A methodological approach to Cleaner Production

Dr. Ali Yaacoub
Director/Regional Executive
Lebanese Cleaner Production Center
UNIDO/UNEP Global Resource Efficient & Cleaner Production Network

I-REXFO Conference
Copenhagen, 27th of May, 2021

What is Clean Production (CP)?

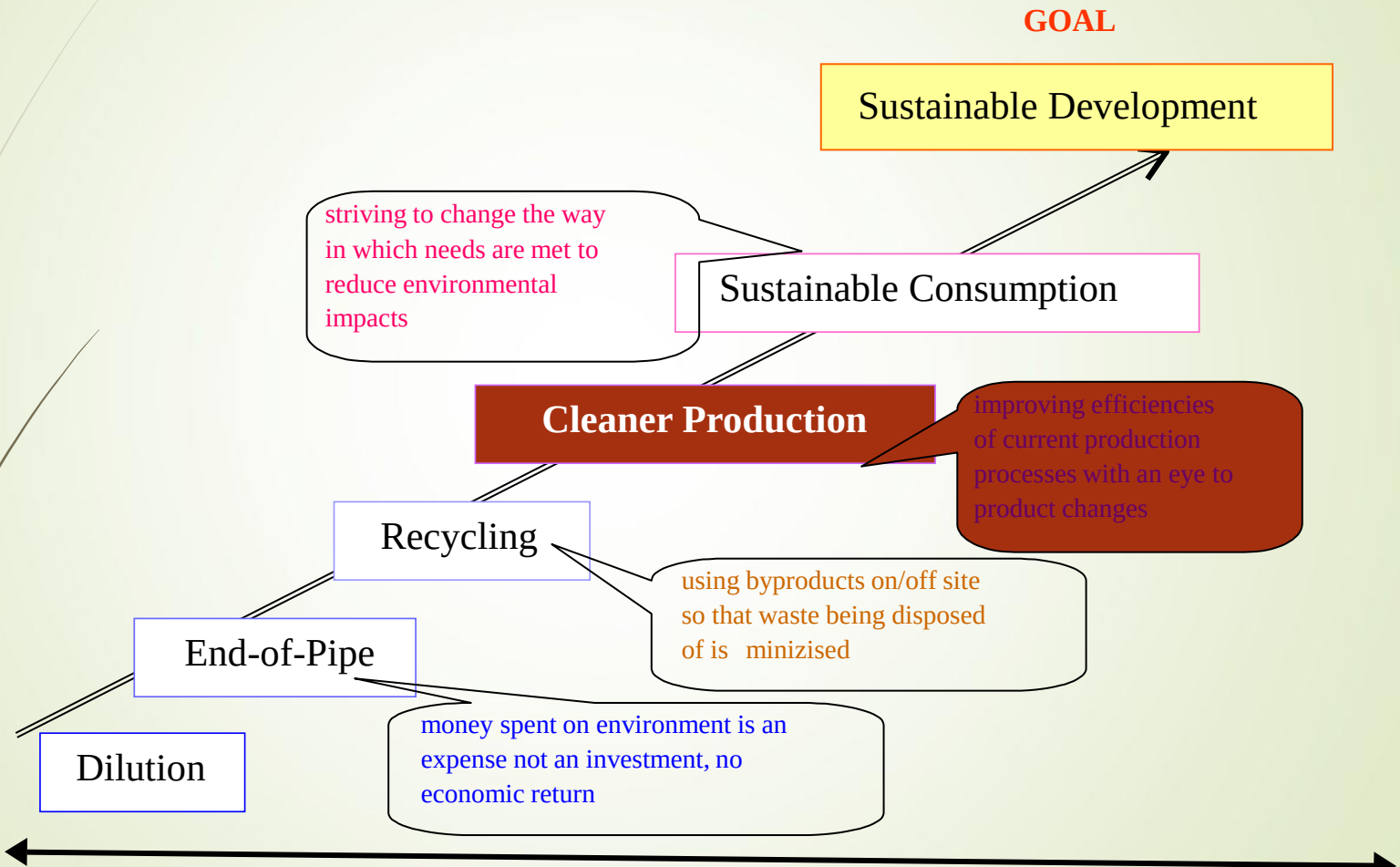
- "Anticipate & Prevent" philosophy.

