

IDI Business

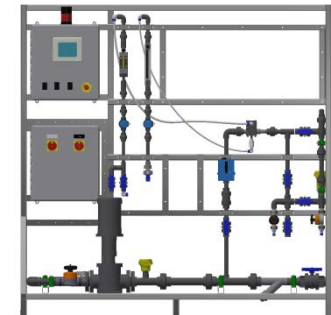
IDI solely focused on ClO₂ chemistry for over 65 years

- ❑ Full service provider for ClO₂ chemistry, equipment and applications
- ❑ Expertise in key ClO₂ market segments in a wide range of applications
- ❑ ~ 50 FTE with ~ 400 years of combined ClO₂ / Industry expertise
- ❑ Installed over 1,000 ClO₂ generators worldwide
- ❑ All Functions are embedded into the business centered at North Kingstown, RI
- ❑ 50% of employees in the field supporting customer activities resulting in an average customer relationship of >10 years
- ❑ Dedicated R&D resources enabling business to constantly commercialize new applications and equipment
- ❑ All elements of generator design, engineering, fabrication, programming, testing and commissioning done with in-house resources to protect expertise and unique access to customers
- ❑ Largest purveyor of Sodium Chlorite solutions in North America
- ❑ Rigorous safety culture due to extensive DuPont heritage

IDI Offerings



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Introduction to chlorine dioxide chemistry

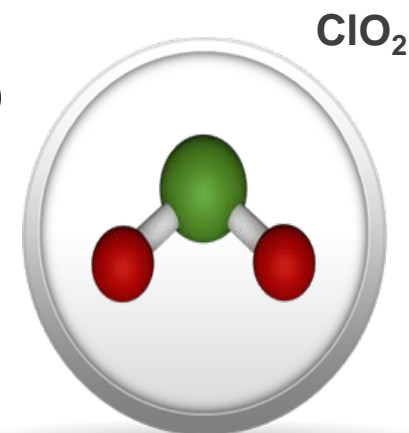
Although it has chlorine in the name, ClO_2 behaves very differently

Chemistry

- 200 year old, well proven chemistry which has been used commercially for more than 70 years
- ClO_2 chemistry is 1 of 4 EPA approved disinfectants for potable drinking water
- ClO_2 can not be compressed like Cl_2 and must be made on-site at the point of application
 - ClO_2 generation equipment has limited adoption of ClO_2 chemistry

