

# Tratamento de efluentes e geração de créditos de carbono

Daniel R. Medeiros

Doutorando EESC/USP



pdfMachine

A pdf writer that produces quality PDF files with ease!

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!



# Tópicos



- Introdução
- Efluentes
- Tratamentos
- MDL – metodologias
- exemplos

**pdfMachine**

**A pdf writer that produces quality PDF files with ease!**

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!



# Introdução



- Pesquisas em tratamento de efluentes
  - Escola de Engenharia de São Carlos - USP
- Elevada recalcitrância
- Técnicas avançadas
  - Pulp and Paper Center – UBC / Canadá

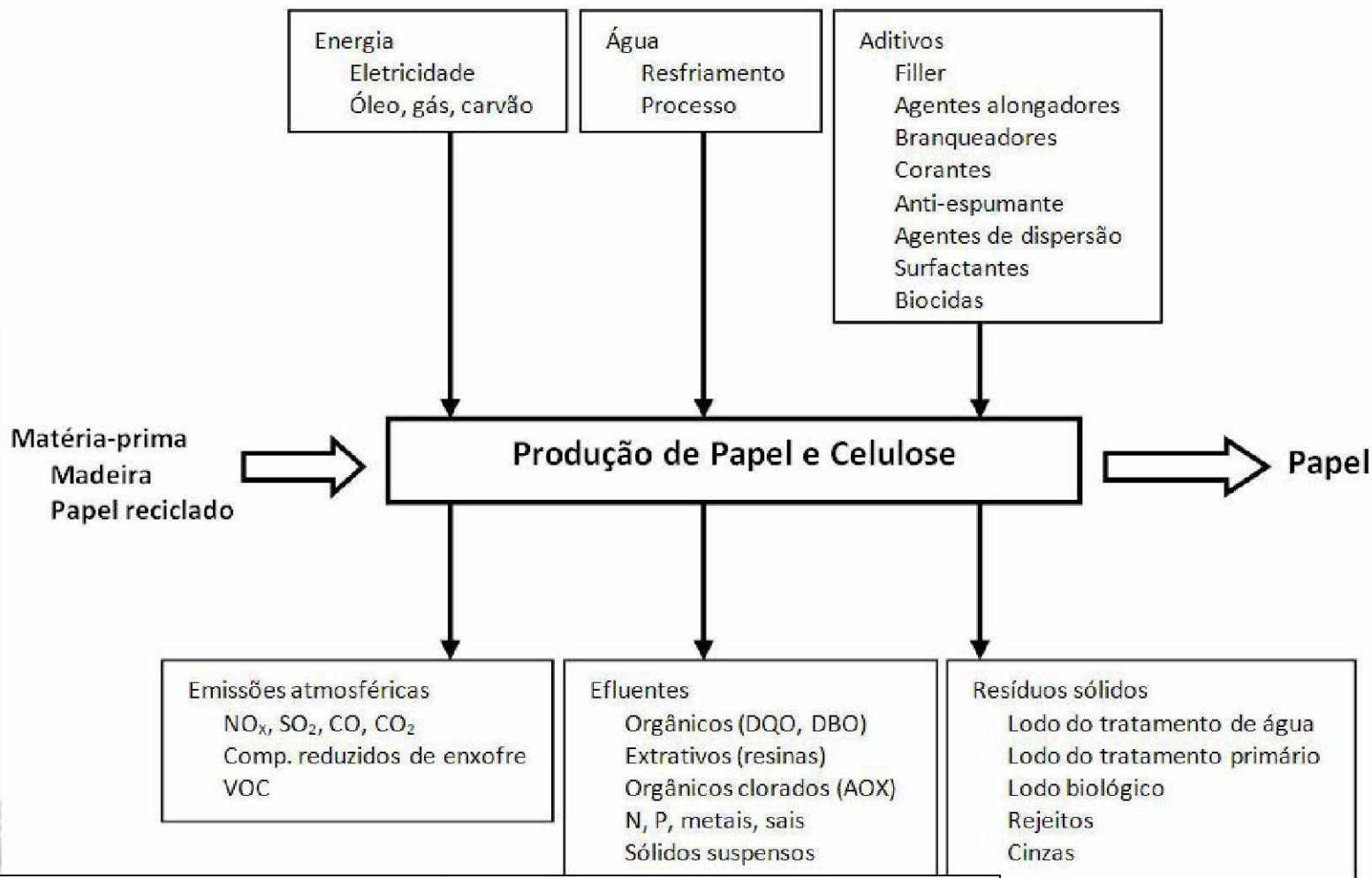
**pdfMachine**

**A pdf writer that produces quality PDF files with ease!**

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!

