Supplement Table 1. **VOCs in Previous Printery Studies**

|  |  |
| --- | --- |
| VOC | First Author and Year |
| n-Pentane | Laire1997, Vega2000, Yuan2010 |
| n-Hexane | Chang1987, Wadden1995, Laire1997, Crouch1999, Vega2000, Wypych2001, Batterman2002, Yu2004, Sutton2009, Yuan2010 |
| Cyclopentane | Vega2000, Yuan2010 |
| Cyclohexane | Laire1997, Vega2000, Casselli2009, Yuan2010 |
| Methyl Chloride |  |
| Methylene Chloride | Laire1997, Crouch1999, Wypych2001, Leung2005, Lee2009, Sutton2009, Kumagagai2013, Zheng2013, Prica2016 |
| Chloroform | Leung2005 |
| Carbon Tetrachloride | Deng1987, Doherty2000, Prica2016 |
| 1,2-DCEa | Leung2005 |
| Methyl Chloroform | Laire1997, Leung2005, Sancini2014 |
| 1,1,2-TCEa | Leung2005 |
| TCEa | Crouch1999, Gioda2002, Prica2016 |
| 1,1,2,2-TCEa | Leung2005 |
| Propylene Dichloride | Kumagagai2013 |
| Bromoform |  |
| HCFC-22 |  |
| CFC-12 | Leung2005 |
| CFC-114 |  |
| CFC-11 | Leung2005 |
| CFC-113 | Leung2005, Casselli2009 |
| Propene | Yuan2010 |
| Vinyl Chloride | Herbert1975, USEPA1994, Leung2005 |
| 1,1-DCEe |  |
| cis-1,2-DCEe |  |
| cis/trans-1,3-DCPe |  |
| TCEe | Wypych2001, Batterman2002, Leung2005 |
| Benzene | Wadden1995, Crouch1999, Vega2000, Batterman2002, Gioda2002, Yu2004, Leung2005, Casselli2009, elSiad2009, Godoi2009, Yuan2010, Kirurski2012, Curic2013, Mansouri2015 |
| Ethylbenzene | Wadden1995, Crouch1999, Vega2000, Wypych2001, Gioda2002, Leung2005, Casselli2009, Godoi2009, Yuan2010, Djogo2011, Kirurski2012, Curic2013, Mansouri2015 |
| Styrene | Vega2000, Batterman2002, Leung2005, Casselli2009, Yuan2010, Zheng2013 |
| m-Xylene | Wadden1995, Gioda2002, Leung2005, Casselli2009, Sancini2014 |
| o-Xylene | Wadden1995, Laire1997, Gioda2002, Leung2005, Casselli2009, Godoi2009, Yuan2010, Vilcekova2016 |
| p-Xylene | Wadden1995, Gioda2002, Leung2005 |
| m/p-Xylenes | Laire1997, Vega2000, Godoi2009, Yuan2010 |
| Xylenes | Crouch1999, Wypych2001, Rodriguez2007, elSiad2009, Kirurski2012, Curic2013, Mansouri2015, |
| 1,3,5-TMB | Wadden1995, Laire1997, Batterman2002, Vega2002, Leung2005, Rodriguez2007, Casselli2009, Sutton2009, Yuan2010 |
| 1,2,3-TMB | Wadden1995, Laire1997, Casselli2009, Yuan2010 |
| 1,2,4-TMB | Wadden1995, Laire1997, Crouch1999, Wypych2001, Batterman2002, Gioda2002, Leung2005, Rodriguez2007, Casselli2009, Sutton2009, Yuan2010, Zheng2013 |
| Toluene | Wadden1995, Laire1997, Crouch1999, Svendson2000, Vega2000, Wypych2001, Batterman2002, Gioda2002, Yu2004, Leung2005, Rodriguez2007, Casselli2009, elSiad2009, Godoi2009, Yuan2010, Djogo2011, Kirurski2012, Sancini2014, Mansouri2015 |
