



TOTAL
COMMITTED TO BETTER ENERGY

3 Barrier Concept

FOR PROTECTING THE WASTE WATER
TREATMENT DURING TURNAROUNDS

PLATFORM OF LEUNA - GERMANY



Keep me happy
and healthy!

PREVIOUS SITUATION & BACKGROUND

- During TA 2008 and intermediate shutdown 2011 **complete killing of biological stage** in waste water treatment
 - **1 Mio € margin loss** (1 day delay of start-up)
 - **Image loss** (authorities + industrial neighbours)
- TA's marked by **huge load of various flushing activities** not being easily controlled
- Entry of **contaminants** (e.g. DEA, phenols, DMDS, acid, ...) during TA's **cannot be easily prevented** and **not 100 % predictable**
- **No clear visibility** on potential consequences and **thus lack of control**
- **Lab capacity limits** number of analyses
- Results of standard lab analyses often provided **too late** (several hours)
- Standard lab analyses **cannot give the whole picture on toxicity**

To die; to sleep; No more...!



3 Barrier Concept :ACHIEVEMENTS & ADVANTAGES

Achievements:

- **Preventing environmental incidents** by keeping waste water always within its specification
- **High availability and flexibility** of waste water treatment to prevent a delay of start-up after TA
- **Support tight TA time schedule** by maximum availability of vacuum trucks for draining activities
- **Minimize costs** for waste water disposal (external treatment)
- **Keep positive image of reliability** towards authorities and industrial neighbourhood by survival of biological stage (no poisoning, no starvation)

Advantages:



1. Simple
2. Fast
3. Straightforward results
4. Cost efficient
5. Matches exactly the operating window of biological stage
6. Easily be learnt (by operator)
7. Applicable on every stream/ every substance
8. Almost no maintenance costs
9. Industrially proven during TA
10. Cost reduction for waste water treatment (less disposal)

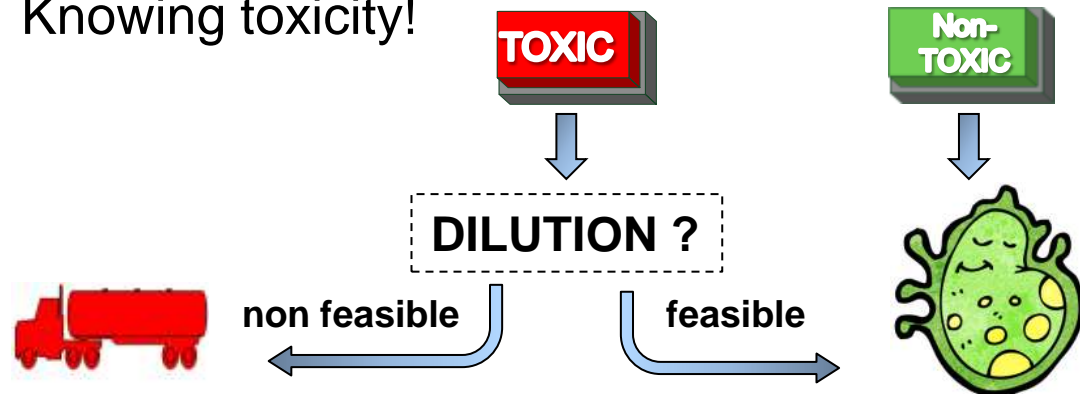
1st Barrier: WHAT IS MoBiTox ?



Toxicity **supervision starts at source points** of waste water within the production units!

How is it simple!

1. Take the sample
2. Mix it with biology from waste water treatment
3. Saturate mixture with oxygen
4. Monitor oxygen decrease for 5 mins
5. Compare result with reference
6. Knowing toxicity!



2nd Barrier: WHAT IS STIPTOX ?

Toxicity supervision at inlet of biological stage



STIPTOX-Analyser purchased from ENDRESS & HAUSER (CAPEX: 200 k€ (25 k€ analyser + 175 k€ installation) :

- Contains mainly a small vessel and an O₂-probe

STIPTOX was integrated into our **3 Barrier Concept** by continuously providing the correct actual ratio between biology and waste water. So we ensure that **our results always match the reality:**

- Changing biology activity is taken into account
- Continuous measurement (response time 1 minute)
- Clear indication of stream being toxic or not toxic
- Also detects nutrient shortage
- **Successfully implemented in TA 2014**



We did it!



3rd Barrier: GUIDELINES AND BACK-UP PLANS



PROactive!

Pre-TA phase:

- Strengthen the biology
- Housekeeping
- Prepare nutrient and chemical agents
- Purchase and mount flexible hoses
- Intensive operator training in waste water unit
- Awareness campaign across the whole refinery

TA phase:

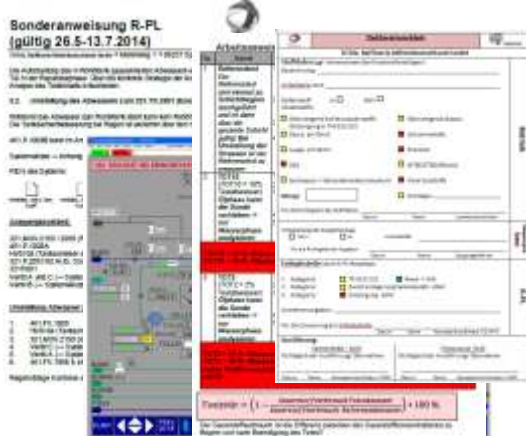
- Specially TA-related operation mode for maximum flexibility and availability
- Intensive housekeeping to maintain high unit performance level
- Stand-by mode for 1 of 2 biological trains
- 24/7 availability of waste water coordinator

Defense!

Emergency cases:

- Dilution strategies for toxic streams
- NaOH for pH adjustments
- Oil-degrading enzymes and flocculation agents to improve clarifier performance
- Providing additional nutrients to handle high hydrocarbon concentration

Doping!



3 Barrier Concept: CONCLUSION

- **Successful** application of **3 Barrier Concept** during TA 2014
→ high availability of biology, waste water always within specification, no environmental impact and no delay of start up
- Strong **teamwork** of all business departments
- Protection strategy **can be transferred and easily adapted** to other waste water treatments in refineries
- **Key role is high personal contribution** by doing offline toxicity measurements and by preparing extensive guidelines and awareness training
- **Successful implementation** of the method is possible even without online toxicity analyser



I'm a
SURVIVOR!