# Efluentes



pdfMachine

**A pdf writer that produces quality PDF files with ease!**

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!



# Características



- Matéria-prima
- Fonte energética
- Aditivos químicos
- Processo de deslignificação
- Seqüência e processos de branqueamento

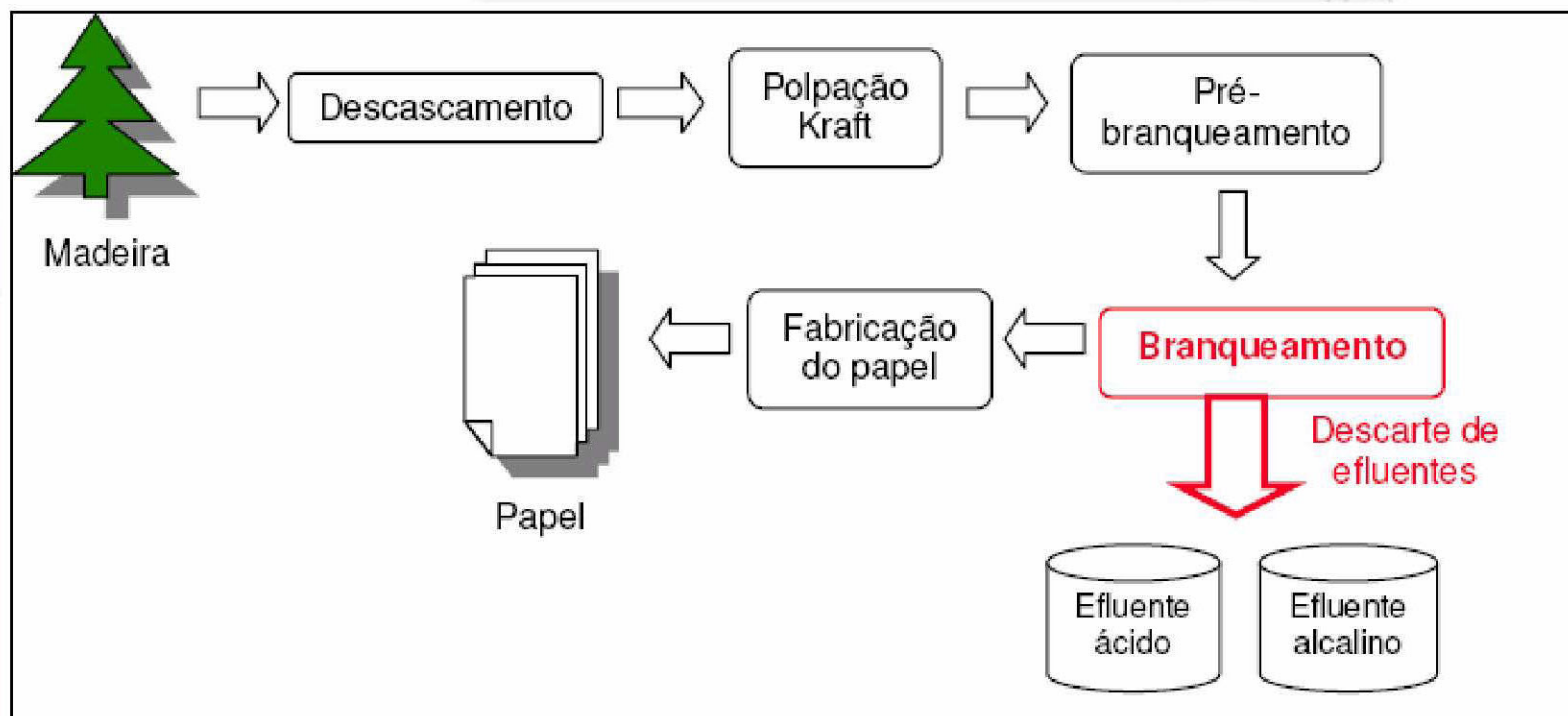
**pdfMachine**

**A pdf writer that produces quality PDF files with ease!**

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!

