BSC Decontamination with **Chlorine Dioxide** Gas

A biological safety cabinet (BSC) is designed to protect biologically sensitive materials that are placed within the cabinet while providing protection to both personnel working with that material and the surrounding environment. There are occasions when it is strongly advisable to treat the interior of a BSC with a gas capable of decontaminating all internal surfaces of the cabinet that are not accessible by the use of liquid decontaminant.

Chlorine dioxide (CD) gas has become the chemical of choice for many leading pharmaceutical, government and university laboratories as the decontaminant for BSC's, replacing the historical method using formaldehyde gas. We use the **Mini Chlorine Dioxide System** (**MCS**, manufactured by DRS Laboratories).

Comparative highlights between these techniques are shown in the table below, with more details given on the second page of this bulletin.

	Formaldehyde Gas	**Chlorine Dioxide Gas (using the MCS)**
NSF International Validation	Yes	**Yes**
Non-condensing gas (at room temperature)	Yes	**Yes**
Humidity Requirement	65 - 90% RH	65 - 90% RH
Material Effects	Humidity may cause mild corrosion of non-stainless ferric materials	• Humidity and gas may cause mild corrosion of non-stainless ferric materials • Minimal copper and aluminum discoloration with multiple usage
Carcinogen	Yes	**No**
Chemical solid residue	Yes (typically)	**No**
Gas removal	Neutralization with ammonia and venting	**Charcoal scrubbing**
Odor residue	Formaldehyde, ammonia, and/or methenamine	**None**
Duration of decontamination	6 - 12 hours	**90 minutes**
BSC down-time	9 - 15 hours	**3.0 - 3.5 hours**

Chlorine dioxide (CD) is a green-colored gas, generated at the time of a decontamination event. Being a **potent sporicidal gas**, CD penetrates and decontaminates all parts of a targeted volume with the same ease experienced with the traditional formaldehyde procedure. However, **CD is not a carcinogen**, and **leaves behind no residue or odor.**

Chlorine dioxide MSC and formaldehyde BSC decontamination comparison:

CABINET PREPARATION

For both methods, the BSC is sealed with appropriate incorporation of the decontamination system (about 30 minutes).

HUMIDIFICATION

For both methods, at least 65% RH is generated and circulated throughout the cabinet (5 - 10 minutes).

CHEMICAL PLACEMENT

Formaldehyde usage typically involves placing paraformaldehyde into the BSC. For CD usage with the MCS, **gas generating chemicals are outside of the cabinet within the MCS.**

GAS CIRCULATION

For optimal efficacy, both types of gases should be circulated throughout the cabinet, including above the cabinet's exhaust HEPA filter. **This is standard for CD with the MCS**.

GAS CONTACT TIME

6 - 12 hours for formaldehyde, **90 minutes for CD with the MCS.**

GAS REMOVAL METHOD

Formaldehyde gas is typically neutralized with ammonia gas, with the ammonia subsequently exhausted. **CD gas, using the MCS, is removed through a scrubbing unit, with no adverse gas exhausted outside the cabinet or MCS.**

GAS NEUTRALIZATION AND/OR REMOVAL TIME

75 - 90 minutes for formaldehyde, **45 minutes for CD.**

RESIDUALS

Formaldehyde treatments typically leave a particulate residue consisting of paraformaldehyde and methenamine, and a strong odor from the residue. The standard formaldehyde procedure calls for as much of this residue to be cleaned from the cabinet as possible. **CD leaves no residue.**

TOXICITY

Both formaldehyde and CD are toxic at concentrations used within the BSC. In the event of leakage, both gases have an odor easily sensed at concentrations well below their OSHA permissible exposure limits. **Formaldehyde is a carcinogen, CD is not**.

OVERALL CYCLE TIME (from preparation of BSC to it being ready for use)

Formaldehyde – 9 - 15 hours; CD (with MCS) – 3.0 - 3.5 hours.

NSF INTERNATIONAL VALIDATION

Following NSF guidelines, **formaldehyde and CD are the only gas methods for decontamination that require no further validation to guarantee acceptable decontamination results.**

With no chemical solid residue or noxious residual odor, no carcinogenic chemicals, and a cycle time reduced from up to 15 hours to less than 3½ hours… why haven't you switched to CD decontaminations using the MCS?