- "The continuous application of an integrated preventive environmental strategy applied to processes, products, and services to increase overall efficiency and reduce risks to humans and the environment." UNEP.
  Applied "From Cradle to Grave"

What is NOT CP?

- Diluting hazardous or toxic constituents to reduce hazard or toxicity
  OR
  Concentrating hazardous or toxic constituents to reduce volume
  (Which do not reduce the absolute amount of hazardous constituents entering the environment)
- Transferring hazardous or toxic constituents from one environmental medium to another
- Off-site recycling (a waste management option which creates pollution during transport)
- Waste treatment

Where is CP?


GOAL
Sustainable Development
striving to change the way in which needs are met to reduce environmental impacts
Sustainable Consumption
Cleaner Production
improving efficiencies of current production processes with an eye to product changes
Recycling
using byproducts on/off site so that waste being disposed of is minizised
End-of-Pipe
money spent on environment is an expense not an investment, no economic return
Dilution
Reactive
Proactive

Common Waste Treatment :

Waste is generated !
What do I have to do with it ?

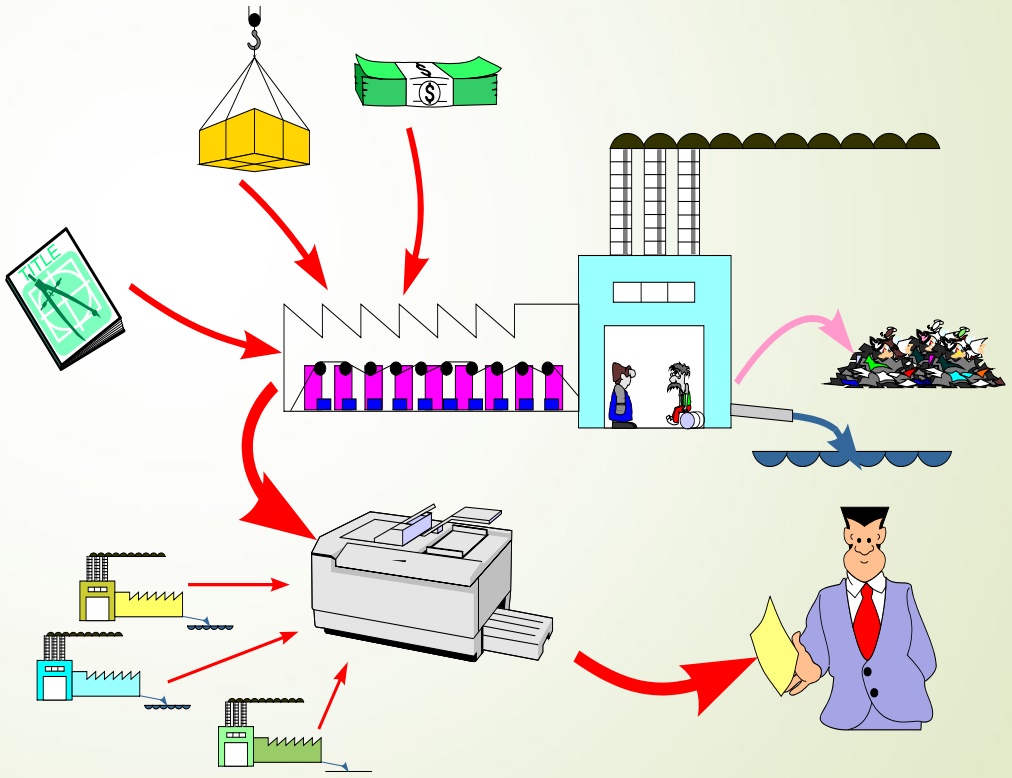
Cleaner Production :

Waste is generated !
Where does it come from ?