| Chlorobenzene | Leung2005 |
| Benzyl Chloride |  |
| o-DCB | Wadden1995, |
| m-DCB | Wadden1995, |
| p-DCB | Wadden1995, Leung2005 |
| Methyl Alcohol | Crouch1999, Wypych2001, Prica2016 |
| Ethyl Alcohol | Crouch1999, Zheng2013, Prica2016 |
| n-Propyl Alcohol | Crouch1999 |
| Isopropyl Alcohol | Brugone1983, Wadden1995, Laire1997, Crouch1999, Svendson2000, Wypych2001, Yu2004, Casselli2009, Hautamaki2009, Kirurski2012, Zheng2013, Rossita2015 |
| n-Butyl Alcohol | Wypych2001, Casselli2009 |
| 1,4-Dioxane | Wypych2001 |
| MTBE | Vega2000 |
| Acetone | Crouch1999, Kirurski2012, Zheng2013, Prica2016, |
| MEK | Crouch1999, Wypych2001, Batterman2002, Casselli2009, Zheng2013, Prica2016 |
| MIBK | Crouch1999, Wypych2001, Zheng2013 |
| Ethanal | Gioda2005 |
| Propanal |  |
| Butanal |  |
| Pentanal |  |
| Hexanal |  |
| Heptanal |  |
| Octanal |  |
| Nonanal | Vilcekova2016 |

Supplement Table 2. **VOC concentrations (ppb) from recent Air Quality Studies**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Kuwait Outdoor Air | | Kuwait Indoor Air | | Printery Air | |
| VOC | Summary | Minimum | Maximum | Minimum | Maximum | Minimum | Maximum |
| n-Pentane | Outdoor, Indoor | 1.3 | 17 | 1.1 | 37 |  |  |
| n-Hexane | Printery | 1 | 5.7 | 0.7 | 9.8 | 20 | 14,800 |
| Cyclopentane |  | 1.1 | 1.4 | 0.8 | 1.8 |  |  |
| Cyclohexane | Indoor | 0.5 | 5.3 | 0.5 | 22 | 0.3 | 1.7 |
| Methyl Chloride |  | 0.8 | 0.8 | 1 | 1.1 | 2.1 | 2.1 |
| Methylene Chloride | Outdoor, Printery | 0.9 | 209 | 0.7 | 8.4 | 192 | 6,900 |
| Chloroform |  | 11 | 11 |  |  | 12 | 12 |
| Carbon Tetrachloride | Outdoor | 9 | 24 |  |  | 0 | 0 |
| Ethyl Chloride |  |  |  |  |  | 0 | 0 |
| 1,1-Dichloroethane |  |  |  |  |  | 0 | 0 |
| Methyl Chloroform | Printery |  |  |  |  | 0.5 | 6,287 |
| 1,1,2-TCEa |  |  |  |  |  | 0 | 0 |
| 1,1,2,2-TCEa |  |  |  |  |  | 15 | 15 |
| Propylene Dichloride |  |  |  |  |  | 0 | 0 |
| Ethylene Dibromide |  |  |  |  |  | 0 | 0 |
| Bromoform | Outdoor | 74 | 74 |  |  |  |  |
| Bromodichloromethane |  |  |  |  |  |  |  |
| CFC-12/HCFC-22 | Indoor | 0.2 | 6.7 | 0.2 | 18 | 2 | 2 |
| CFC-114 | Outdoor, Indoor | 11 | 119 | 9.6 | 231 |  |  |
| CFC-113/1,1-DCEe |  |  |  |  |  | 0.2 | 1.2 |
| CFC-11 | Outdoor | 0.5 | 43 | 0.5 | 0.8 | 1.5 | 1.5 |
| Propene | Outdoor, Indoor | 3.2 | 94 | 3.5 | 177 |  |  |
| Isobutylene |  | 1.5 | 1.7 | 2 | 5.4 |  |  |
| Isoprene |  | 0.9 | 1.8 | 1.6 | 2 |  |  |
