3rd INTERNATIONAL WORKSHOP
ADVANCES IN CLEANER PRODUCTION
2011 – May 18-20
Brazil – Sao Paulo-SP
"CLEANER PRODUCTION INITIATIVES AND CHALLENGES FOR A SUSTAINABLE WORLD"

Decisions and Procedures to Cleaner Production Concerning on Liquid Effluents Assessment

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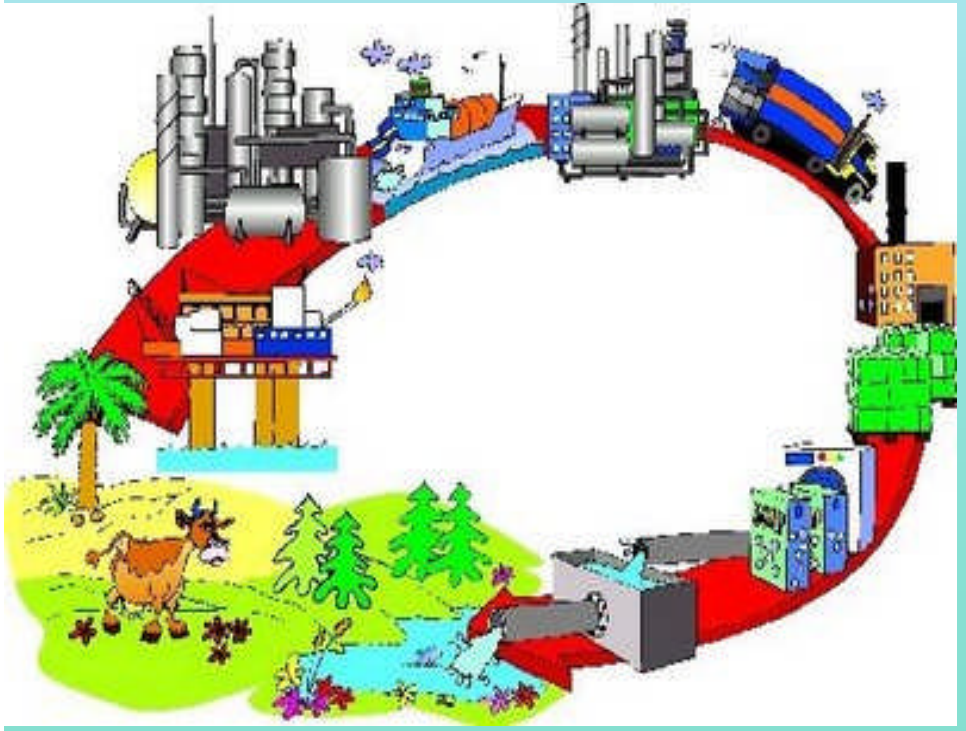


INTRODUCTION

Economic Planning in Production

Environmental Regulation Compliance

Inputs

- Energy
- Raw
- Water
- Capital $
- Manufacture
- Staff ability
- Technology
- Information
- Management