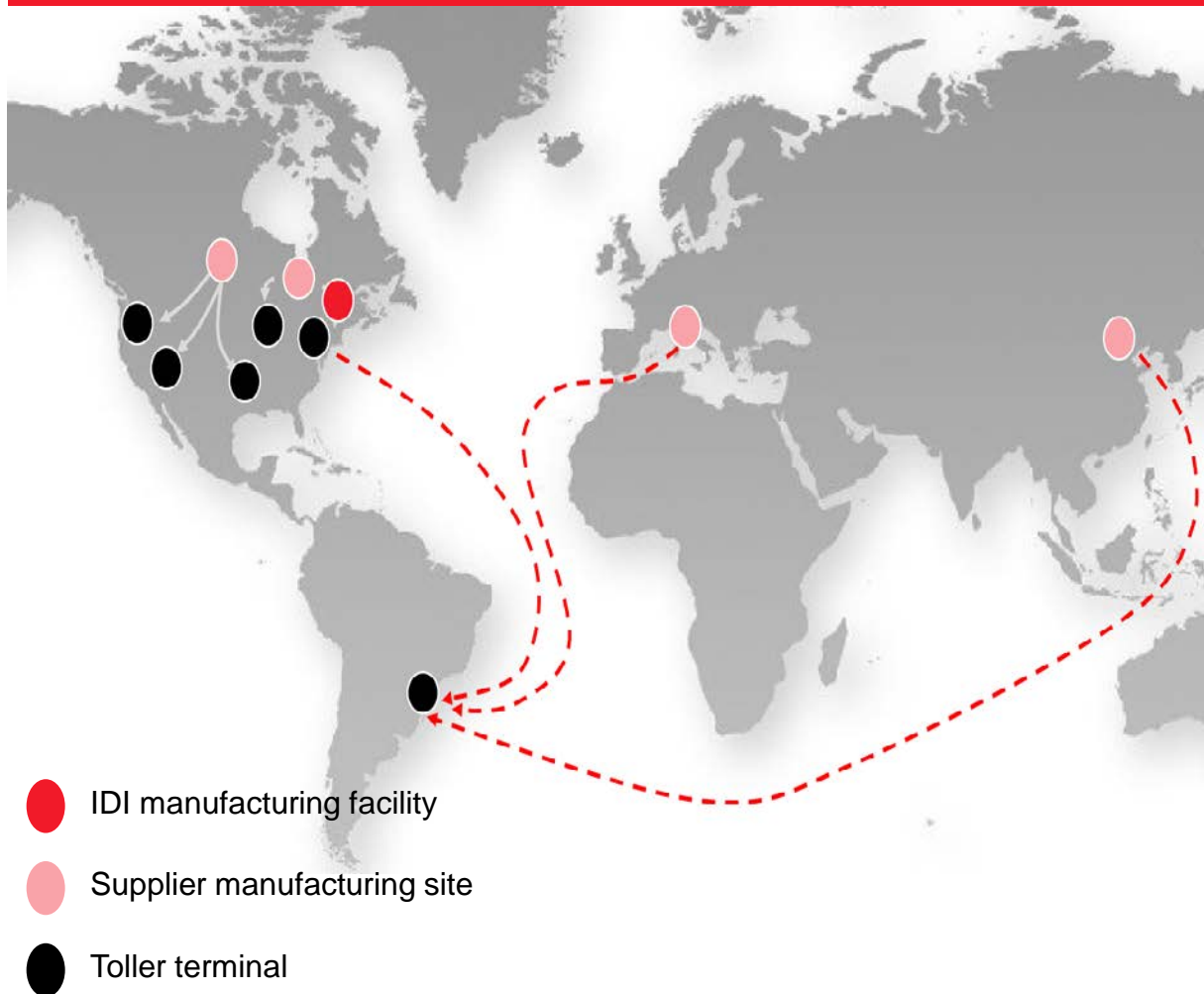
Key market drivers

- Replacing Cl_2 gas/bleach in most instances
 - Regulatory compliance (no chlorinated organics / less by-products)
 - Superior biocidal performance (e-coli, cryptosporidium, legionella, etc.)
 - Highly selective oxidant minimizes undesired reactions (lower dose)
- Knowledge intensive / solution sale
- Rapid expansion of the technology in several attractive market spaces



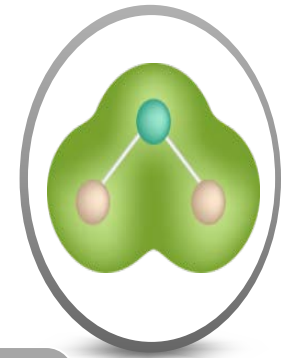
Supply network in North America

IDI's logistical network



- Sodium chlorite supply secured by long-term strategic supply relationships
 - 2 independent production facilities in North America for reliable supply
 - 2 additional producers based in Italy and China supply South American customers
- 4 regional terminals allow for just-in-time delivery
- Sodium chlorite solutions sold in rail, tank wagon, IBC and drum quantities
 - Sodium chlorite distributed to terminals via competitive supplier-dedicated rail fleet

ClO₂ CORE Markets



Industrial Cooling

- Refineries
- Power utilities
- Ammonia plants



Oil & Gas

- Frac Water Disinfection
- Salt Water Disposal
- Breaker fluids



Municipal Water

- Potable water disinfection
- Wastewater disinfection
- Generator sales



Food Manufacturing

- Hard surface sanitizer
- Fruit & vegetable processing
- Brewing & beverage



Odor Abatement / Control

- Wastewater deodorization
- O&G H₂S Control
- Rendering odor control



Industrial / Institutional

- Process water microbial control
- *Legionella* control
- Mollusk control
- Paper slimicide

ADOX™ Sodium Chlorite Solutions

US EPA approved for potable water disinfection	ANSI/NSF 60 certified drinking water additives	AWWA standard # B-303-13a	FDA Authorized under various CFR's in Food applications	Registered in all applicable States and Countries
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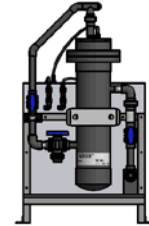
Product Name	Sodium Chlorite Concentration	EPA, ANSI/NSF 60 Approved
ADOX™ 7.5 or ADOX™ BCD 7.5	7.5%	Yes
ADOX™ 15 or ADOX™ BCD 15	15%	Yes
ADOX™ 25 or ADOX™ BCD 25	25%	Yes
ADOX™ 31 or ADOX™ BCD 31	31%	Yes
ADOX™ 37 or ADOX™ BCD 37	37%	Yes
ANTHIUM™ series	1 - 5% (as s-ClO ₂)	Yes
Endimal™ series	5 – 31%	Yes