| Vinyl Chloride | Outdoor, Indoor | 13 | 138 | 12 | 271 | 1.4 | 1.4 |
| cis-1,2-DCEe |  |  |  |  |  | 1.4 | 1.4 |
| cis-1,3-DCPe |  |  |  |  |  | 0 | 0 |
| trans-1,3-DCPe |  |  |  |  |  | 0 | 0 |
| TCEe/n-Butyl Alcohol |  | 2 | 2 | 2.7 | 2.7 | 3.6 | 14 |
| Benzene/1,2-DCEa | Outdoor, Print | 1.1 | 36 | 0.4 | 5 | 0.3 | 95,000 |
| Ethylbenzene | Printery | 0.7 | 8.5 | 0.6 | 6.1 | 0.2 | 10,200 |
| o-Xylene/Styrene | Printery | 1.1 | 8.2 | 0.8 | 7.9 | 0.4 | 71 |
| m-Xylene/p-Xylene | Printery | 0.9 | 19 | 0.8 | 14 | 0.3 | 72,162 |
| 1,3,5-TMB | Printery | 0.3 | 0.3 | 0.2 | 4.6 | 1.4 | 1,585 |
| 1,2,3-TMB |  | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 3.1 |
| 1,2,4-TMB | Printery | 0.6 | 0.6 | 0.8 | 1.4 | 0.1 | 7,176 |
| Toluene | Outdoor, Indoor, Printery | 2.1 | 23 | 1.3 | 16 | 14 | 26,000 |
| Chlorobenzene |  |  |  |  |  | 1.9 | 1.9 |
| Benzyl Chloride |  |  |  |  |  |  |  |
| o-DCB |  |  |  |  |  | 0 | 0 |
| m-DCB |  |  |  | 0.8 | 2.1 | 0 | 0 |
| p-DCB |  | 2.3 | 2.3 | 2.5 | 2.5 | 3.4 | 3.4 |
| Methyl Alcohol | Outdoor, Indoor | 4.5 | 23 | 7.5 | 42 |  |  |
| Ethyl Alcohol | Outdoor, Indoor | 3.3 | 17 | 9.3 | 753 |  |  |
| n-Propyl Alcohol | Outdoor, Indoor | 81 | 81 | 17 | 43 |  |  |
| Isopropyl Alcohol | Indoor, Printery | 0.9 | 6.6 | 1.8 | 57 | 2 | 267,000 |
| Vinyl Acetate |  | 0.5 | 0.5 | 0.5 | 0.5 |  |  |
| 1,4-Dioxane |  |  |  |  |  |  |  |
| MTBE |  | 0.5 | 0.7 | 0.6 | 0.9 |  |  |
| Acetone | Indoor, Printery | 2.7 | 19 | 3.4 | 19 | 12,100 | 12,100 |
| MEK |  | 1.1 | 1.1 | 1 | 2.8 | 0.8 | 12 |
| MPK |  |  |  |  |  |  |  |
| DEK |  |  |  |  |  |  |  |
| MBK |  |  |  |  |  |  |  |
| MIBK |  |  |  |  |  |  |  |
| Ethanal |  | 0.5 | 4.9 | 1.1 | 7.7 |  |  |
| Propanal |  | 3.7 | 4.9 | 5.7 | 6.1 |  |  |
| Butanal |  | 0.6 | 1 | 1.2 | 1.4 |  |  |
| Pentanal |  | 0.4 | 0.4 | 0.5 | 0.5 |  |  |
| Hexanal |  | 0.6 | 0.7 | 0.5 | 12 |  |  |
| Heptanal |  |  |  |  |  |  |  |
| Octanal |  |  |  |  |  |  |  |
| Nonanal |  | 2.1 | 3.7 | 3.1 | 8.2 |  |  |
| Acrolein |  | 0.5 | 0.7 | 1 | 1 |  |  |
| Methacrolein |  | 1.2 | 1.2 | 0.8 | 0.8 |  |  |
| Acetonitrile |  | 1.9 | 3.3 | 1.9 | 4.1 |  |  |

Supplement Table 3. **Government Printery: Percentage coefficient of variation (CV (%)) (SD (ppb)) of VOC concentrations**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | CTP | Rcpt. | Admin. | Design | Digital/  Photo. | Offset/  Com.  Bind | Maint/  Com.  Bind | Dec.  Bind | Storage |
| n-Pentane | 1.1 (0.018) |  |  | 3.5 (0.045) |  | 1.6 (0.026) | 3.3 (0.055) |  |  |