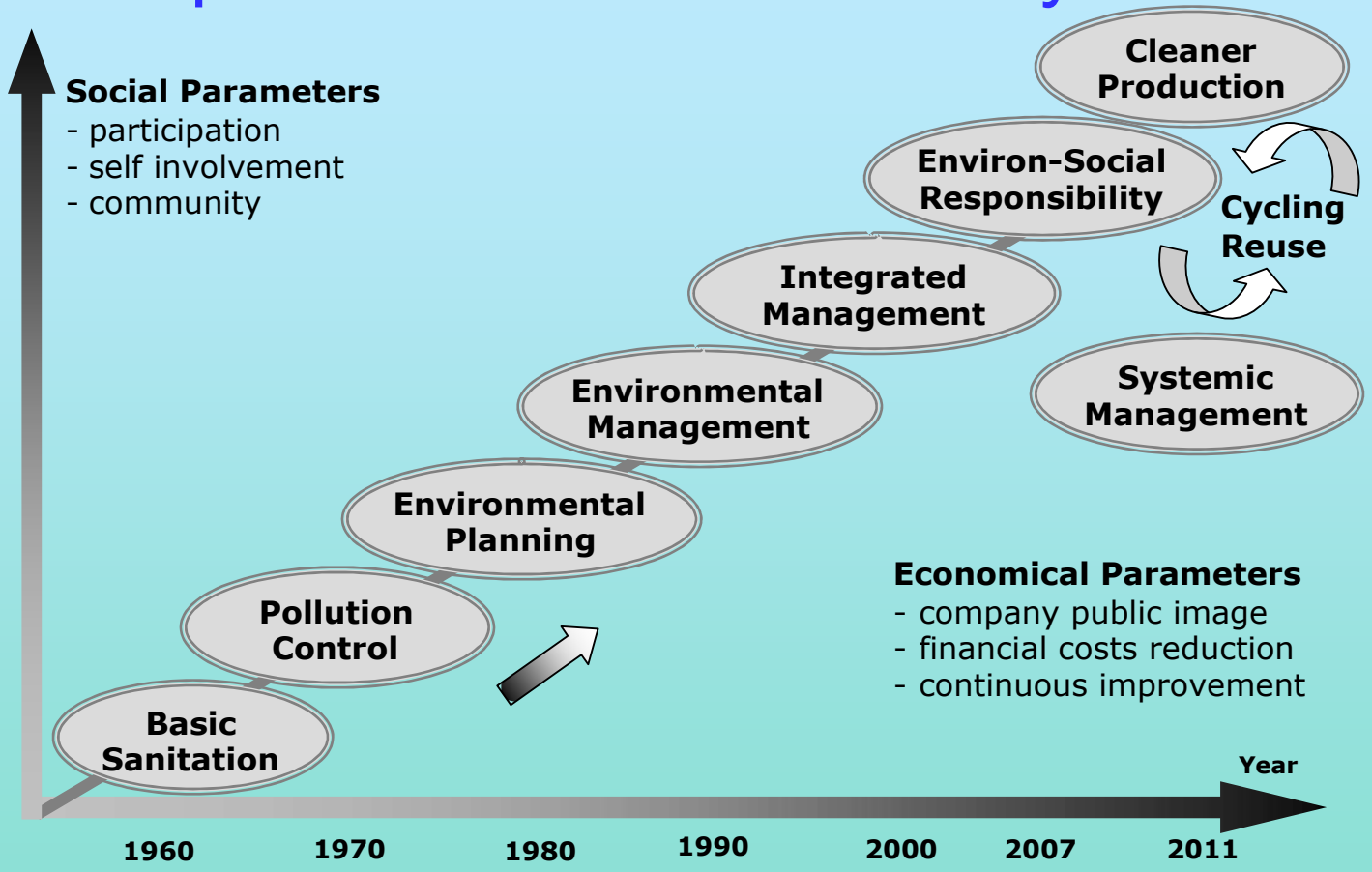
Outputs

- Solid Residue
- Solid Waste
- Liquid Effluent
- Gases Release
- GHG
- Ozone Depletion
- Noise
- POP
- Radioatives
- Conventional
- Products

Reuse Treatments Recovery Reduction

COMPANY IMAGE: goals

Cleaner production and sustainability factors evolution



Environmental management evolution in the Brazil, under three main sustainability influence factors.

- Liquid Effluent Contain
  - + Potential Stable Pollutants (conventional chemical substances)
  - + Potential Radioactive Pollutants (radioisotopes)

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Environmental Impact Assessment

