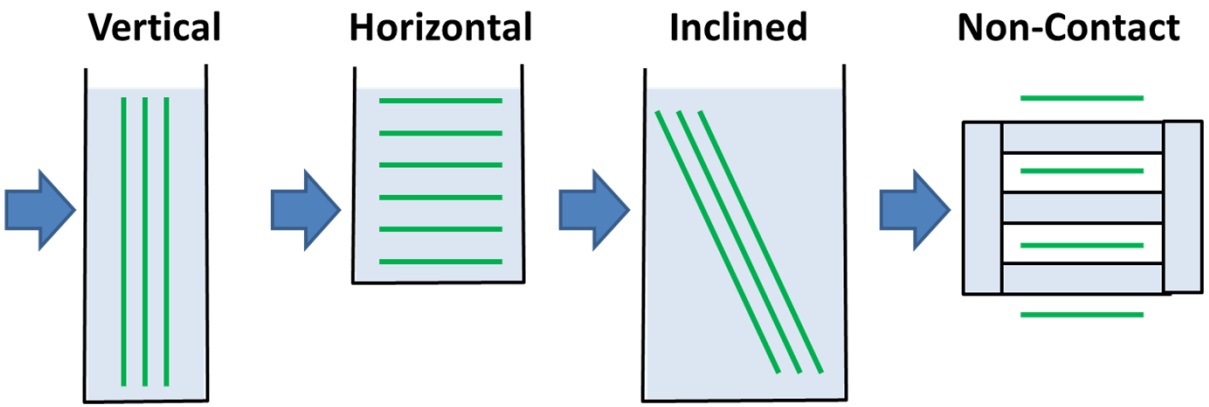
- Protect the UV System with Upstream Filtration



Design Considerations

- Look at the Life Cycle… not just Capital Costs





Questions?

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