



**Extract of MBBR/IFAS reference plants of Multi Umwelttechnologie AG, operated with Mutag BioChip™**

| <i>Project</i>                | <i>Type of wastewater</i> | <i>Country</i> | <i>Flow rate</i>          | <i>Removal performance</i> | <i>Process</i> | <i>Commissioning</i> |
|-------------------------------|---------------------------|----------------|---------------------------|----------------------------|----------------|----------------------|
| China Steel Corporation 1*    | Coke oven                 | Taiwan         | 300 (m <sup>3</sup> /h)   | 18,000 (kg COD/d)          | MBBR           | 2000                 |
| ZKS Dillingen ArcelorMittal   | Coke oven                 | Germany        | 800 (m <sup>3</sup> /h)   | 800 (kg TN/d)              | MBBR           | 2008                 |
| HSC Czestochowa               | Coke oven                 | Poland         | 250 (m <sup>3</sup> /h)   | 220 (kg TN/d)              | MBBR           | 2008                 |
| Perlen Papier 1 (Voith Paper) | Paper mill                | Switzerland    | 500 (m <sup>3</sup> /h)   | 15,000 (kg COD/d)          | MBBR           | 2009                 |
| Perlen Papier 2 (Voith Paper) | Paper mill                | Switzerland    | 500 (m <sup>3</sup> /h)   | 15,000 (kg COD/d)          | MBBR           | 2009                 |
| Perlen Papier 3 (Voith Paper) | Paper mill                | Switzerland    | 1,000 (m <sup>3</sup> /h) | 15,000 (kg COD/d)          | IFAS           | 2010                 |
| Perlen Papier 4 (Voith Paper) | Paper mill                | Switzerland    | 1,000 (m <sup>3</sup> /h) | 15,000 (kg COD/d)          | IFAS           | 2010                 |
| Papierindustrie Myszkow       | Paper mill                | Poland         | 150 (m <sup>3</sup> /h)   | 10,000 (kg COD/d)          | MBBR           | 2008                 |
| WEPA paper                    | Paper mill                | Poland         | 25 (m <sup>3</sup> /h)    | 3,000 (kg COD/d)           | MBBR           | 2009                 |
| Kartonagen Schwarzenberg      | Paper mill                | Germany        | 60 (m <sup>3</sup> /h)    | 2,800 (kg COD/d)           | MBBR           | 2010                 |

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|-----------------------------|---------------------------|----------------|---------------------------|--|----------------|-----------------------|
| Erkelenz                    | Municipal                 | Germany        | 56,000 PE                 | Polishing-Stufe  | MBBR           | 2010                  |
| ArcelorMittal               | Coke oven                 | South Africa   | 2,000 (m <sup>3</sup> /h) | 14,400 (kg COD/d) and<br>2,160 (kg TN/d)   | MBBR           | under<br>construction |
| Bhushan Steel               | Coke oven                 | India          | 130 (m <sup>3</sup> /h)   | COD in = 2,500 mg/l<br>COD out = 250 mg/l<br>N total in = 300 mg/l<br>NH3N out = 50 mg/l | MBBR           | under<br>construction |
| Nanking Paper (Voith China) | Paper mill                | China          | 250 (m <sup>3</sup> /h)   | 48,000 (kg COD/d)  | MBBR           | under<br>construction |
| Hydrotec Biesenthal         | Municipal                 | Germany        | 450 (m <sup>3</sup> /d)   | 730 (kg COD/d) and<br>280 (kg BOD5/d)  | MBBR           | 2010                  |
| Bakery Riga                 | Food industry             | Latvia         | 30 (m <sup>3</sup> /d)    | 60 (kg BOD5/d)   | IFAS           | 2010                  |
| Philip Morris               | Tobacco industry          | Malaysia       | 30 (m <sup>3</sup> /d)    | 130 (kg BOD5/d)  | IFAS           | 2010                  |
| Fischzucht Langwald         | Aquaculture               | Germany        | 192 (m <sup>3</sup> /d)   | Nitrification  | MBBR           | 2010                  |
| Smurfit Kappa               | Paper mill                | Germany        | 150 (m <sup>3</sup> /h)   | 5,000 (kg COD/d)   | MBBR           | 2011                  |
| Lee Kum Kee                 | Food industry             | Malaysia       | 120 (m <sup>3</sup> /d)   | 600 (kg BOD5/d)  | MBBR           | 2011                  |
| Keck Seng Oil Mill          | Palm oil                  | Malaysia       | 1,200 (m <sup>3</sup> /d) | 600 (kg BOD3/d)  | MBBR           | 2011                  |
| Berjaya Oil Mill            | Palm oil                  | Malaysia       | 240 (m <sup>3</sup> /d)   | 120 (kg BOD3/d)  | MBBR           | 2011                  |