Environmental Assessment Liquid Effluent

1- Liquid Effluent Generation

2- Storage Tank for Analyses

3- Sewerage System Inside Company Area

4- Discharge Sewerage Point

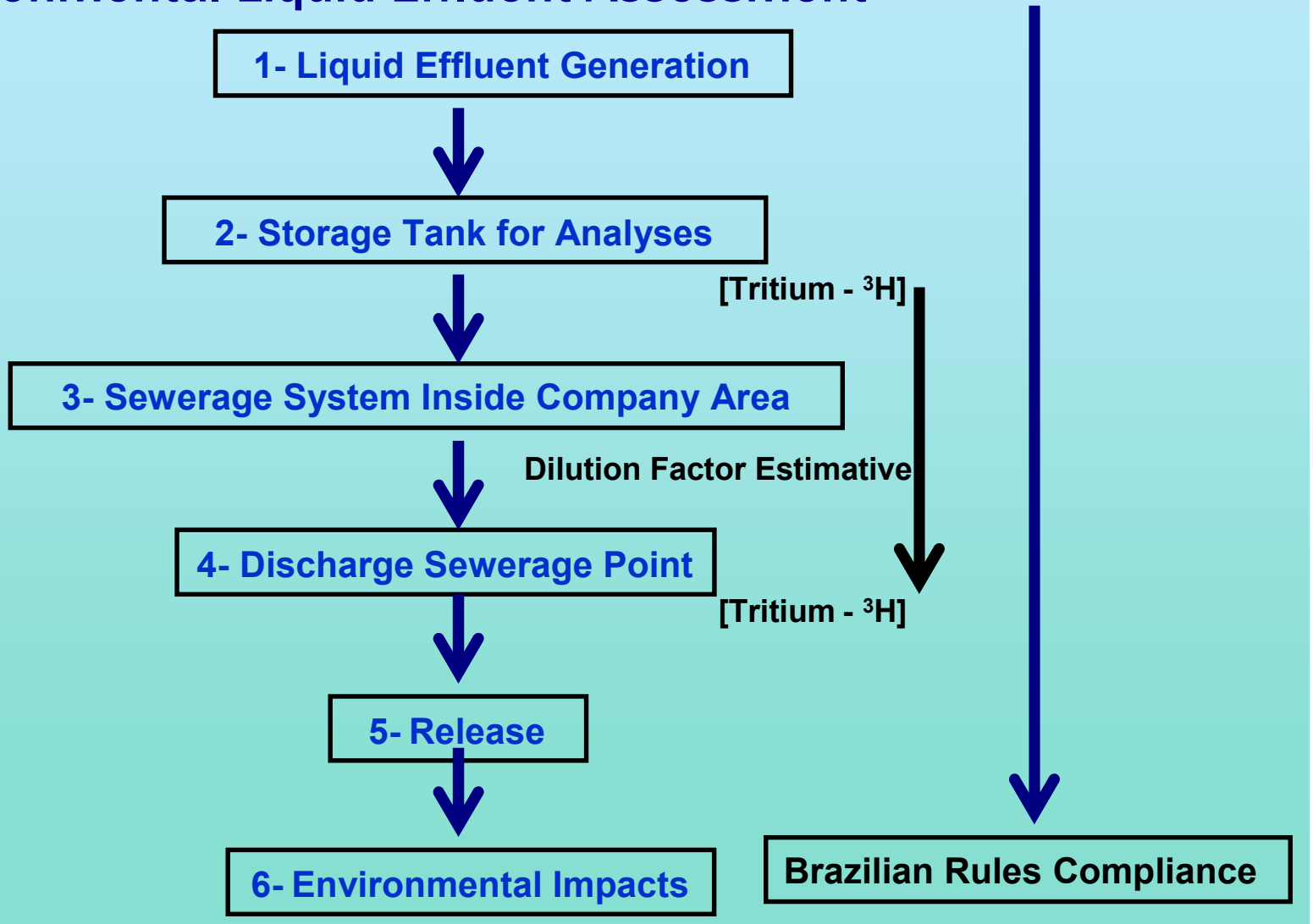
5- Release

6- Environmental Impacts

Brazilian Rules Compliance

METHODOLOGY

Environmental Liquid Effluent Assessment

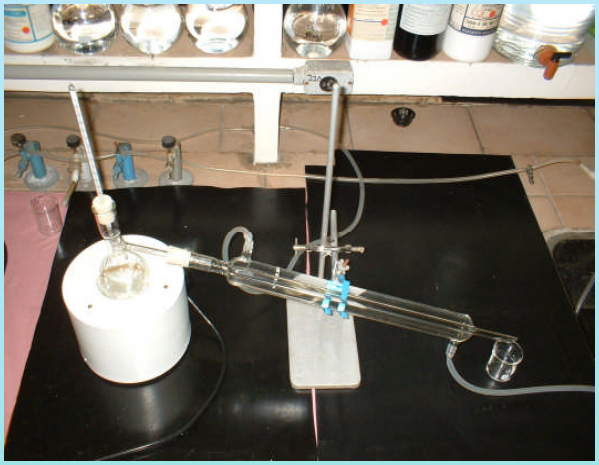


Tritium generation could be associated with:

- naturally in the upper atmosphere when cosmic rays strike nitrogen molecules in the air;
- during nuclear weapons explosions;
- as a byproduct in power reactors, producing electricity;
- as a potential pollutant in research reactors operation.

Tritium Measurement

Sample pre-treatment



Sample Homogenization

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Tritium Sub-samples Very Slow Distillation

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Transfer to Cocktail Scintillation Solution

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Gentle Mixing

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Cooled and Dark Storage

Tritium Measurement

Liquid Scintillation Counting Method for Beta Radiation Tritium Emission

Tritium samples concentration (Bq L-1)determination

$$C = \left(\frac{Ca}{Ef_{a.V}} - \frac{Bg}{Ef_{bg.V}} \right)$$

Where:

C: Tritium sample concentration (Bq L-1)
Ca: sample counting (cps)
Bg: background radiation (cps)
Efa: sample counting efficiency (cps dps-1)
Efbg: background counting efficiency (cps.dps-1)
V: sample volume (L)

Tritium Measurement Quenching Correction

