

Impact of Cassava Processing on the Environment

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The Problem

- Cassava processing highly concentrated
 - Polluting
 - Burden on natural resources
- Development beyond traditional methods
 - Water intensive
- Very visual display of pollution

Cassava Processing

- Consists of combination unit operations
 - Each has different impact on environment
- Impact is at different levels of biological and ecological resources
- Must consider:
 - Broad scale
 - Site-specific

Wastes with Different Unit Operations

Unit operation	Type of waste generated	Expected environmental impact
Washing	Organic matter, soil	Little impact
Retting	Cyanide diffused into surface water, organic matter	High cyanide can be a problem if used directly on land, Organic matter is a problem
Peeling	Peels with high fiber and high cyanide content	Contamination ground water supply, Foul odor, Cyanide problem if used as feed
Squeezing	Effluent with high cyanide and organic content	HCN can kill plants. Organic content can be a problem
Drying and cooking	Cyanide vapors, ash	Should be no problem
Sieving	Fibrous waste	Poor storage could lead to seepage to ground water – raining
Sedimenting	Starch residue Waste water	Foul odor Organic matter a problem

Cassava Roots

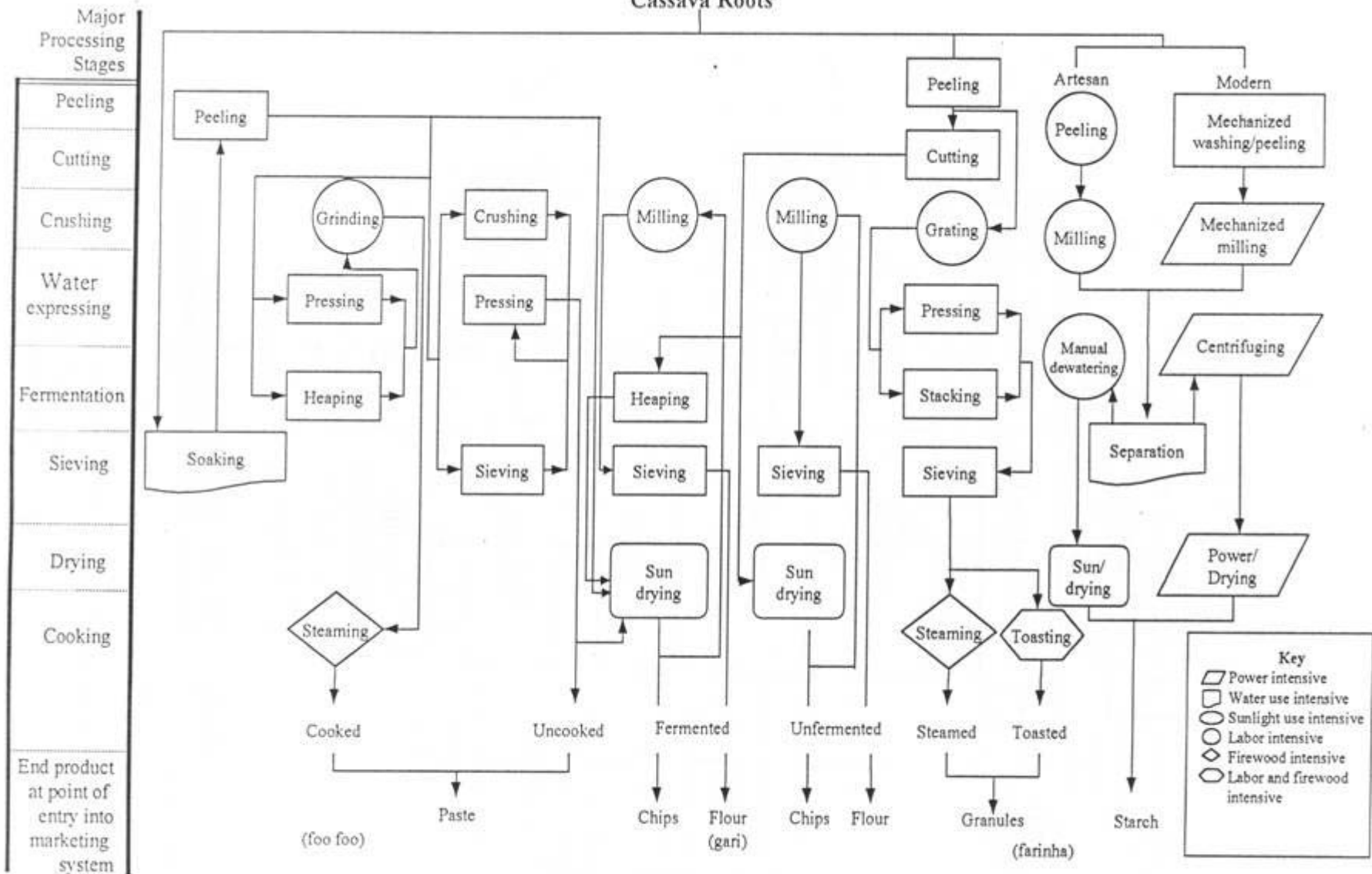
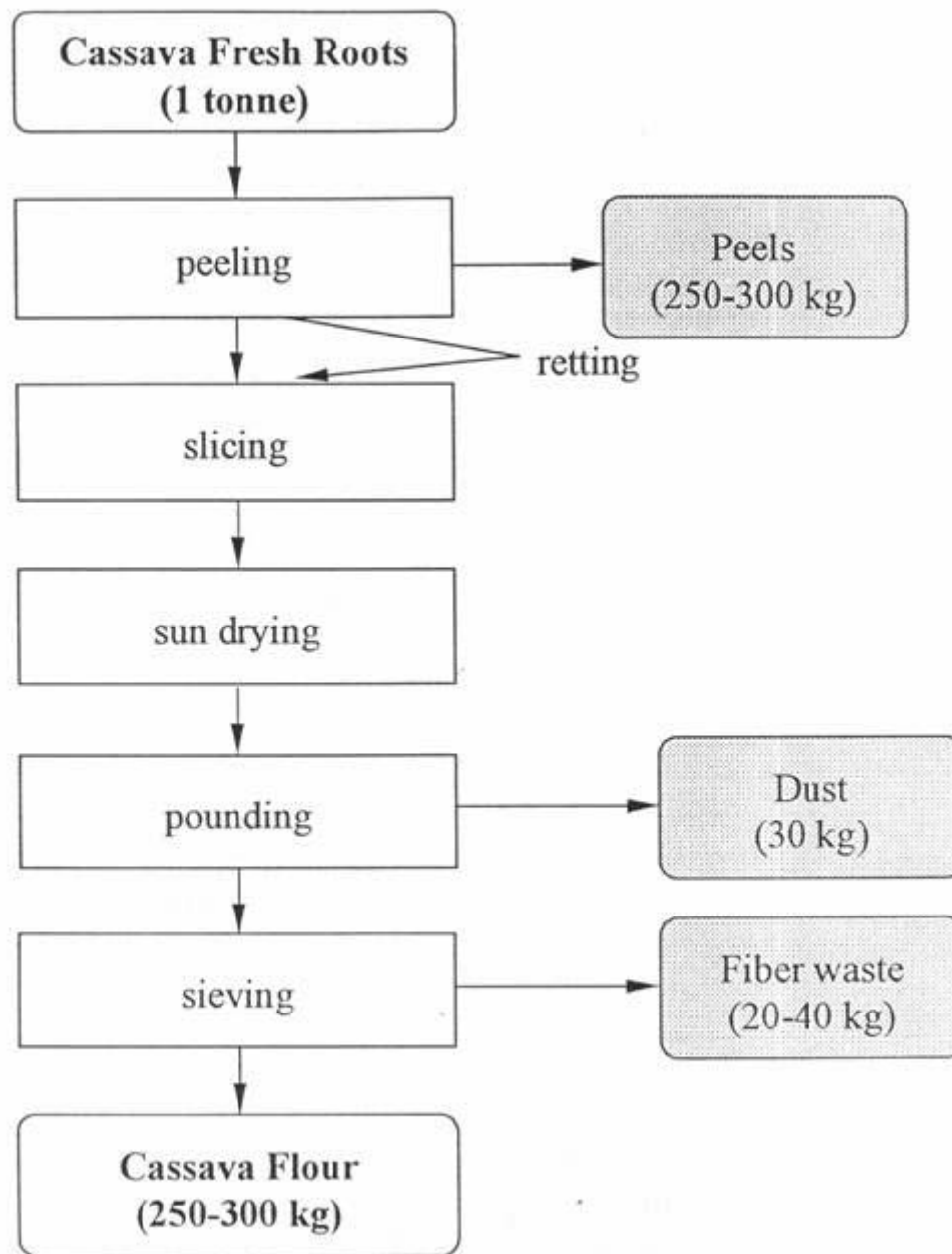
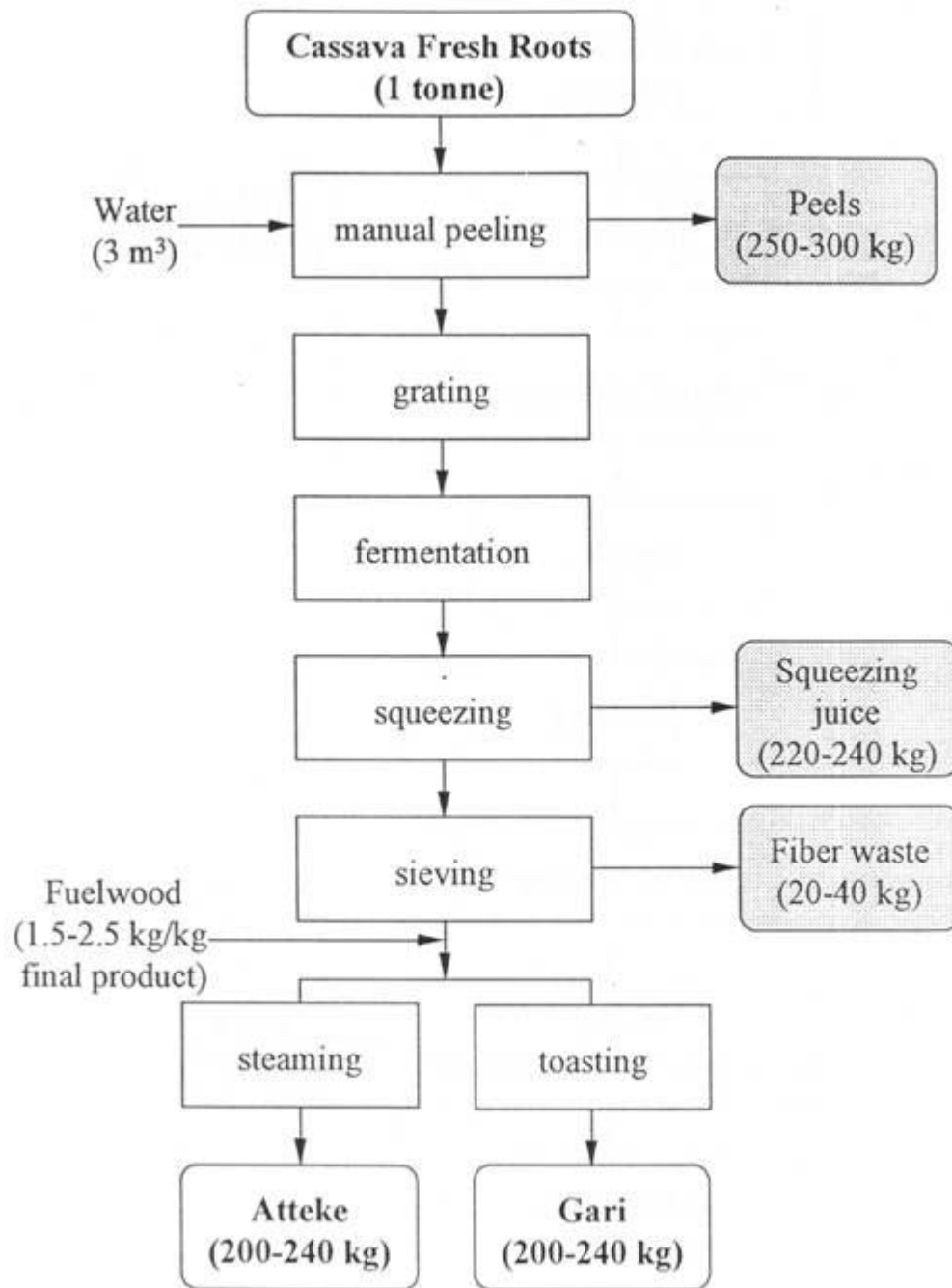
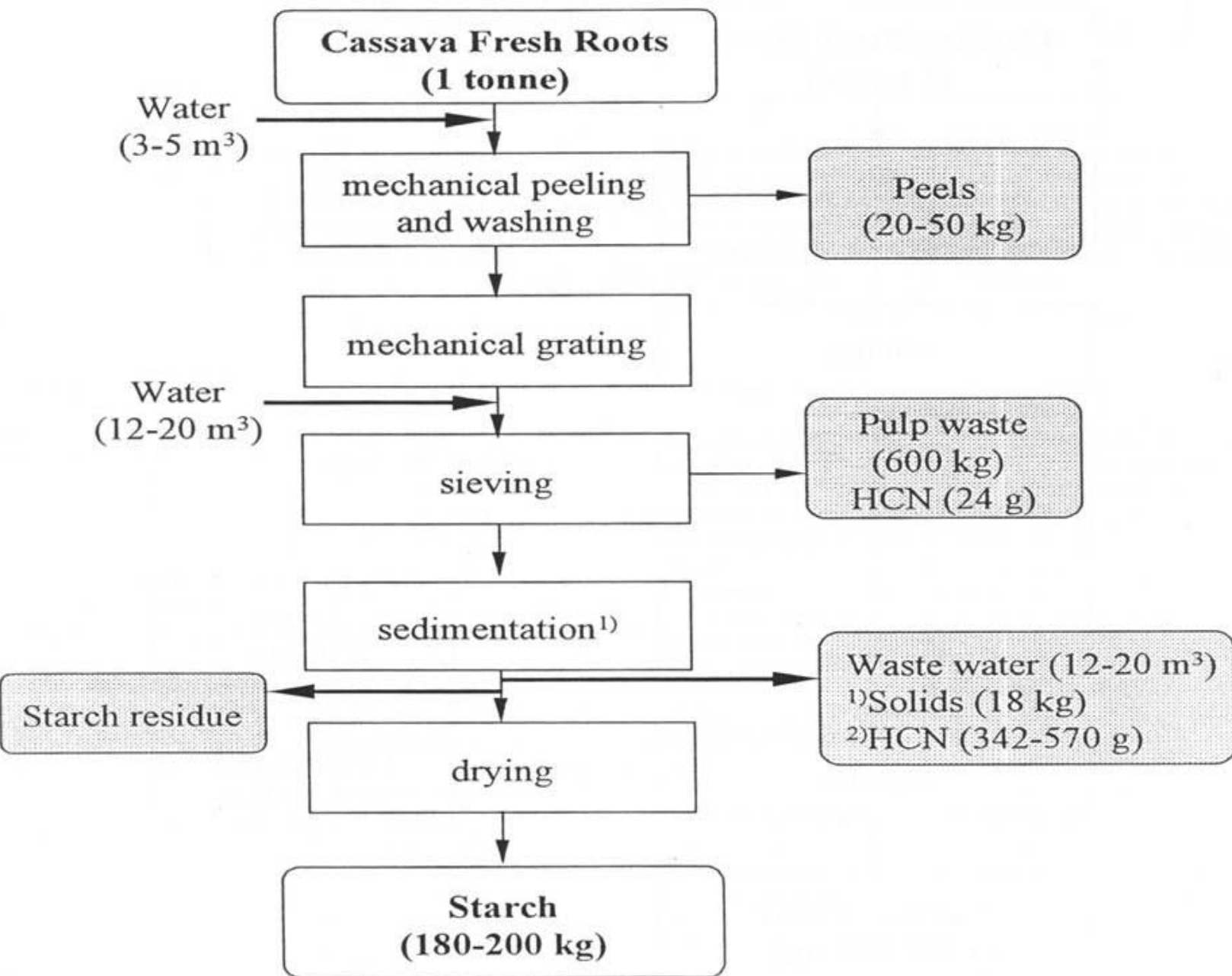