# Processo



Momenti, T. 2006.

pdfMachine

**A pdf writer that produces quality PDF files with ease!**

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!

# Efluentes

- Baixa relação  $DBO_5/DQO$
- Compostos clorofenólicos
- Coloração
- Lignina
- AOX

pdfMachine

**A pdf writer that produces quality PDF files with ease!**

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!



# Tratamento Biológico



- Tratamento Biológico
  - Degradação dos compostos orgânicos
  - Microrganismos
  - Conversão
- Lagoas de estabilização
- Processos aeróbios – Lodos ativados
- Reatores anaeróbios

pdfMachine

A pdf writer that produces quality PDF files with ease!

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!



- Mecanismo de Desenvolvimento Limpo

- Lagoas

- Anaeróbia
- Facultativa



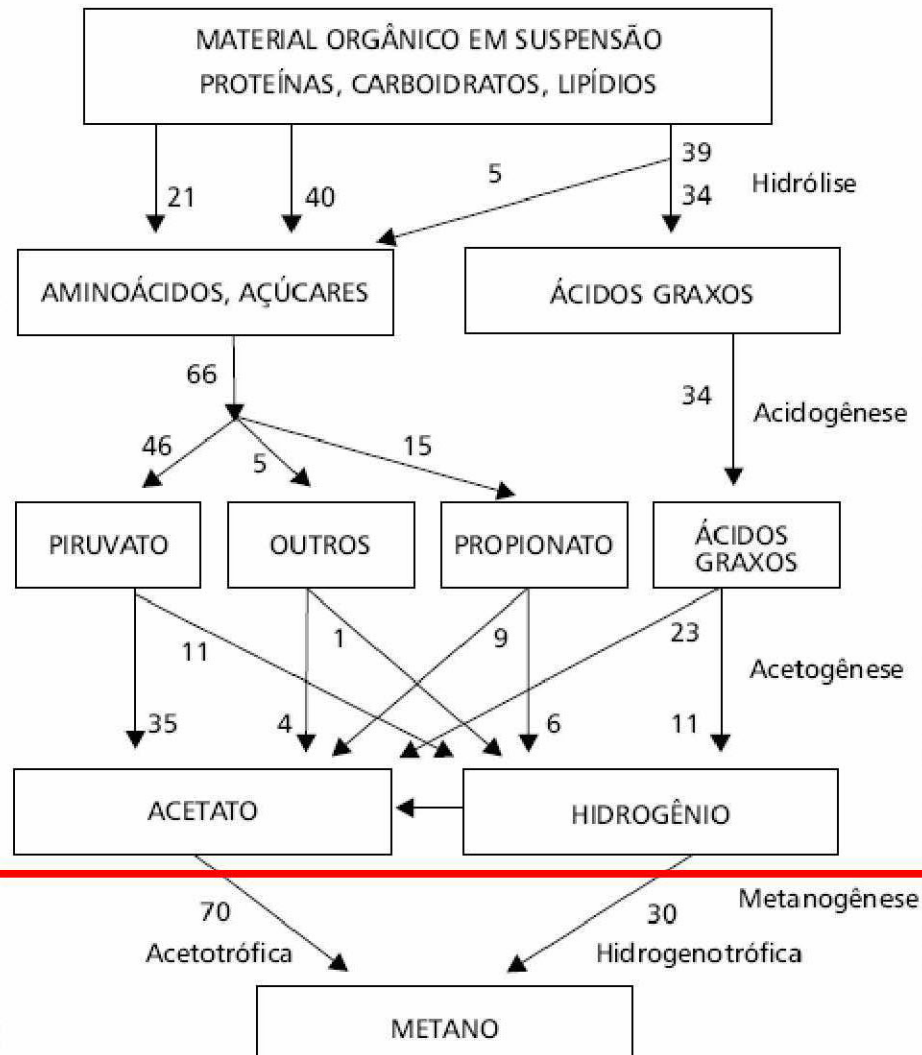
pdfMachine

**A pdf writer that produces quality PDF files with ease!**

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!