The Quench-indicating Parameter is the Spectral Index of the Sample (QIP) and the external source quench-indicating parameter is the transformed Spectral Index of the External Standard (tSIE). The counting efficiency was certain for the methodology "transformed Spectral Index f the standard External" (tSIE) using a source 133Ba, wherein each radionuclide equation is near linear and is expressed in the equation

$$y = mx + b$$

Where:

y: QIP value;

m: slope of plot of SIS versus tSIE;

x: tSIE value,

b: intercept on SIS axis of a plot of SIS versus tSIE.

Planned release for stored effluent

tank flow rate exit estimative for liquid controlled dispenser

2- Storage Tank for Analyses

3- Sewerage System Inside Company Area

4- Discharge Sewerage Point

Potential Radioactive Pollutant

[Tritium - ^3H]

Tritium concentration

Dilution Factor Estimative

[Tritium - ^3H]

The Tritium concentration was determined for several time controlled samples (Bq L^{-1}). These values were compared with the initial activity concentration.

Tritium Measurement Quenching Correction

The dilution factor estimated for radioactive sample effluent in the sewerage point was obtained by equation:

$$Fd_{E1,i} = \frac{C_{tr1,i}}{C_{E1,i}}$$

Where:
FdE1,i: sewerage point E1 Dilution Factor for radioisotope i.
Ctr1,i : radiotracer i initial concentration (Bq L-1) for effluent inside storage tank.
CE1,i : radiotracer i concentration (Bq L-1) in sewerage effluent sampled (Bq L-1)

RESULTS

Planned release for stored effluent

tank flow rate exit was estimated as 10.9 ± 0.9 m3.h-1 for liquid controlled dispenser

2- Storage Tank for Analyses

[Tritium - ^{3}H] **56881±3255 Bq L^{-1}**

3- Sewerage System Inside Company Area

Dilution Factor Estimative

4- Discharge Sewerage Point

[Tritium - ^{3}H]