| n-Hexane |  |  |  |  |  | 0.3 (0.004) |  |  |  |
| Cyclohexane | 1.1 (0.016) |  |  |  |  | 0.4 (0.031) | 1.4 (0.043) |  |  |
| Methyl Chloride | 2.4 (0.028) |  |  |  |  |  |  |  |  |
| Methylene Chloride | 0.5 (0.034) |  |  | 1.7 (0.087) | 2.5 (0.088) |  | 2.0 (0.1) | 3.1 (0.2) | 8.5 (1.0) |
| 1,1,2,2-TCEa | 3.4 (0.073) |  |  | 2.4 (0.051) | >20 | 0.2 (0.003) |  |  |  |
| Bromoform | 5.4 (0.2) |  |  | 2.3 (0.064) | 4.4 (0.2) |  | 1.2 (0.2) | 3.0 (0.3) |  |
| Bromodichloromethane |  |  |  |  |  | 3.3 (0.082) |  |  |  |
| CFC-12/HCFC-22 | 0.5 (0.4) | 3.3 (0.5) |  | **>20%** | 2.8 (0.2) | 6.9 (0.4) | 6.8 (1.1) | 5.7 (0.3) | 6.7 (0.8) |
| CFC-114 | 1.2 (2.2) | 2.3 (0.7) | 6.2 (2.7) | 3.8 (2.8) | 5.0 (6.1) | 1.8 (1.1) | 17.7 (8.2) | 6.5 (0.8) | 18.8 (1.3) |
| CFC-113/1,1-DCEe |  |  |  |  |  | 2.5 (0.060) |  |  |  |
| CFC-11 |  |  |  |  |  | 2.9 (0.043) | 19.4 (0.2) |  |  |
| Propene | 2.2 (0.2) | 2.7 (0.074) | 7.1 (0.2) | 1.1 (0.1) | 5.0 (0.5) | 1.7 (0.1) | 8.8 (0.7) | 7.0 (0.1) | 16.3 (0.1) |
| Vinyl Chloride | 1.9 (2.6) | 2.4 (0.7) | 5.6 (2.7) | 5.6 (3.1) | 5.1 (7.3) | 2.5 (1.2) | **>20%** | 9.6 (1.2) | **>20%** |
| cis-1,2-DCEe |  |  |  |  |  | 4.3 (0.3) | 5.5 (0.1) |  |  |
| TCEe/n-Butyl Alcohol |  |  |  |  |  | 8.3 (0.3) | 8.8 (0.3) |  |  |
| Ethylbenzene |  |  |  |  |  | 2.2 (0.078) |  |  |  |
| o-Xylene/Styrene |  |  |  |  |  | 1.9 (0.1) | 1.9 (0.080) | 3.7 (0.1) |  |
| m-Xylene/p-Xylene |  |  |  |  | 3.2 (0.1) | 1.7 (0.4) | 1.4 (0.2) | 3.2 (0.3) |  |
| 1,3,5-TMB | 4.7 (0.5) | 2.0 (0.089) | 2.3 (0.041) | 7.0 (0.6) | 2.7 (0.5) | 0.7 (0.8) | 2.0 (1.4) | 3.3 (1.5) |  |
| 1,2,3-TMB | 0.6 (0.030) | 2.0 (0.038) |  | 6.0 (0.2) | 3.3 (0.3) | 1.1 (0.5) | 2.1 (0.6) | 3.7 (0.7) |  |
| 1,2,4-TMB | 0.3 (0.042) | 5.7 (0.3) | 10.9 (0.2) | 2.1 (0.2) | 3.1 (0.8) | 1.2 (1.5) | 2.4 (2.3) | 3.8 (2.3) | 10.6 (0.2) |
| Toluene |  |  |  |  |  | 0.7 (0.2) | 1.3 (0.1) | 3.3 (0.056) |  |
| Benzyl Chloride | 2.4 (0.046) |  |  |  | 3.6 (0.1) | 1.3 (0.2) | 1.7 (0.1) | 3.0 (0.1) |  |
| o-DCB | 0.3 (0.015) | 10.8 (0.2) |  | 2.4 (0.067) | 3.3 (0.3) | 1.1 (0.5) | 2.5 (0.5) | 3.9 (0.6) |  |
| m-DCB | 2.1 (0.032) |  |  |  | 4.0 (0.1) | 0.6 (0.078) | 1.7 (0.1) | 3.5 (0.2) |  |
| p-DCB |  |  |  |  | 4.2 (0.079) | 1.0 (0.1) | 1.5 (0.077) | 3.0 (0.1) |  |
| Methyl Alcohol | 0.8 (1.3) | 2.3 (1.3) | 4.1 (1.4) | 2.7 (3.1) | 1.8 (4.0) | 1.2 (24.8) | 2.3 (17.2) | 3.1 (12.3) | 6.6 (1.6) |
