Penanganan Bahan Padat
Teknik Kimia FT UNS

Sperisa distantina
Pendahuluan (lanjutan): beberapa proses dengan penanganan bahan padat
Cyanide extraction for Gold

• PROCESS: Preparation
  – ground into fine powder –
  – mixed in solution of NaCN (sodium cyanide) & water
  – referred as SLURRY

• PROCESS: extraction
  – Zinc powder is added to this gold-cyanide solution – which precipitates out the gold -
  – The mixture then goes thru a filter where the precipitate sticks to a heavy canvas filter which is later cleaned to remove the gold.
  – Extreme heat is applied which burns off the Zn

• ENVIRONMENT:
  – Gold mines make sure that cyanide doesn't escape, by using containment systems and recycling the water.
  – Entire operation must be kept on the alkaline side – HCN is volatile and poisonous

• ALTERNATIVE PROCESSES
  – Gold extraction by Mercury. Elemental Hg forms an amalgam with many metals, such silver and gold.
  – Mercury boiled off, precious metals remain.
  – Practised in Central America 1570-1900, and in Brazil until now.
Gold mining

Blasting

Underground Mining

Ore and Waste Haulage

Oxidization

Milling

Heap leaching

Leaching

Stripping

Electro-winning
Cyanide extraction for Gold

\[
\begin{align*}
\text{metal} & \quad \text{metal-film boundary} & \quad \text{film-solution boundary} & \quad \text{solution} \\
\text{film diffusion} & \quad \text{Au} & \quad \text{Au}_{(i)}^{+} & \quad \text{Au}_{(o)}^{+} \\
\quad & \quad -e^- & \quad & \quad \text{CN}^- \\
\text{AuCN}(o) & \quad \text{film growth} & \quad \text{CN}^- & \quad \text{film dissolution} \\
\text{Au} & \quad \text{Au}(CN)_{2}^- & \quad & \\
\end{align*}
\]
Gold leaching processes from PCBs (printed circuit board)

**Raw Material**
(Input 1.01): PWB with Gold Plated Pins @ Rs.1.50/kg

**Extraction of Pints**
Process 01:
In this process, the plastic of the part is hit with nail and hammer and the pins get extraction from PWB Plate.

Output 1.01: PWB after extraction of Pinta
Selling Price: 12-13/kg

**Gold Pins**
Output 1.03 = Input 2.01
1 Kg PWB = 100 gms Gold Pinta
i.e. 10Kg PWB/Rs 1500 = 1Kg Pinta

**Sulphuric acid**
Input 2.02:

**Process 02:**
Gold Pinta are mixed with solution containing sulphuric acid and boiled twice. The base on which the gold plating gets dissolved and gold traces get separated.

Output 2.02: Fumes containing poisonous gases.

**Metallurgy:**
In this process, the mercury is mixed with gold traces and boiled, then poured through a cold mercury with impurities get separated. Now the extracted gold is put in a container made of ash and lime and kept for heating in oven. Gold which come out is refined gold.

**Generation:** 7 gms Gold / 1Kg of Gold Plated Pinta

Output 2.01: Water containing acid and dissolved brass in drains.
Figure 4.16 This integrated waste materials plant has facilities for recovery of metals and removal of plastics, followed by anaerobic digestion of the remainder. The solid residue from the digester serves as fuel for power production.
Biomass Direct Combustion

Figure 6. Direct Combustion for Biomass Power Generation

1. Bale handling
2. Chain conveyor
3. Scarifier
4. Stoker
5. Vibrating grate
6. Preheated air
7. Combustion chamber
8. High pressure steam
9. Steam turbine
10. Generator
11. Condenser
12. Feedwater
13. Slag
14. Bag filter
15. Ash
16. Fan
Centralized Recycling Flowsheet
FIG. 20-56 Ball- and rod-mill circuit. Simplified flow sheet of the Cleveland-Cliffs Iron Co. Republic mine iron-ore concentrator. To convert inches to centimeters, multiply by 2.54; to convert feet to centimeters, multiply by 30.5.

(Johnson and Byrne, Milling in the Americas, Gordon and Breach, New York, 1964.)
FIG. 20-57 Autogenous mill circuit. Simplified flow diagram of the Cleveland-Cliffs Iron Co. Empire iron-nine concentrator with two autogenous wet-grinding stages. To convert inches to centimeters, multiply by 2.54; to convert feet to centimeters, multiply by 30.5.
Industri tepung ketela pohon

Cassava Fresh Roots (1 tonne)

- Water (3-5 m³)
  - mechanical peeling and washing
    - Peels (20-50 kg)
  - mechanical grating

- Water (12-20 m³)
  - sieving
    - Pulp waste (600 kg) HCN (24 g)
  - sedimentation
    - Starch residue
      - drying
        - Waste water (12-20 m³)
          - Solids (18 kg)
          - HCN (342-570 g)

- Starch (180-200 kg)
Coffee processing
Typical Coffee Roasting Operation

1. GREEN COFFEE BEAN UNLOADING (SCC 3-02-002-04)
2. SCREENING (SCC 3-02-002-06)
3. DECAF Extractions (SCC 3-02-002-10, 11)
4. STEAM OR HOT AIR DRYING (SCC 3-02-002-18)
5. ROASTING BATCH (SCC 3-02-002-20, 24)
6. CONTINUOUS (SCC 3-02-002-21, 26)
7. COOLING (SCC 3-02-002-26)
8. DESTONING (SCC 3-02-002-30)
9. EQUILIBRATION (SCC 3-02-002-34)
10. INSTANT COFFEE PRODUCTION

- PRODUCT STREAM
- EXHAUST STREAM
- OPTIMAL PROCESS
1. PM EMISSIONS
2. VOC EMISSIONS
3. OTHER GASOLINE EMISSIONS (CO, CO₂, Methane, NO₂)

GRINDING
PACKAGING
SHIPPING
WATER EXTRATION
SPRAY DRYING OR FREEZE DRYING (SCC 3-02-003-01, 06)