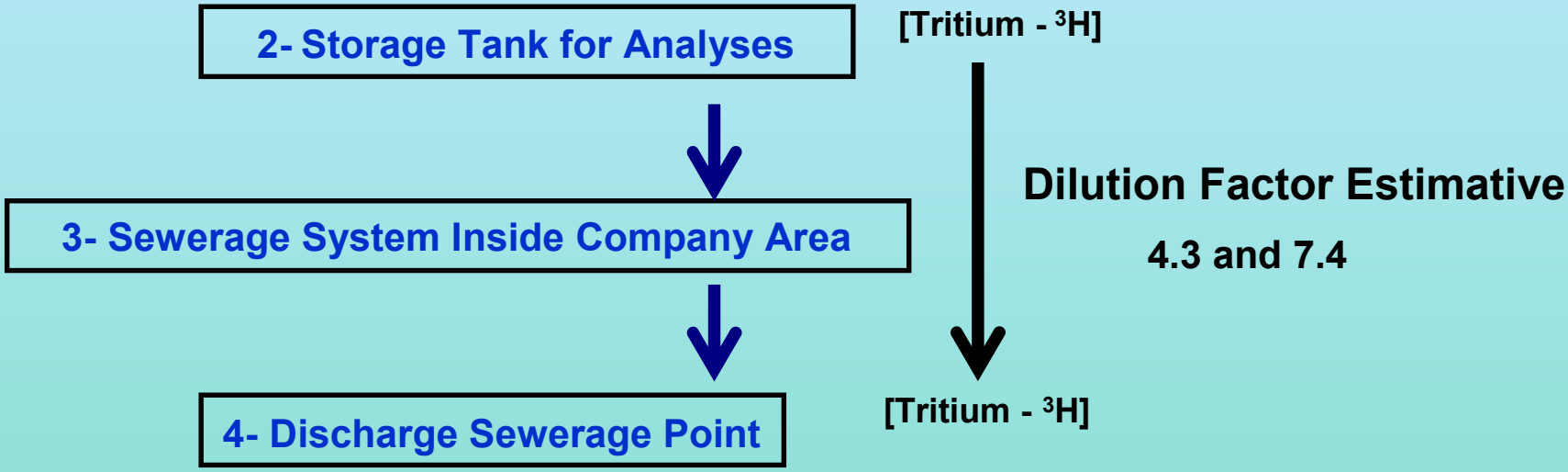
The tritium concentration was determined for several time controlled samples (Bq L^{-1}). These values were compared with the initial activity concentration.

Day	Time	^{3}H (Bq L^{-1})	Dilution Factor
1	9h37	10361 ± 518	5.5
1	10h35	14881 ± 748	3.8
1	11h31	21963 ± 1098	2.6
1	12h37	14629 ± 732	3.9
1	13h33	11247 ± 563	5.1
1	14h30	11913 ± 596	4.8
average			4.3
2	9h35	9727 ± 486	5.8
2	10h30	9849 ± 493	5.8
2	11h20	5367 ± 269	10.6
average			7.4