| Ethyl Alcohol | 1.2 (9.6) | 1.7 (4.7) | 4.8 (6.0) | 1.8 (9.2) | 1.4 (3.2) | 17.4 (173.1) | 2.7 (19.8) | 2.7 (10.6) | 7.2 (0.6) |
| Isopropyl Alcohol | 1.6 (4.4) | 1.8 (1.7) | 5.0 (2.1) | 1.4 (2.5) | 1.2 (4.8) | 0.4 (0.3) | 2.5 (55.8) | 2.9 (34.1) | 11.8 (0.2) |
| MTBE |  |  |  |  |  | 0.7 (0.066) | 1.4 (0.033) |  |  |
| Acetone | 1.5 (0.3) | 6.3 (0.2) | 7.7 (0.2) | 4.9 (0.4) | 2.3 (0.2) | 1.0 (0.8) | 3.8 (1.0) | 3.2 (0.2) | 4.4 (0.1) |
| MEK |  |  |  |  |  | 0.3 (0.1) | 4.3 (0.2) |  |  |
| MPK |  |  |  |  |  | 2.4 (0.059) |  |  |  |
| Ethanal | 1.5 (0.056) |  |  | 6.0 (0.1) | 3.5 (0.068) | 3.8 (0.2) | 0.5 (0.016) | 3.0 (0.047) | 2.7 (0.027) |
| Propanal |  |  |  |  |  | 3.7 (0.2) | 1.3 (0.027) |  |  |
| Hexanal |  |  |  |  |  | 0.8 (0.023) | 6.9 (0.1) |  |  |
| Heptanal | 0.9 (0.089) | 3.4 (0.1) |  | 1.7 (0.1) | 2.5 (0.4) | 0.7 (0.2) | 1.4 (0.8) | 3.4 (1.4) |  |
| Octanal | 12.0 (0.4) |  | 15.9 (0.3) | 4.4 (0.1) | 7.0 (0.3) | 1.2 (0.3) | 1.8 (0.2) | 2.9 (0.2) |  |
| Nonanal | 4.1 (0.2) | 2.8 (0.068) | 13.7 (0.4) | 2.8 (0.1) | 12.2 (0.6) | 2.0 (0.3) | 0.6 (0.036) | 10.3 (0.5) | 8.9 (0.3) |
| Acrolein |  |  |  |  |  |  | 18.9 (0.3) |  |  |
| Acetonitrile | 1.8 (0.053) |  |  | 19.5 (0.4) |  |  |  |  |  |

Supplement Table 4. **Scientific Printery: Percentage coefficient of variation (CV (%)) (SD (ppb)) of VOC concentrations**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Storage | Admin/  Design | Binding/  Photocopy | Sheet-fed  Offset | CTP |
| n-Pentane | 0.2 (0.041) | 4.7 (0.4) | 1.9 (0.1) | 0.9 (0.2) | 7.7 (0.071) |
| n-Hexane | 0.2 (0.023) | 6.7 (0.3) | 2.2 (0.082) | 0.7 (0.1) |  |
| Cyclopentane | 0.6 (0.014) |  |  | 0.8 (0.022) |  |
| Cyclohexane | 0.1 (0.047) | 6.9 (2.9) | 2.4 (0.8) | 0.7 (1.2) | 1.6 (0.041) |
| Methyl Chloride |  | 2.4 (0.015) | 1.3 (0.008) | 1.1 (0.008) |  |
| Methylene Chloride | 3.5 (2.4) | 6.3 (1.7) | 2.2 (0.5) | 0.5 (0.2) | 7.4 (0.2) |
| Chloroform | 0.5 (0.044) | 6.3 (0.5) | 3.4 (0.2) | 0.6 (0.2) |  |
| Carbon Tetrachloride | 0.0 (0.002) | 6.1 (0.2) | 2.6 (0.069) | 0.4 (0.035) |  |
| Ethyl Chloride | 0.1 (0.001) |  |  | 5.6 (0.047) |  |
| 1,1-Dichloroethane | 0.1 (0.003) |  |  | 0.8 (0.027) |  |
| Methyl Chloroform | 0.2 (0.019) | 5.6 (0.4) | 2.5 (0.1) | 0.6 (0.057) |  |
| 1,1,2-TCEa |  |  |  |  | 0.3 (0.031) |
| 1,1,2,2-TCEa |  |  | 3.8 (0.063) | 17.1 (0.9) |  |
| Propylene Dichloride |  |  |  | 0.8 (0.045) |  |
| Ethylene Dibromide | 0.5 (0.018) |  |  | 3.8 (0.1) |  |
| Bromoform | 3.2 (0.069) | 6.1 (1.4) | 1.7 (0.4) | 6.2 (6.6) | 2.9 (0.2) |