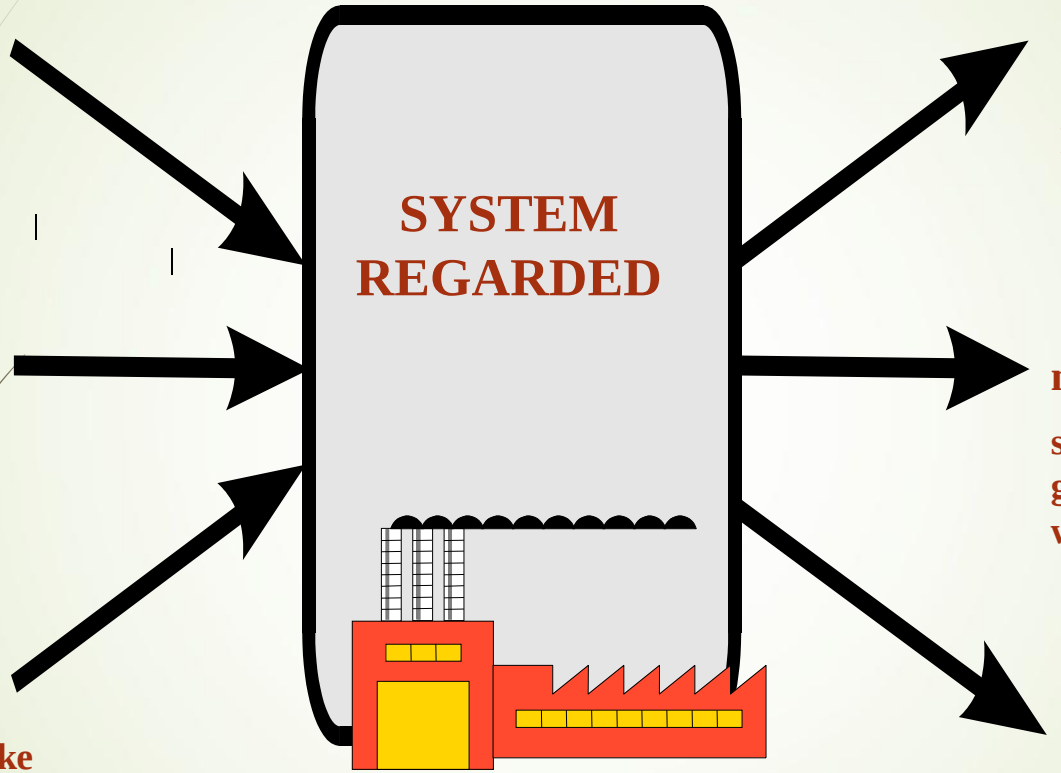
Cleaner Production

considers your

- **technologies**
- **employees**
- **raw materials**
- **processes**
- **emissions**
- **partners and**
- **products.**



INPUT OUTPUT



MATERIAL
raw material, auxiliary material, other material

ENERGY CARRIERS
fuels like gas, oil, coal

ENERGY
mass free, like electricity or district heating

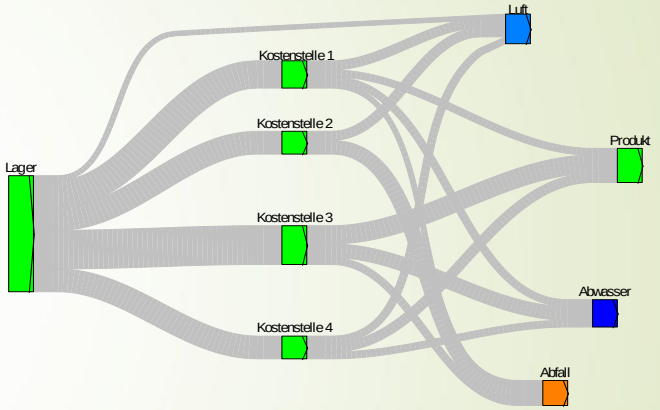
PRODUCTS
primary- and coupled

material emissions
solid waste, gases, waste water

energetic emissions
waste heat noise

Material flow analysis
detailed description of the material and energy uses

- which waste and emission streams are generated ?
- which raw materials are lost ?
- where and why does this happen ?
- where are weak points ?
- where are potentials for improvement ?
- which materials can be reused ?