IDI Generator Platforms

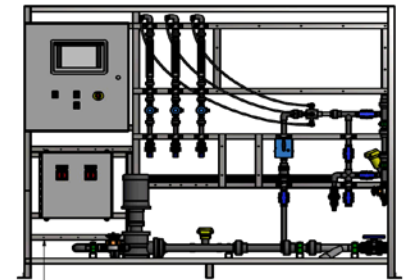
MiniAC

- Simplicity of 2 chemical reaction (ADOX™ 7.5 & 15% HCl)
- Optional stand, on/off control, rotometers
- Capacity 6-30 PPD; max back pressure is 25 PSI



MG

- Efficient 3 chemical reaction (ADOX™ 25, 15% HCl and Bleach)
- Stand, rotometers, on/off control, optional flow pacing; optional multi application points
- Capacity 20 - 5,000 PPD; Turndown 4:1; Back pressure is 30 PSI



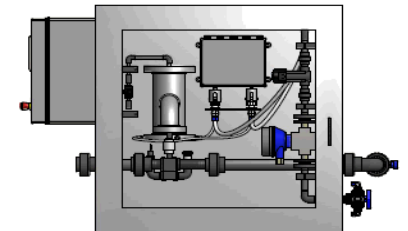
In-line

- Efficiency of 3 chemical reaction (ADOX™ 25, 15% HCl and Bleach)
- Stand, on/off control, flow pacing;
- Generator Capacity 50 - 1,500 PPD; Turndown 30:1; Max back pressure is 30 PSI



PurDox

- Two chemical chlorate based generator
- Vacuum based design
- Available in 1st qtr 2018



Typical ClO₂ Generator Reactions

Typical ClO₂ generation reaction chemistries

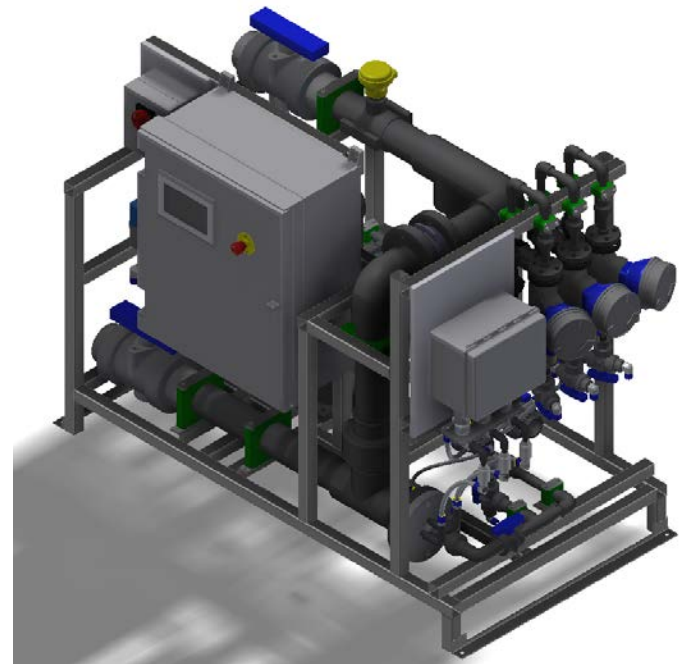
Reaction Chemistry	Chemical Formula	Theoretical Yield (%)	Reaction Efficiency (%)	Effective Yield (%)	Inherent Safety	ClO ₂ Purity	Service Complexity	Pros	Cons
Sodium Chlorite & Gaseous Chlorine	2NaClO ₂ + Cl ₂ → 2ClO ₂ + 2NaCl	100	95+	95+	High – with vacuum based systems	<ul style="list-style-type: none"> Excellent Slight excess of Cl₂ 	Minimal	Lowest Cost	<ul style="list-style-type: none"> Gas Cl₂ on site
Sodium Chlorite, Hypochlorite, Hydrochloric Acid	2NaClO ₂ + NaOCl + 2HCl → 2ClO ₂ + 3NaCl + H ₂ O	100	95+	95+	High – with vacuum based systems	<ul style="list-style-type: none"> Excellent 	Minimal	Minimal excess chlorine	<ul style="list-style-type: none"> Three Chemicals Cost \$/lb 30% more than chlorite/chlorine
Sodium Chlorite & Hydrochloric Acid	5NaClO ₂ + 4HCl → 4ClO ₂ + 5NaCl + 2H ₂ O	80	90+	72+	Low, with traditional pump based systems	<ul style="list-style-type: none"> OK Excess acidity and unreacted chlorite 	Minimal	<ul style="list-style-type: none"> No excess Cl₂ Good for low volume applications Simple equipment 	<ul style="list-style-type: none"> Lowest efficiency Highest Cost/Lb. 3-4X overfeed of acid required
Sodium Chlorate, Hydrogen Peroxide & Sulfuric Acid	NaClO ₃ + ½ H ₂ O ₂ + ½ H ₂ SO ₄ → ClO ₂ + ½ Na ₂ SO ₄ + ½ O ₂ + H ₂ O	100	90 – 95	95	Has real risks that must be considered	<ul style="list-style-type: none"> Purity isn't as good Excess acidity Perchlorate Chrome 	Moderate	<ul style="list-style-type: none"> Lowest cost Eliminates gas chlorine Less chloride ion 	<ul style="list-style-type: none"> Very hazardous chemicals pH leaving generator very acidic Other by-products
Dry Sodium Chlorite & Gaseous Chlorine	NaClO ₂ + ½ Cl ₂ → ClO ₂ + NaCl	100	95+	95+	Very dangerous reaction process	<ul style="list-style-type: none"> Excellent 	Complex	Purity	<ul style="list-style-type: none"> Handling an oxidizer How to dispose of the spent chlorite Channeling results in waste of costly chlorte