| Bromodichloromethane |  |  | 18.9 (0.4) |  |  |
| CFC-12/HCFC-22 | 0.4 (0.3) | 2.8 (2.3) | 1.1 (0.9) | 0.2 (0.1) | 0.5 (4.8) |
| CFC-114 | 0.4 (0.1) | 11.8 (5.3) | 3.1 (1.5) | 0.3 (0.1) | 12.2 (0.9) |
| CFC-113/1,1-DDEe | 0.1 (0.001) |  |  | 0.9 (0.011) |  |
| CFC-11 | 0.2 (0.074) | 5.4 (0.7) | 2.2 (0.3) | 0.9 (0.5) | 2.1 (0.036) |
| Propene | 0.7 (0.045) | 1.0 (0.1) | 0.3 (0.037) | 0.7 (0.080) | 5.9 (0.2) |
| Isoprene | 0.4 (0.004) | 5.0 (0.1) | 2.1 (0.051) | 0.2 (0.004) | 0.5 (0.006) |
| Vinyl Chloride | 0.4 (0.2) | 1.8 (1.2) | 0.3 (0.2) | 0.3 (0.2) | 9.6 (0.9) |
| cis-1,2-DCEe | 0.9 (0.015) | 1.7 (0.065) | **>20%** | 6.5 (0.3) |  |
| cis-1,3-DCPe |  | **>20%** | 1.8 (0.062) |  |  |
| trans-1,3-DCPe |  | 5.3 (0.2) | 2.2 (0.057) | 1.0 (0.2) |  |
| TCEe/n-Butyl Alcohol |  |  |  | 1.3 (0.028) |  |
| Benzene/1,2-DCEa | 3.3 (0.049) | 2.3 (0.1) | **>20 %** | 11.2 (0.9) | 17.9 (0.3) |
| Ethylbenzene | 1.5 (0.1) | 6.4 (0.8) | 2.6 (0.3) | 1.0 (0.4) |  |
| o-Xylene/Styrene | 3.2 (0.1) | 5.9 (0.3) | 1.0 (0.039) | 3.6 (0.5) |  |
| m-Xylene/p-Xylene | 0.2 (0.022) | 6.8 (0.7) | 2.9 (0.3) | 1.9 (0.6) | 3.1 (0.1) |
| 1,3,5-TMB | 1.0 (0.065) | 6.0 (2.5) | 2.3 (0.9) | 1.9 (3.3) | 3.8 (0.3) |
| 1,2,3-TMB | 0.7 (0.027) | 5.6 (0.5) | 9.9 (0.8) | 2.8 (1.0) |  |
| 1,2,4-TMB | 0.4 (0.054) | 5.6 (0.8) | 1.2 (0.2) | 3.8 (1.7) |  |
| Toluene | 0.0 (0.029) | 6.8 (3.4) | 2.4 (1.0) | 0.3 (0.3) | 0.4 (0.013) |
| Chlorobenzene |  |  |  | 8.0 (0.2) |  |
| Benzyl Chloride |  | 5.3 (0.4) | 1.5 (0.1) | 9.9 (3.0) |  |
| o-DCB | 3.7 (0.1) | 6.6 (0.4) | 2.7 (0.2) | 7.5 (2.6) |  |
| m-DCB |  | 4.0 (0.1) | 3.2 (0.1) | 7.8 (1.1) |  |
| p-DCB |  | 4.9 (0.3) | 2.1 (0.1) | 5.7 (1.6) |  |
| Methyl Alcohol | 5.6 (3.8) | 4.2 (5.1) | 6.2 (6.2) | 2.4 (2.5) | 3.9 (0.9) |
| Ethyl Alcohol | 3.4 (1.3) | 1.4 (2.0) | 10.0 (15.0) | 2.3 (2.7) | 7.0 (0.7) |
| n-Propyl Alcohol |  |  | 11.3 (0.2) | 3.0 (0.2) |  |
| Isopropyl Alcohol | 3.6 (0.2) | 6.5 (1.6) | 4.8 (0.8) | 4.0 (0.7) | 5.4 (0.6) |
| Vinyl Acetate | 0.1 (0.003) |  | **>20%** | 2.7 (0.1) |  |
| 1,4-Dioxane |  | 10.6 (0.2) | **>20%** | **>20%** |  |
| MTBE | 0.1 (0.024) | 6.3 (0.5) | 2.1 (0.2) | 0.8 (0.2) |  |
| Acetone | 0.4 (0.2) | 0.4 (0.2) | 12.0 (5.5) | 1.1 (0.5) | 7.0 (0.5) |
| MEK | 2.6 (0.3) |  |  | 2.8 (0.2) |  |
| DPK | 0.3 (0.012) | 5.4 (0.4) | 8.8 (0.6) | 2.7 (0.8) |  |
| DEK | 0.2 (0.010) |  | 6.2 (0.1) | **>20%** |  |
| MIBK | 0.6 (0.014) | 8.6 (0.3) | 6.1 (0.2) | **>20%** |  |
| Ethanal | 0.7 (0.039) | 3.3 (0.1) | **>20%** | 3.6 (0.1) | 6.0 (0.1) |