# Digestão anaeróbia



# Metano – CH<sub>4</sub>

- Digestão anaeróbia
- GEE
- Potencial de aquecimento global
  - 21 vezes superior ao potencial do CO<sub>2</sub>
- Biogás – geração de energia
  - Eletricidade / aquecimento / queima

pdfMachine

A pdf writer that produces quality PDF files with ease!

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!

- 1) Evitar a liberação de metano
- 2) Recuperar o metano

**pdfMachine**

**A pdf writer that produces quality PDF files with ease!**

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!

$$BE_{CH_4,y} = GWP_{CH_4} \times MCF_{BL,y} \times B_0 \times COD_{BL,y}$$

$BE_{CH_4,y}$  – emissões de metano decorrentes do tratamento  
(tCO<sub>2</sub>e / yr)

$GWP_{CH_4}$  – potencial de efeito estufa (tCO<sub>2</sub>e / tCH<sub>4</sub>)

$B_0$  – capacidade máxima de produção de CH<sub>4</sub> (tCH<sub>4</sub>/tCOD)

$MCF_{BL,y}$  – fator de conversão do metano

$COD_{BL,y}$  – tCOD / yr

pdfMachine

A pdf writer that produces quality PDF files with ease!

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!



# MDL - Metodologias



- Grande escala
  - ACM0014
  
- Pequena escala
  - AMS - III.H
  - AMS - III.I

**pdfMachine**

**A pdf writer that produces quality PDF files with ease!**

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!



# MDL - Metodologias



- ACM0014 – mitigação de GEE originados pelo tratamento de efluentes industriais (28 Março 2008)
- Substituição
  - AM0013 – emissões evitadas de  $\text{CH}_4$  originadas pelo tratamento de águas residuárias orgânicas
  - AM0022 – emissões evitadas de efluentes e do

pdfMachine

A pdf writer that produces quality PDF files with ease!

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!









industrial



# MDL - Metodologias



## ACM0014 : Mitigation of greenhouse gas emissions from treatment of industrial wastewater --- Version 2.1

<b>Title</b>	<p> <a href="#">Mitigation of greenhouse gas emissions from treatment of industrial wastewater</a> (463 KB)</p> <p>The additionality of the project activity shall be demonstrated and assessed using the  <a href="#">Tool for the demonstration and assessment of additionality (ver 5)</a> (226 KB)</p> <p>Other tools referenced in this methodology:</p> <p> <a href="#">Tool to determine project emissions from flaring gases containing methane</a> (157 KB)</p> <p> <a href="#">Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (version 01) (EB 32, annex 09)</a> (112 KB)</p> <p> <a href="#">Tool to estimate the baseline, project and/or leakage emissions from electricity consumption (version 01)</a> (238 KB)</p> <p> <a href="#">Tool to calculate the emission factor for an electricity system</a> (584 KB)</p>
<b>Version number</b>	2.1  <a href="#">Revision History</a> (28 KB)
<b>Scale</b>	Large scale --- Consolidated
<b>Status</b>	Active
<b>Validity</b>	Valid from 28 Mar 08 onwards
<b>Sectoral scope(s)</b>	

pdfMachine

**A pdf writer that produces quality PDF files with ease!**

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!



- ACM0014 – reduzir emissões de CH<sub>4</sub>
  - Dois cenários:
    - 1) Água residuária não é tratada – utilização de lagoas – condições anaeróbias
    - 2) Planta de tratamento – geração de lodo (decantadores primário e/ou secundário) – disposição em tanques de lodo



# MDL – ACM0014



- Cenário 1 – atividade de projeto
  - Tratamento em digestores anaeróbios
  - Extração do biogás
    - Queima e/ou geração de eletricidade/calor
  - Pós-tratamento
    - Lagoas
    - Tratamento aeróbio

pdfMachine

A pdf writer that produces quality PDF files with ease!