Possible barriers for implementation of CP options

Attitutional

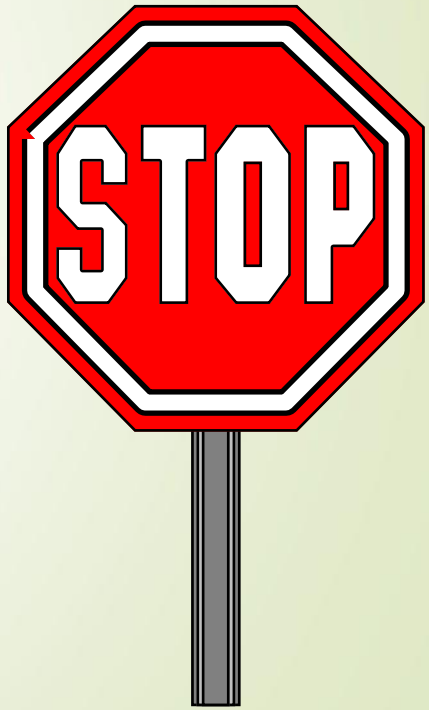
- obstacles within organization, people, awareness etc

Economical

- problems regarding economics, availibility of money etc

Technical

- no technical solution available on the market



Source: Schnitzer, TU Graz

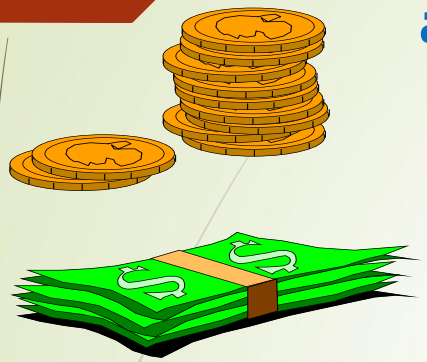
Reasons for an environmental team

- Because there are many different departments/machines in your company and different technological knowledge
- Because you have motivated and competent employees in your company.
- Because as a team you can work more efficient than a one man fighter.

Use people from the departments:
production, maintenance, technology, purchasing, management, quality, accounting, research and development, environment, health and safety, legal branch, ...

Environmental costs

apparent and hidden



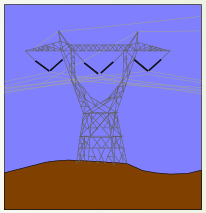
disposal

treatment

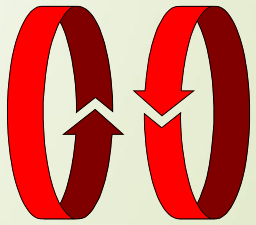
lost raw materials
depreciation, interest
outside services
own personal costs
training
other „hidden“
environmental costs

Energy efficiency
Typical areas of improvement

- Cooling/refrigeration
- Heating
- Compressed air
- Insulation
- Heat recovery
- Separation processes
- Lighting
- ...