Figure 21. Unit operations in the processing of various cassava products.

Source: Adapted from Nweke, 1992







Water Use and Quality

- Requirements of the process
- Technology intervention
- Magnitude
 - Processing scale and technical sophistication
 - Micro-scale – 2,400 m² – 300 ton root – starch
 - Medium – 1,920 m² – 300 ton root – starch
 - Large – 4,500 m² – 300 ton root – starch (but only 600m² fresh water)
 - Concentration processors

Water Use - Significance

- Recharge rate – must be greater than use
- Cassava starch processing has LITTLE impact
 - Tamil Nadu – despite high concentration processors and dependence on ground water only 1.1 -1.2% of recharge used
- Some site specific issues are evident

Wash Water and Effluents

- The problem:
 - Large quantities soil
 - Acidic
 - High organic matter content and suspended solids
 - Cyanide
 - Other chemicals used in processing

Source and Impact of Waste Water

- Squeezing
 - High organic matter, high cyanide level
- Aqueous extraction methods
 - High total solids, high BOD
- Impact depends on extent and type of treatment post factory – consider receiving body
 - Groundwater
 - Surface water

Solid Waste

- Peelings
- Fibrous by-products
- Starch residues

Atmospheric Pollution

- Hydrogen cyanide
- Dust
- Odour

Impact Cassava Processing

Environmental component	Broad-scale Impacts		Site-specific impacts	
	Magnitude	Significance	Magnitude	Significance
Impact on ground water supply			+	+
Impact on ground water quality			++	++
Impact on surface water quality			+	++
Storage waste residue impacts			+	++
Health effects			+	+
Odor	+++	++	+++	++
Visual Impacts	+++	++	+++	++

Cassava Products – Impact of Processing

	Ground water		Waste water	Solid residue	Atm. Emission	Odor	Visual display
	Supply	Quality					
Starch	-	-	-	-	-	-	-
Small-scale	+	++	++	++	+	++	++
Large-scale	++	++	++	++	++	++	++
Flour	-	-	-	-	+++	-	-
Chips	-	-	-	-	-	-	-
Gari	-	++	++	++	-	++	++
Farinha	-	++	++	++	-	++	++

Gaps in Knowledge

- Criteria to identify pollution “hot spots”
- Model to determine maximum number processor per site
- Relationship between soil characteristics – processing – groundwater supply and quality
- Effect key cassava processing unit operations on the environment
- Relationship between processing parameters and composition of waste
- Cost effective ways to reduce organic content and cyanide content
- Value adding of waste products

Summary

The main problems of cassava processing are its unattractive visual display and odour

Other forms of pollution can have an impact on the environment but this is generally not as large as might be expected given the magnitude of the visual display.

Different cassava products will impact the environment differently

Recommendations

- Cassava processing should be located in areas of adequate water supply
- Water utilization should be minimized through use of appropriate technology
- Waste water should be contained in the factory or treated before release
- Store and manage solid waste properly
- Reduce cyanide level before disposing of the waste