

# Technical Advances in the Treatment of Water and Air for Indoor Waterpark Safety and Guest Satisfaction

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## Identify the Challenges

- Larger facilities
- Shallow water / low volumes
- Large spray features
- Warm water
- Large patron attendance
- Responsibility for Public Health

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## Resulting Conditions

- High relative humidity – 50%+
- Contaminated air
- Contaminated water
- Contaminated floor surfaces in pool and associated areas

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## Owner Risks

- Patron or staff health incidents
- Bad press
- Guest dissatisfaction
- Legal action

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## How can we minimize the risk?

- Quality design
- Quality water
- Clean air
- Good maintenance
- Bad air = bad water
- Bad water = bad air

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## Design Basics

- Proper recirculation turnovers of pools
- Correctly sized filtration
- HVAC design
  - Air distribution
  - Efficient Units
  - Filters
- Bathroom/change areas that can be properly cleaned
- Pool deck areas easily cleanable
- Ability to balance the water
- Base disinfectant – assist with ozone/UV

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## Filtration

- Size based on turnover (T.O.) gpm
- Proper flow rate
- Essential to remove particulate inorganics
- Regenerative media filters (RM) < 4M (Microns)
- Sand = 10 to 20M (Microns)

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## Water Balance

- Essential to have water balanced at all times
- Health department criteria is not always most conducive to the quality of water and air

## Optimum

- pH 7.0 – 7.6 (max)  
(effectiveness of free chlorine)
- Free chlorine .5 – 1.5 mg/l
- Combined  $\leq$  1.0 mg/l
- Urea  $\leq$  2.0 mg/l
- Local health codes vary

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## Why do we disinfect the water?

- Many people congregate, each carrying billions of microorganisms
- Prevent odor and transference of water borne infections from person to person
- Water is a great mechanism for transfer of disease and infection

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## Each swimmer leaves something.

- Skin, hair, urea
- These organic materials are nutrients of the microorganisms.
- Not only present in water, but also floors, change facilities, wet environments
- They multiply fast!
- Infection risk to all

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## Contaminants

### Two groups

- Organic – Living plants, animals, humans (composed of carbon based)
- Inorganic – Minerals in water

Floor surfaces – body fats and lime scale

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## Disinfection is essential.

- Many people
- Direct contact
- Indirect contact – food, water, objects on floor surface
- Airborne

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## How do we treat the water?

- 50% of contaminants are removed by filtration, flocculation and the addition of fresh water.
- 50% of contaminants are removed by oxidation and disinfection.

Oxidation is the breakdown of material in solution, ammonia, urine and oil.

Disinfection kills and inactivates microorganisms.

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## Disinfection

- Mainly use chlorine
- Very effective at lower pH
- By-products of the chlorine reaction with organic materials . . . chloramines and trichloramines "The Smell"
- Causes eye/nose mucous membrane irritations
  
- Chlorine ineffective at low levels against select organisms
- Use of UV or ozone will greatly enhance disinfection

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## Ozone

- Effective oxidizer and disinfectant
- Requires extended contact time
- Equipment requires higher maintenance, more space and is more costly

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## UV

- Very effective disinfectant
- Immediate upon contact
- Very effective against waterborne parasites like cryptosporidium and Giardia Lamblia
- Greatly reduces chloramines
- Equipment requires lower maintenance, less space and is less costly

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## HVAC Design

- New frontier
- Air Changes / fresh air
- Heat recovery
- Filters – Body fats and other contaminants
- Filter spec can eliminate aerosols
- Distribution
- Energy efficient

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## High Risk Areas

### Billions of microorganisms

- Change facilities
- Bathroom areas
- Pool decks (standing water)
- Improper cleaning techniques
- Disinfection essential

### Organisms multiply

- Temperature
- Humidity / air
- Nutrients
- Wet surfaces

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## Summary

- Many challenges
- Technology is constantly improving
- Understand that an indoor waterpark is a living element
- Constantly changing – Be aware
  - Your equipment
  - Your environment

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## Important Points

- **Quality water treatment and balance**
- **Install the best HVAC equipment and manage it**
- **Develop methodical cleaning methods**
  - **Changing rooms / bathrooms**
  - **Pool decks**
  - **Any surrounding pool areas**
- **Have a plan in place for managing the unforeseen such as e. coli or cryptosporidium**

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