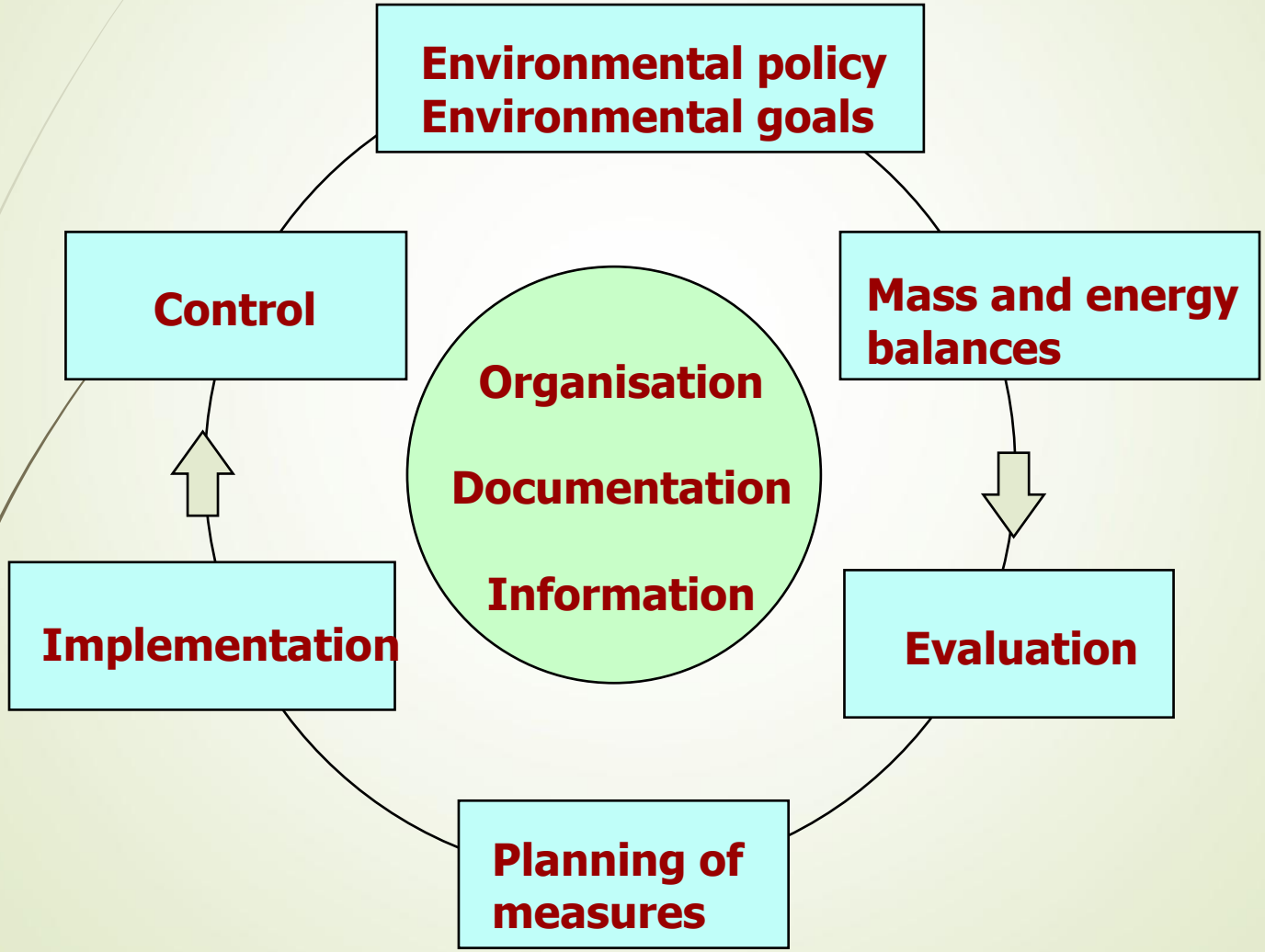




Cooling and freezing

- Raising the temperature of storage for 1°C results in saving appr. 4 % of the electric energy
- Choose the right storage temperature: Frozen meat at -20 °C, cooling at 0 °C to -4 °C
- Clean the condenser regularly and provide for sufficient and cool air supply
- Use the capacity of the storage rooms, collect goods, switch off unnecessary cooling machines
- Keep storage rooms closed to avoid entrance of humidity and warm air
- Switch off lights
- Use curtains
- Defrost in cooling rooms
- Check reuse of heat