Introduction to ADOX™ In-Line Generator Series

Wide Range of Functionality at a Competitive Price

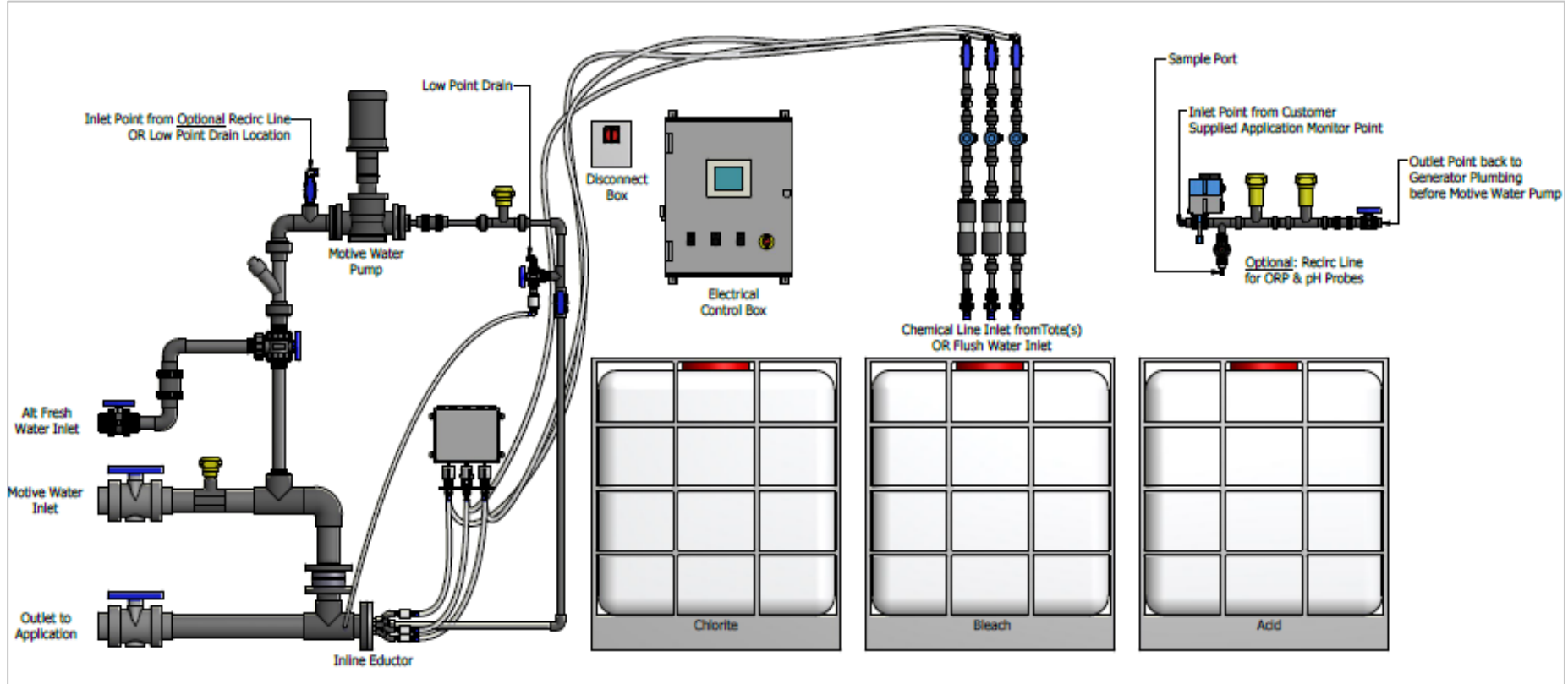
Designed to streamline productivity and safety, while reducing customer operating costs