RESULTS

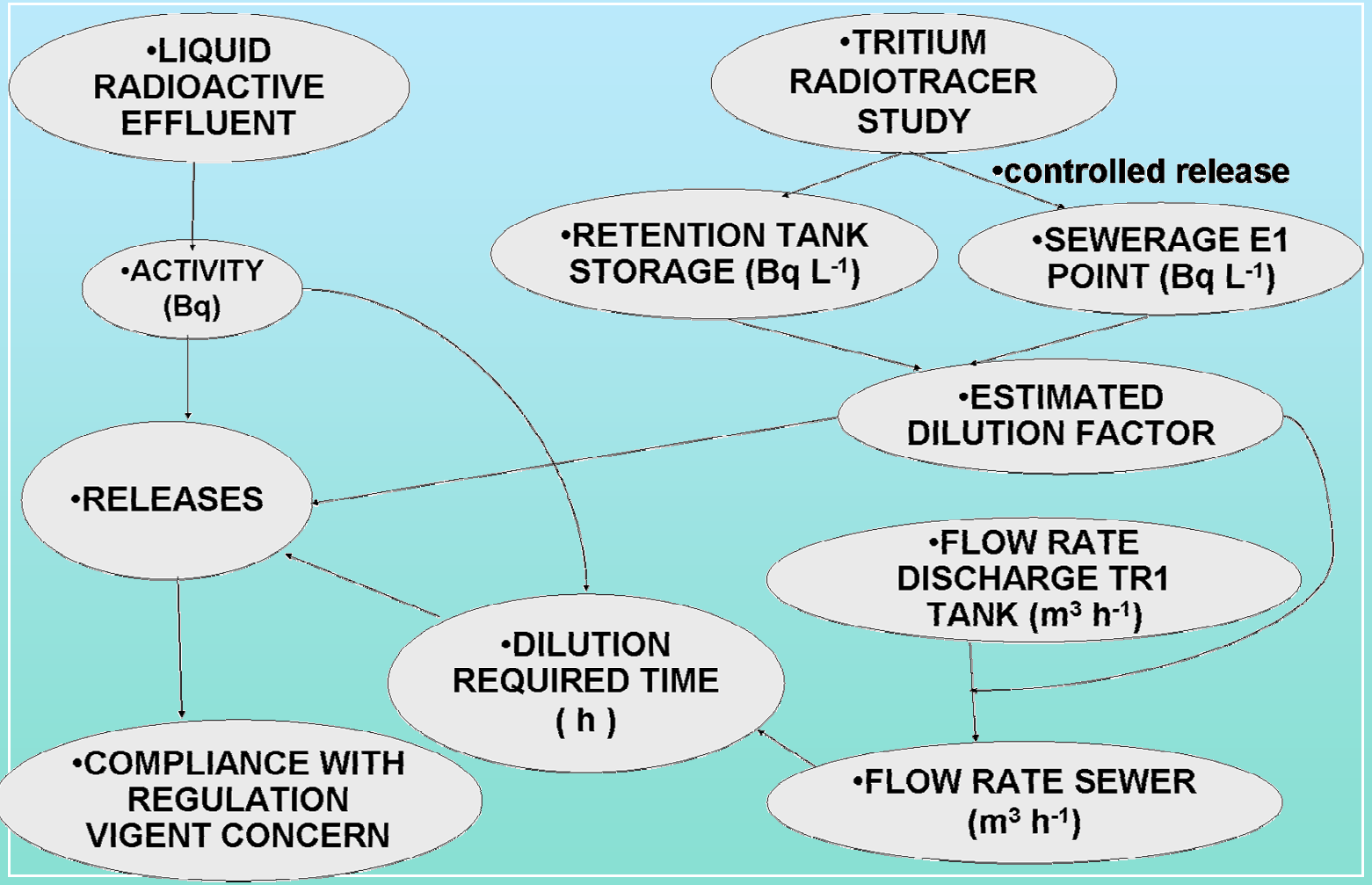
Planned release for stored effluent

tank flow rate exit was estimated as 10.9 ± 0.9 m3.h-1 for liquid controlled dispenser



Brazilian Regulation prohibits the use of superior quality water for effluent dilution.
In this case was estimated the dilution factor for discharge point facility, using the generated effluents (same quality water) from several unities in installation operation company.

RESULTS



Possible Routine Base Protocol Implantation for Environmental Management Improvement Based on Clean Procedure.

CONCLUSIONS

- The Tritium, generated as operational unfavorable radioactive specie was used as an able radiotracer.

- The dilution factor estimative came possible a procedure protocol for use of the practical dilution factor generated in optimization discharge of liquid effluents in production

CONCLUSIONS

- No environmental or financial costs were added by this operational and *in loco* radiotracer assay .

- The procedure for dilution factor estimative was cleaner, without radioisotope increment concentrations into sewage and environment

CONCLUSIONS

- This study was carried out without additional environmental or monetary costs, accomplished the cleaner production practices and procedures propose.

- The actual cleaner production improvement require attitudes changing, ensuring responsible environmental management, creative conductive companies policies and evaluation technology options evaluation.

CONCLUSIONS

- The use of a potential pollutant to estimate the dilution factor of the aqueous effluents is able to conventional industry, radioactive or nuclear plants.

- Could be carried out for all chemical species, generated in process and sent for storage effluent tank or treatment station.