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!

- Cenário 2 – Atividade de projeto
  - Mesmo tratamento do efluente
  - Tratamento do lodo
    - a) Novo digestor anaeróbio
      - Biogás – queima e/ou eletricidade
      - Residual – lagoas ou tratamento aeróbio
    - b) Tratamento aeróbio

- AMS – III.H – Recuperação de metano em tratamento de efluentes

– Seis opções:

- 1) Substituição de tratamento aeróbio (águas residuárias ou lodo) por sistema anaeróbio
- 2) Introdução de tratamento anaeróbio do lodo
- 3) Recuperação de metano de um sistema de

- 4) Recuperação de metano de um sistema de tratamento anaeróbio existente
- 5) Introdução de um sistema de tratamento anaeróbio para águas residuárias sem tratamento
- 6) Introdução de um estágio seqüencial de tratamento a um sistema já existente

pdfMachine

**A pdf writer that produces quality PDF files with ease!**

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!



# MDL – AMS – III.H



- Utilização do metano além da queima
  - Geração de energia térmica ou elétrica
    - Direta
    - Após engarrafado
    - Distribuição: junto a gás natural ou transporte via tubulação a consumidores finais
  - Produção de hidrogênio

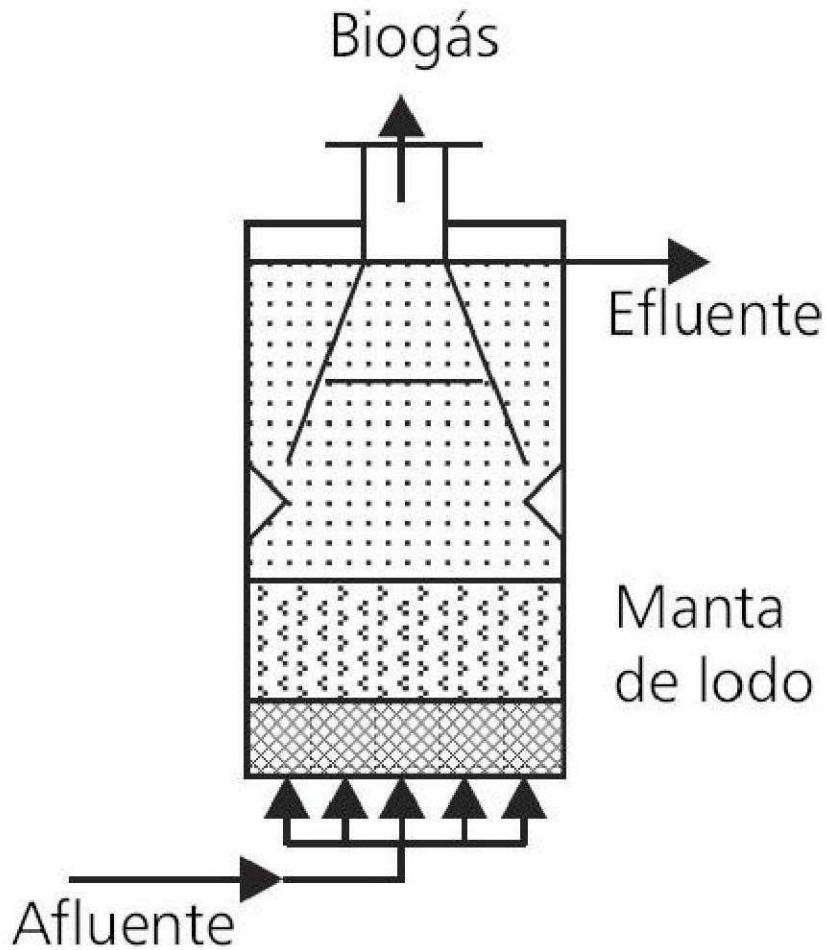
pdfMachine

**A pdf writer that produces quality PDF files with ease!**

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!

# Reatores anaeróbios



Prosab. 1999

pdfMachine

A pdf writer that produces quality PDF files with ease!

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!