- Proven three precursor (chlorite, bleach & acid) reaction chemistry
- High 95%+ reaction efficiency
- Robust industrial design - needs minimal maintenance
- Precise dosage control – eliminates wasted chemical, ensures effective treatment
- Patent pending design provides unmatched price to performance ratio
- Industry leading safety features
- Vacuum based design, chemical feeds are never pumped
- Multiple operator modes
- Wide production range 30:1 turndown ratio
- Integrated measurement of water to be treated
- 120V AC power requirements; all sensors 24 Volts



In-Line Component View of the Process

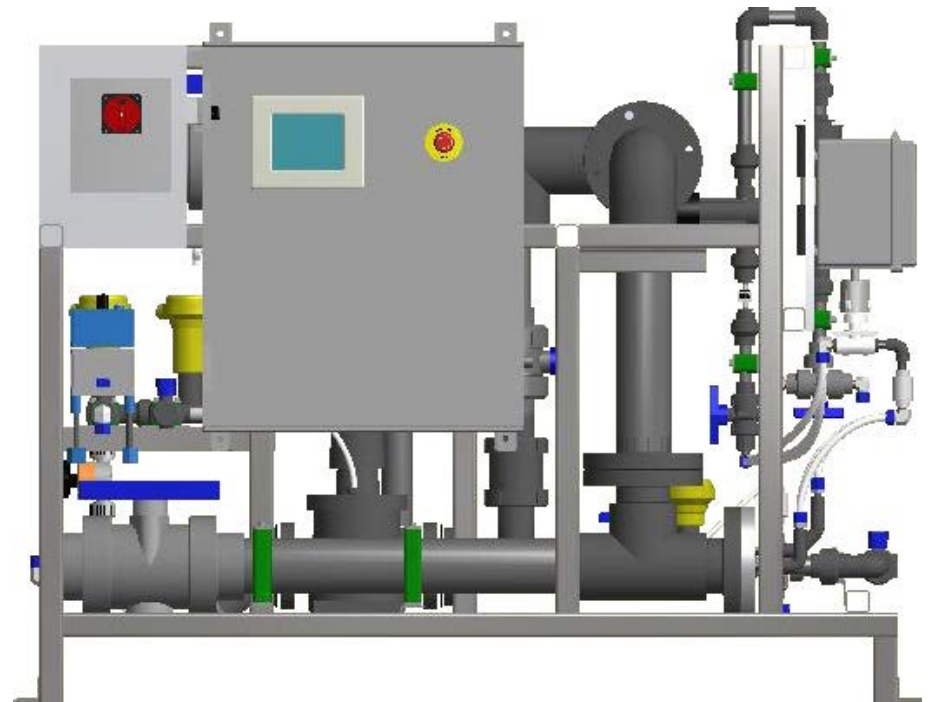
Typical Installation with generator components separated from the Skid



ADOX™ In-Line Generator

Key Features of In-Line Generator

- Multiple operational modes for greater operational flexibility
 - Operator controlled - manual ClO₂ generation
 - Flow compensating auto dosing
 - Dynamic auto dosing based on feedback sensors or 4-20mA signal
- No “pre-reaction” chamber to flush and no salt scaling
- Eductor based design for increased safety (elimination of all chemical pumps)
- Increased chemical reaction safety as 100% of the chemical reaction occurs in water
- Wide production range capability (50 lbs/day to 1500 lbs/day)
- Certified UL508A
- Powered by single phase 120 VAC 20 Amp service
- Use of low voltage (24 volt DC) components for safety
- Simple HMI operation with event logging and ethernet connectivity
- All chemical lines & water flows are monitored to ensure proper and safe operation
- Precision flow measurement control
- Simplified installation and connectivity



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