Elements of environmental management



Strategies for Cleaner Production

1. Minimisation of wastes and emissions

- Reduction at source

  - Product modofication

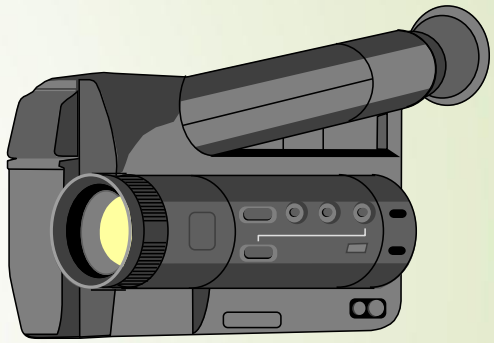
  - Process modification

    * Good Housekeeping

    * Material substitution

    * New technology

- Internal recycling



2. Reuse of wastes and emissions

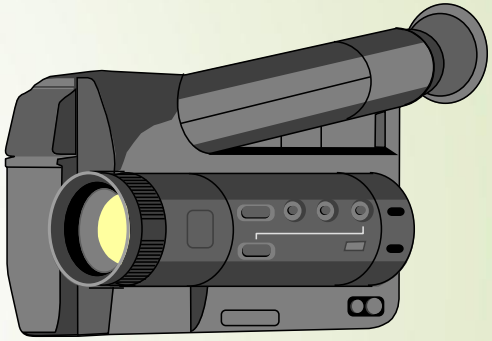
- External recycling (structures/ materials)

Cleaner Production Options

Level 1:
Product modification

Product modification

- substitute the product
- rise the product life time
- change of materials
- change of the product design
- use of recycled materials
- avoid critical components



“Latella“


Lattella
natürlich erfrischend
0,1% Fett
Mango
TirolMilch
Lattella
natürlich erfrischend
0,1% Fett
Maracuja
TirolMilch