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| Yeong Chaur Shing             | Paper mill                          | Malaysia       | 3,000 (m <sup>3</sup> /d) | 2,100 (kg COD/d)   | MBBR           | 2011                 |
| Permai Kaya                   | Food industry                       | Malaysia       | 144 (m <sup>3</sup> /d)   | 120 (kg BOD5/d)  | MBBR           | 2011                 |
| TDU                           | Power plant                         | Switzerland    |                           | Nitrification  | MBBR           | 2011                 |
| UNIFRAX                       | High-temperature isolating products | Germany        | 25 (m <sup>3</sup> /h)    | 800 (kg COD/d)   | MBBR           | 2011                 |
| Baiersbronn                   | Paper mill                          | Germany        | 150 (m <sup>3</sup> /h)   | 2,000 (kg COD/d)   | MBBR/IF AS     | 02/2012              |
| POSCO E&C                     | Coke oven                           | Korea          | 140 (m <sup>3</sup> /h)   | COD in = 2,500 mg/l<br>COD out = 250 mg/l<br>N total in = 450 mg/l<br>NH3N out = 50 mg/l | MBBR           | under construction   |
| Jahasrat                      | Chicken Slaughtering                | Malaysia       | 600 (m <sup>3</sup> /d)   | COD Removal  | MBBR           | under construction   |
| KL Supreme                    | Chicken Slaughtering                | Malaysia       | 156 (m <sup>3</sup> /d)   | COD Removal  | MBBR           | 2011                 |
| Kayu Madang Sanitary Landfill | Leachate                            | Malaysia       | 840 (m <sup>3</sup> /d)   | COD Removal  | MBBR           | under construction   |
| Hume Cemboard                 | Cement Board                        | Malaysia       | 240 (m <sup>3</sup> /d)   | COD Removal  | MBBR           | 2011                 |
| Cray Valley                   | Chemical (Resin)                    | Malaysia       | 10 (m <sup>3</sup> /d)    | COD Removal  | MBBR           | 2011                 |

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| Tulow               | Municipal  | Bangladesh     | 840 (m <sup>3</sup> /d)  | COD Removal                | MBBR           | 2012                  |
| SDS Dumai           | Palm Oil Refinery/<br>Oleochemical/<br>Biodiesel | Indonesia      | 2000 (m <sup>3</sup> /d) | COD Removal                | MBBR           | 2012                  |
| Crown Mills         | Textile  | Bangladesh     | 840 (m <sup>3</sup> /d)  | COD Removal                | MBBR           | 2012                  |
| ST Foods            | Chicken<br>Slaughtering                          | Malaysia       | 450 (m <sup>3</sup> /d)  | COD Removal                | MBBR           | 2012                  |
| AAJ Marunda         | Palm Oil Refinery                                | Indonesia      | 450 (m <sup>3</sup> /d)  | COD Removal                | MBBR           | 2012                  |
| Thai Tuan Textile   | Industry Zone                                    | Vietnam        | 1500 (m <sup>3</sup> /d) | COD Removal                | MBBR           | 2012                  |
| Copmark Nguyen Kiem | Textile  | Vietnam        | 100 (m <sup>3</sup> /d)  | COD Removal                | MBBR           | 2012                  |
| Thuy San 4          | Fish Processing                                  | Vietnam        | 500 (m <sup>3</sup> /d)  | COD Removal                | MBBR           | 2012                  |
| Vien Dong Hotel     | Municipal  | Vietnam        | 100 (m <sup>3</sup> /d)  | COD Removal                | MBBR           | 2012                  |
| StarTower           | Municipal  | Vietnam        | 60 (m <sup>3</sup> /d)   | COD Removal                | MBBR           | 2012                  |
| Binh Thuan Laundry  | Laundry  | Vietnam        | 80 (m <sup>3</sup> /d)   | COD Removal                | MBBR           | 2012                  |
| Xuan An Market      | Municipal  | Vietnam        | 80 (m <sup>3</sup> /d)   | COD Removal                | MBBR           | 2012                  |
| QL Agroventure      | Chicken<br>Slaughtering                          | Vietnam        | 400 (m <sup>3</sup> /d)  | COD Removal                | MBBR           | under<br>construction |

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|--------------------------|---------------------------|----------------|--------------------------|----------------------------|----------------|----------------------|
| Himlam President         | Municipal                 | Vietnam        | 3200 (m <sup>3</sup> /d) | COD Removal                | MBBR           | under construction   |
| Sai Dong Industrial Zone | Industry Zone             | Vietnam        | 2000 (m <sup>3</sup> /d) | COD Removal                | MBBR           | under construction   |
| Tran Hiep Thanh Textile  | Textile                   | Vietnam        | 4000 (m <sup>3</sup> /d) | COD Removal                | MBBR           | under construction   |
| ARA Oberes Surbtal       | Municipal                 | Switzerland    | 648 (m <sup>3</sup> /h)  | 20,750 PE                  | MBBR           | 2013                 |

The waste water treatment plants listed above have partially been designed and engineered by Multi Umwelttechnologie AG and are, if not marked \*, currently using the Mutag MBBR Technology™. The numerous plants which have just been supplied with Mutag BioChip™ carrier media and are therefore also applying the Mutag MBBR Technology™ are not listed in the present document.