# MDL - Metodologias



- AMS – III.1 – Emissões evitadas de metano no tratamento de águas residuárias pela substituição de lagoas anaeróbias por sistemas aeróbios
  - Não há combustão ou recuperação de metano

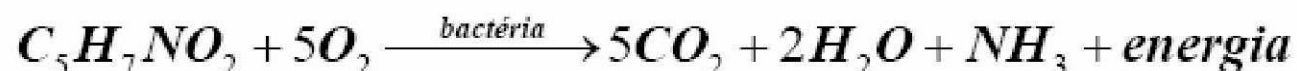
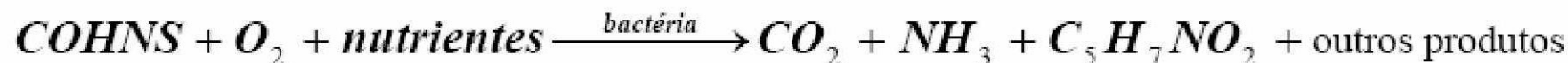
pdfMachine

**A pdf writer that produces quality PDF files with ease!**

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!

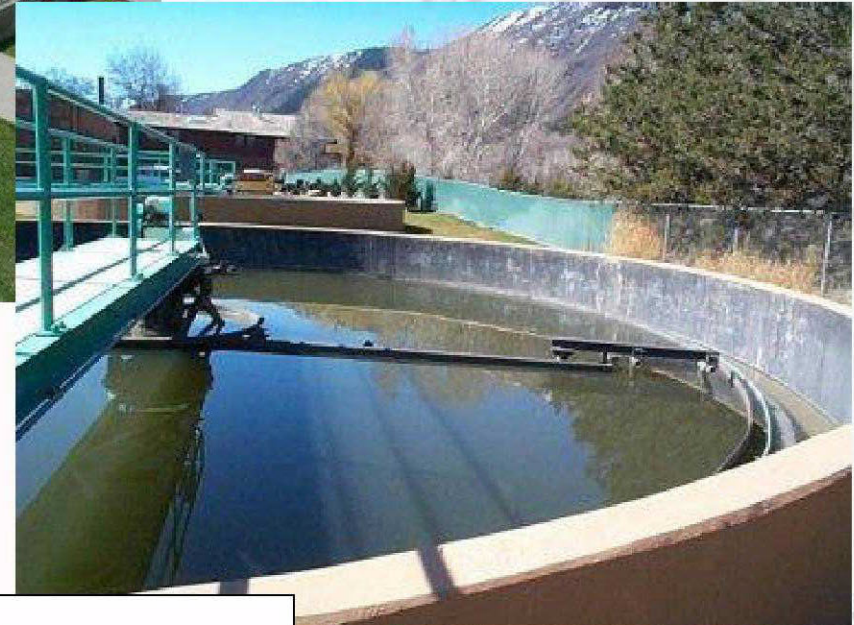
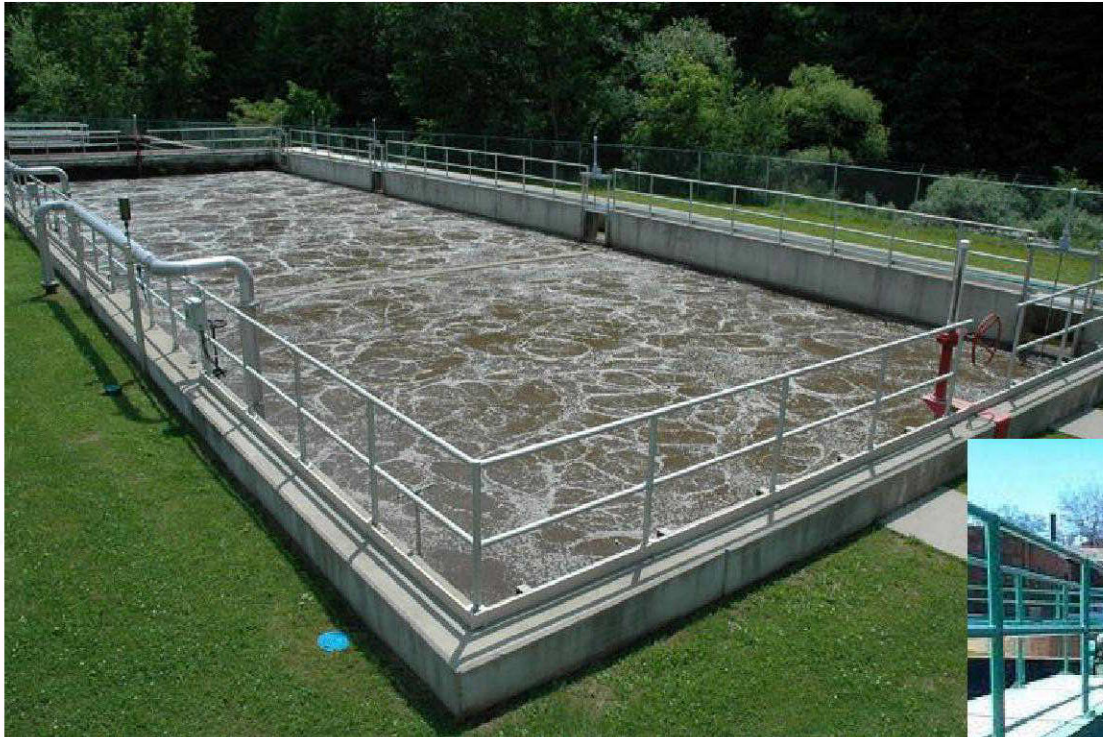