Cleaner Production Options

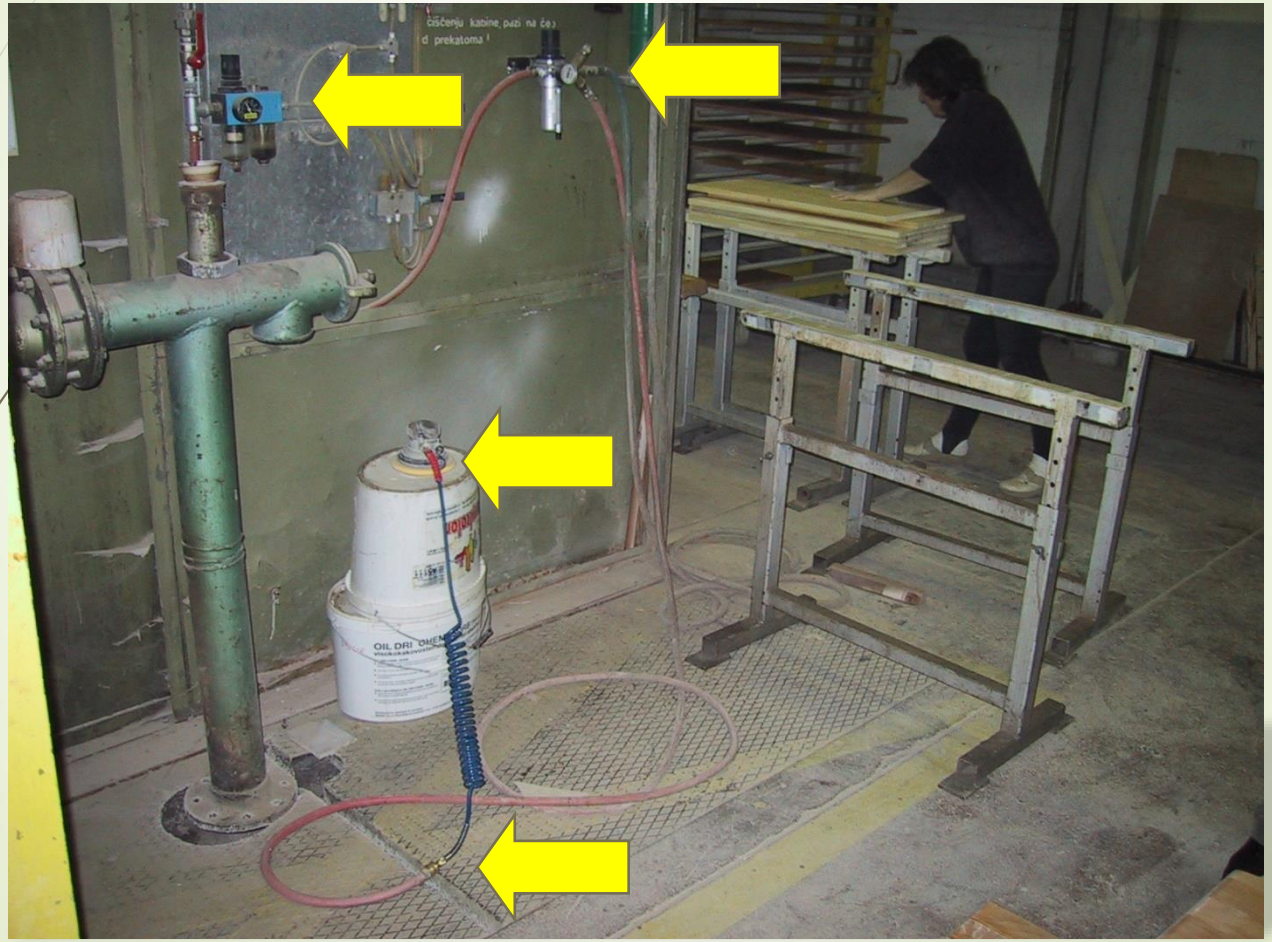
Level 1:
Good housekeeping

Good housekeeping

Good housekeeping of materials

- improved information
- change of dosage / concentration
- increase the use of process capacities
- check cleaning and maintenance period
- standardization / automation
- improvement at purchasing, storage and distribution
- material flow analysis