| Propanal | 1.3 (0.027) | 3.9 (0.056) | **>20%** | 15.5 (0.2) |  |
| Butanal | 0.2 (0.028) | 5.9 (0.3) | **>20%** | 1.1 (0.2) |  |
| Hexanal |  | 5.2 (0.4) | 4.7 (0.4) | 9.6 (4.6) | 3.2 (0.1) |
| Heptanal | 3.7 (0.1) | 5.6 (3.6) | 1.7 (1.2) | 1.3 (3.3) | 4.4 (0.5) |
| Octanal | 2.3 (0.055) | 7.7 (1.2) | 5.1 (0.8) | 15.6 (9.1) | 15.7 (0.6) |
| Nonanal | 1.6 (0.085) | **>20%** | 19.8 (1.3) | 2.8 (0.6) | **>20%** |
| Acrolein | 0.1 (0.008) |  | **>20%** |  |  |
| Methacrolein |  |  |  | 3.7 (0.061) |  |
| Acetonitrile | 2.5 (0.070) | 15.6 (0.6) | **>20%** | **>20%** | 3.9 (0.062) |

Supplement Table 5. **Newspaper Printery: Percentage coefficient of variation (CV (%)) (SD (ppb)) of VOC concentrations**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Archive | Administration | CTP | Storage | Web-fed Offset |
| n-Pentane | 0.7 (0.053) | 0.7 (0.049) | 0.8 (0.071) | 15.6 (1.3) | 7.9 (0.6) |
| n-Hexane | 1.3 (0.017) |  | 3.4 (0.051) | >20 | 10.1 (0.1) |
| Cyclohexane | 0.4 (0.040) | 0.8 (0.1) | 0.2 (0.022) | 8.7 (1.5) | 11.3 (2.9) |
| Methyl Chloride |  | 3.0 (0.019) | 2.7 (0.022) | >20 | 0.8 (0.005) |
| Methylene Chloride | 0.1 (0.009) | 0.3 (0.031) | 0.6 (0.063) | 7.1 (0.7) | 5.8 (0.7) |
| Chloroform | 1.0 (0.019) | 1.0 (0.031) | 0.2 (0.007) | 9.4 (0.4) | 5.2 (0.3) |
| Ethyl Chloride |  |  |  | 7.2 (0.055) |  |
| Methyl Chloroform |  |  | 1.2 (0.020) | 6.2 (0.2) | 3.9 (0.1) |
| 1,1,2,2-TCEa |  | 13.1 (0.8) | 4.9 (0.3) | 3.4 (0.3) | 0.7 (0.038) |
| Bromoform | 11.1 (1.0) | 6.5 (2.5) | 9.1 (2.8) | 9.6 (5.4) | 4.1 (3.5) |
| Bromodichloromethane |  | **>20%** | 7.6 (0.1) | 7.7 (0.2) | 9.2 (0.4) |
| CFC-12/HCFC-22 | 4.3 (0.3) | 2.5 (0.2) | 16.3 (1.4) | **>20%** | **>20%** |
| CFC-114 | 5.8 (2.2) | 5.0 (2.4) | 3.1 (2.6) | 2.2 (1.0) | **>20%** |
| CFC-11 | 1.2 (0.1) | 0.4 (0.034) | 0.4 (0.035) | 5.7 (0.5) | 5.4 (0.5) |
| Propene | 5.1 (0.3) | 1.7 (0.2) | 0.5 (0.073) | 10.9 (1.2) | 8.3 (0.9) |
| Isobutylene |  |  |  |  | 4.4 (0.032) |
| Isoprene | 1.8 (0.026) | 1.8 (0.053) | 3.0 (0.1) | 13.1 (0.2) | 15.7 (0.2) |
| Vinyl Chloride | 4.5 (2.0) | 5.6 (2.7) | 1.7 (1.4) | 2.2 (1.1) | **>20%** |
| cis-1,2-DCEe | 6.6 (0.1) | 17.8 (0.3) | 6.3 (0.2) | 15.8 (0.4) | **>20%** |
| cis-1,3-DCPe |  |  |  |  | 6.5 (0.1) |
| trans-1,3-DCPe | 2.0 (0.033) | 1.0 (0.077) | 2.0 (0.1) | 4.6 (0.6) | 5.4 (1.2) |
| Benzene/1,2-DCEa | **>20%** | **>20%** | **>20%** | 5.3 (0.2) | **>20%** |
| Ethylbenzene | 1.7 (0.3) | **>20%** | 6.4 (6.0) | 1.4 (3.1) | 1.9 (6.0) |