- Oxidação biológica
- Matéria orgânica como fonte de energia
- Produção de  $CO_2$
- Geração de lodo



# Tratamento aeróbico



pdfMachine

**A pdf writer that produces quality PDF files with ease!**

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!

# Exemplo 1

- Pequena escala – Captura de CH<sub>4</sub>
  - 2000 m<sup>3</sup>/dia
  - COD: 7000 mg/L
  - Lagoas anaeróbias
- Proposta: instalação de reator UASB
  - Gás: energia para *boilers* – casca de arroz

# Exemplo 1

- Emissões da Linha de Base (lagoa)
  - 22.000 ton/yr
- Emissões do projeto
  - 9.000 ton/yr
- Redução
  - 13.000 ton/yr

pdfMachine

**A pdf writer that produces quality PDF files with ease!**

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!

## Exemplo 2

- Pequena escala – Captura CH<sub>4</sub>
  - 12.000 m<sup>3</sup>/dia
  - COD: 6000 mg/L
  - Lagoas anaeróbias
- Proposta – reator UASB – subst. fósseis
  - TDH: 20 horas

6 kg COD / m<sup>3</sup> / dia

pdfMachine

A pdf writer that produces quality PDF files with ease!

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!

## Exemplo 2

- Emissões da Linha de Base
  - Lagoa: 40.000 tCO<sub>2</sub>e/yr
  - Comb. Fósseis: 9.000 tCO<sub>2</sub>e/yr
- Emissões do projeto
  - 12.000 tCO<sub>2</sub>e/yr
- Redução:

pdfMachine

A pdf writer that produces quality PDF files with ease!

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!

# Conclusões

- Tratamento de efluentes
  - Papel de destaque
- Não se limita a atingir os limites de descarte
- Aumento da eficiência e controle
  - Subst. lagoas por reatores

Introdução de novas tecnologias

pdfMachine

A pdf writer that produces quality PDF files with ease!

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!

# Conclusões

- Fonte energética renovável
  - Elevado valor ambiental
  - Subproduto da degradação
- Metodologias simples
- Incentivo à otimização dos processos
- Desenvolvimento e Pesquisa

pdfMachine

**A pdf writer that produces quality PDF files with ease!**

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!





# Obrigado pela atenção!

## Contato:

[daniel.medeiros@sustentax.com.br](mailto:daniel.medeiros@sustentax.com.br)

(11) 3062-5031 / (51) 3251-5474

pdfMachine

**A pdf writer that produces quality PDF files with ease!**

Produce quality PDF files in seconds and preserve the integrity of your original documents. Compatible across nearly all Windows platforms, if you can print from a windows application you can use pdfMachine.

Get yours now!