CONCLUSIONS

- The procedure and decisions are able for human production field, such as mining, milling, engineer, agricultural, public urban area policy, transportation and tourism actions.

- In addition, a table of expected dilution volumes may be prepared by continuous monitoring, case to case.

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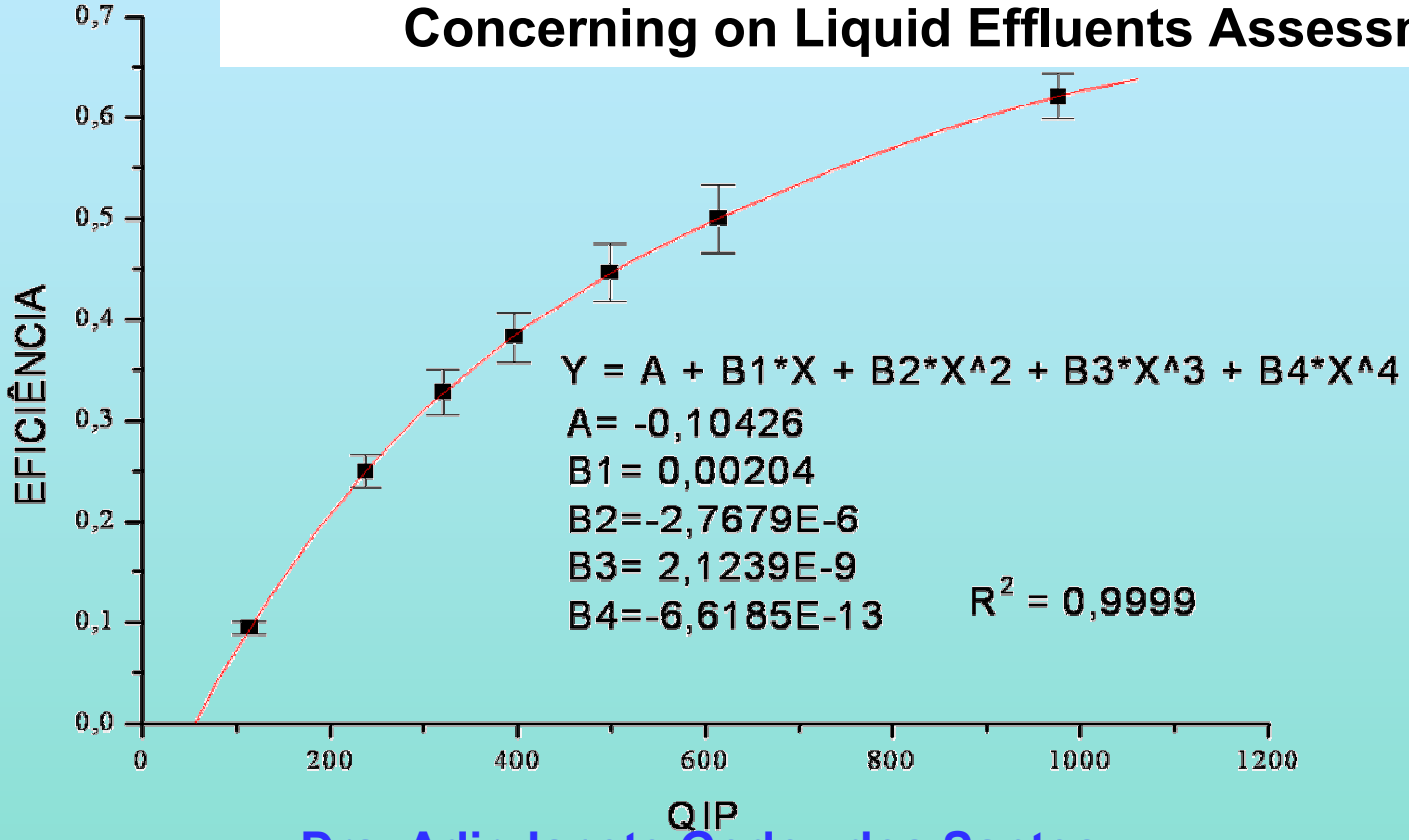

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