| o-Xylene/Styrene | 1.1 (0.2) | 1.7 (1.3) | 1.1 (0.7) | 5.6 (6.5) | 4.1 (8.8) |
| m-Xylene/p-Xylene | 1.3 (0.5) | 1.8 (3.8) | 2.0 (3.8) | 4.8 (15.6) | 2.6 (17.0) |
| 1,3,5-TMB | 2.2 (0.6) | 1.1 (1.3) | 2.2 (2.1) | 3.8 (5.6) | 2.6 (5.8) |
| 1,2,3-TMB | 2.8 (0.3) | **>20%** | 5.1 (1.8) | 14.7 (7.2) | **>20%** |
| 1,2,4-TMB | 2.3 (0.2) | 4.6 (0.7) | 14.0 (1.7) | 6.3 (0.8) | 3.4 (0.5) |
| Toluene | 1.0 (0.1) | 1.2 (0.3) | 1.6 (0.4) | 4.9 (1.8) | 7.4 (4.2) |
| Chlorobenzene |  |  | 2.3 (0.5) | 6.7 (1.4) |  |
| Benzyl Chloride | 2.0 (0.3) | 9.3 (4.4) | 12.2 (5.9) | 10.4 (5.5) | 18.6 (6.6) |
| o-DCB | 2.2 (0.2) | 2.3 (1.4) | 2.2 (1.1) | 2.8 (2.3) | 3.0 (3.3) |
| m-DCB | 0.8 (0.036) | 16.2 (6.0) | **>20%** | 19.3 (6.4) | **>20%** |
| p-DCB | 2.1 (0.2) | 8.3 (5.5) | 16.6 (5.0) | 6.6 (5.0) | 17.4 (8.7) |
| Methyl Alcohol | 4.6 (15.1) | 1.0 (17.0) | 0.5 (9.9) | 0.7 (18.2) | 0.1 (1.6) |
| Ethyl Alcohol | 4.0 (11.6) | 0.5 (4.8) | 0.9 (9.3) | 4.6 (15.3) | 2.0 (12.6) |
| n-Propyl Alcohol |  | 7.2 (0.2) | 3.9 (0.086) | 8.3 (0.2) | 8.3 (0.3) |
| Isopropyl Alcohol | 2.6 (1.1) | 0.4 (0.1) | 3.1 (1.7) | 4.9 (2.5) | 3.5 (1.8) |
| 1,4-Dioxane |  | 18.8 (0.4) |  |  | **>20%** |
| MTBE | 0.5 (0.026) | 0.4 (0.017) | 2.6 (0.1) | 11.7 (0.6) | 8.0 (0.4) |
| Acetone | 2.3 (0.5) | 3.2 (1.4) | 1.0 (0.6) | 11.9 (6.8) | 12.4 (7.9) |
| MEK | 1.7 (0.063) | 1.2 (0.058) | 2.1 (0.2) | 6.7 (1.1) | 6.9 (0.4) |
| MPK | 2.7 (0.080) | 7.9 (0.3) | **>20%** | 5.8 (0.2) | 5.9 (0.3) |
| MBK |  | **>20%** | **>20%** | 6.7 (0.3) | **>20%** |
| Ethanal | 1.6 (0.1) | 1.6 (0.3) | 1.6 (0.2) | 8.5 (1.7) | 6.7 (1.8) |
| Propanal | 4.1 (0.1) | 3.2 (0.3) | 1.9 (0.1) | 8.6 (0.7) | 8.5 (1.0) |
| Butanal | 12.9 (0.2) | >20 | 8.3 (0.2) | 7.8 (0.1) | 13.6 (0.3) |
| Pentanal | 6.9 (0.1) | 3.3 (0.2) | 2.1 (0.1) | 6.1 (0.4) | 4.4 (0.5) |
| Hexanal | 0.9 (0.1) | 1.3 (0.4) | 1.9 (0.6) | 5.4 (2.7) | 6.8 (5.1) |
| Heptanal | 11.0 (0.5) | 13.7 (1.8) | **>20%** | 8.0 (1.5) | 5.4 (1.6) |
| Octanal | 4.6 (0.6) | 4.8 (2.8) | **>20%** | 2.9 (2.3) | 2.1 (2.1) |
| Nonanal | 12.8 (2.0) | 9.6 (2.0) | 11.9 (3.9) | **>20%** | **>20%** |
| Acrolein |  | **>20%** | 3.0 (0.042) |  | 10.3 (0.2) |

Supplement Figure 1. VOC concentrations (ppb) from Government printery and that from post-2000 printery studies.



Supplement Figure 2. VOC concentrations (ppb) from Scientific printery and that from post-2000 printery studies.



Supplement Figure 3. VOC concentrations (ppb) from Newspaper printery and that from post-2000 printery studies.