Leakages in compressed air systems

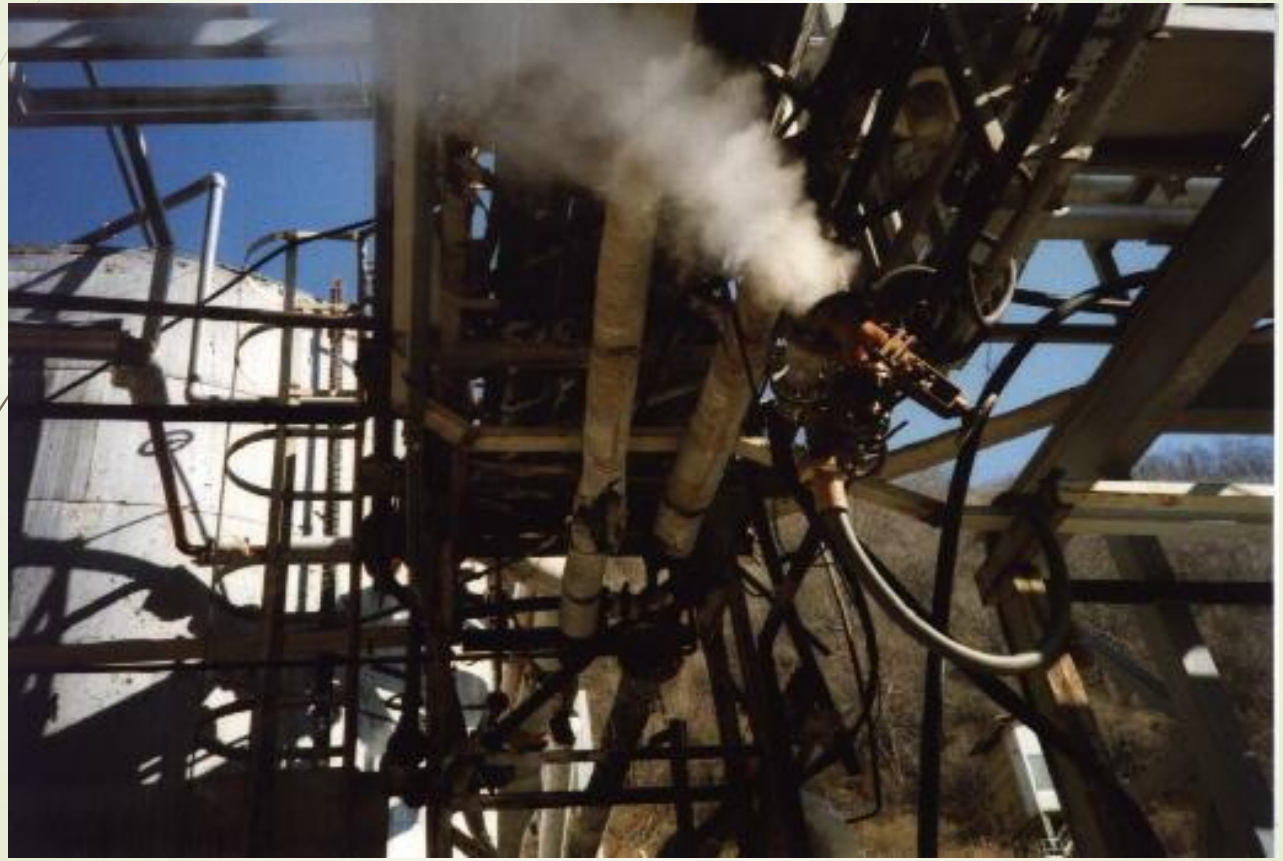


Air leak costs

(based on 100 PSIG, 8760 hours per year, 0.22 $/m³)

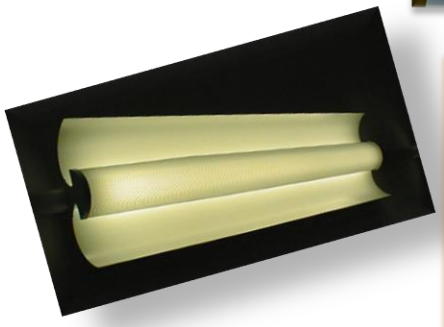
Diameter of leak [feet]	Cubic feet per minute	Loss per year [US$]
1/16“	6,5	744,0
1/8“	37,2	2.981,0
¼“	103,0	11.904,0

Energy efficiency is not a question of latest technology!



Lighting

- Turn off when not needed
- Use time or movement controller
- Day light use
- Maintenance and cleaning
- Cleaning of windows, design of rooms
- Use energy saving bulbs



Quelle: Karl Lummerstorfer, Energie Institut Linz

Dry cleaning ...

Saved 30% of water in McCain!

High pressure cleaning ...

- can do the same effect with 15% water consumption!

Better maintenance

Waste logistics

Separation of waste and waste water to

- enable closed cycles
- facilitate recovery and re-utilisation
- minimize quantities of hazardous waste
- minimize disposal costs
- minimize cleaning expenses
  (waste water, exhaust gases, ...)

Storage and logistics

Cleaner Production Options

Level 1:
Change of Raw Materials


JOGHURT

Cleaner Production Options

Level 1:
Change in Technology

Dosage system for cleaning agents

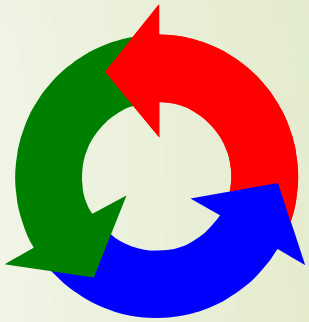
Saved 10% of cleaning agents!

Cleaner Production Options

Level 2:
Internal Recycling

Internal recycling

- re-utilization of materials
- reuse of materials for different purposes (e. g. paper)
- closing of loops (water)
- Returnable packaging systems
- reclaiming of materials with high value



Return of condensate

Saved 7% of fuel!

Cleaner Production Options

Level 3:
External Recycling


METALLE
KUNSTSTOFF
ALTPAPIER
METALL
SSI SCHAFER
SSI SCHAFER


METALL VERPACKUNGEN
RESTMÜLL
PAPIER / KARTON

Targets should be

- *Specific*
- *Measurable*
- *Ambitious*
- *Realistic*
- *Terminated*

Let Us Start Together

Cleaner Production

is a JOURNEY

NOT a destination