

RESTAURAT PICA  
EL AMIG

New approaches to  
safer amalgam burning  
within the cultural context  
of artisanal miners in Peru and Ecuador



# Artisanal Gold Mining and Amalgamation

## The fact:

Amalgamation is the preferred and most frequently applied method in artisanal small-scale gold mining

In the near future, amalgamation will continue to be the preferred and applied method in artisanal small-scale gold mining

## Two steps and two different problems:

Usually: Amalgam burning



1. Producing the Amalgam
2. **Destroying the Amalgam**

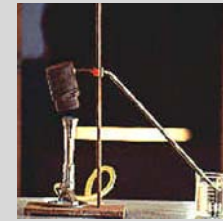


# Amalgam burning = Retorts

## *Old News:*

Amalgam burning should be done carefully within a hermetically closed retort

Hundreds of different designs of retorts are readily available and can be locally produced at low cost in any country



# Retorts and Artisanal Miners

*As generally known ...*

Most artisanal miners don't like and don't use retorts

*Usual arguments:*

Gold will be lost	<input type="checkbox"/>	not true
Retorting is not hot enough	<input type="checkbox"/>	excess heat not necessary
Gold will not be burned well	<input type="checkbox"/>	not true if correctly burned
Some mercury remains	<input type="checkbox"/>	not true if correctly burned
Retorting takes too long	<input checked="" type="checkbox"/>	takes longer
Burning can't be observed	<input checked="" type="checkbox"/>	true for metal retorts
Glass retorts are too delicate	<input checked="" type="checkbox"/>	true for rough field use
Gold color may change	<input checked="" type="checkbox"/>	critical if true !!!

In Peru:

Negotiation of gold price according to color of gold:





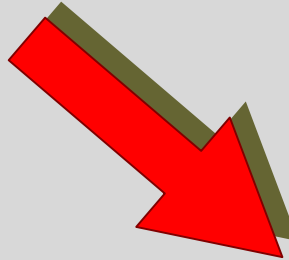
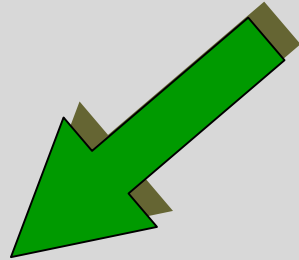
## Integral project approaches

The Swiss Agency for Development and Cooperation (SDC) has supported, since 1993, a series of **environmental projects** for the Artisanal Small-scale Mining sector of the Andean countries Ecuador, Bolivia and Peru.

**Reduction of mercury emissions** from ASM continues to be one of the priorities within these projects.

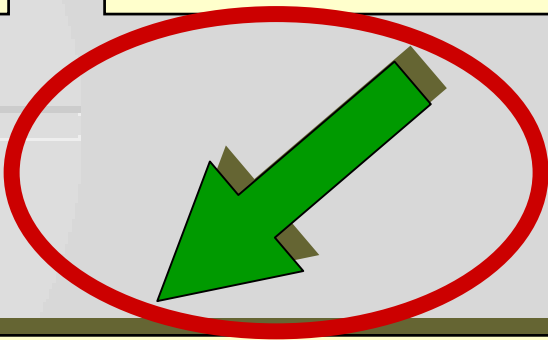
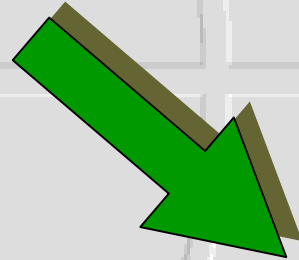
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					93 - Ecuador		Ecuador - 99										
1990					1995					2000					2005		

# Swiss approach in Ecuador and Peru



- Retort:
- Best technical solution for mercury recovery

- Miners:
- In many cases don't like and won't use retorts



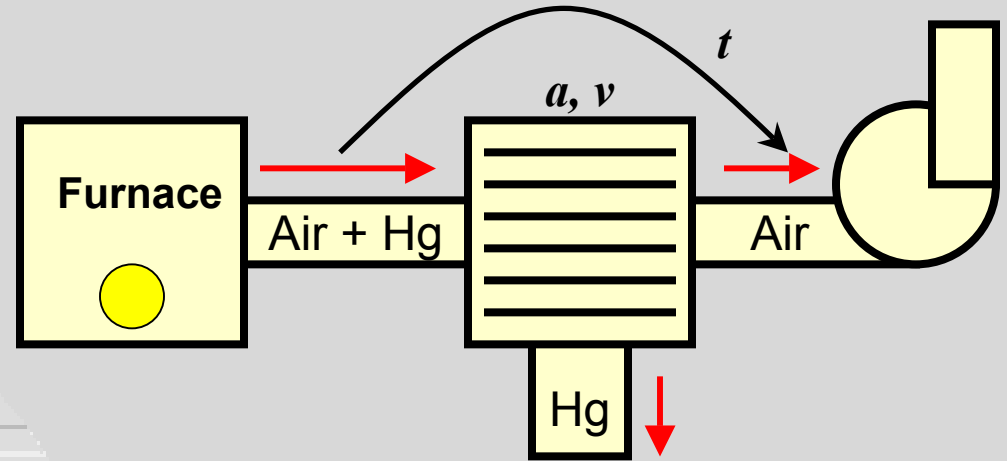
- If miners accept retorts ... ok
- If not ... **other solutions must be provided !**

# Open furnace + Condensator = “community retort”

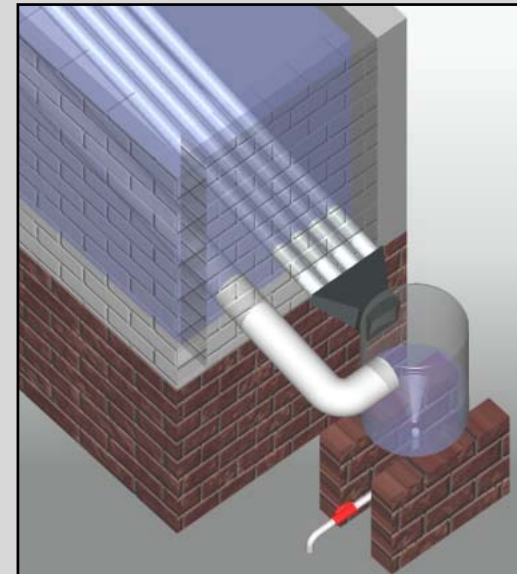
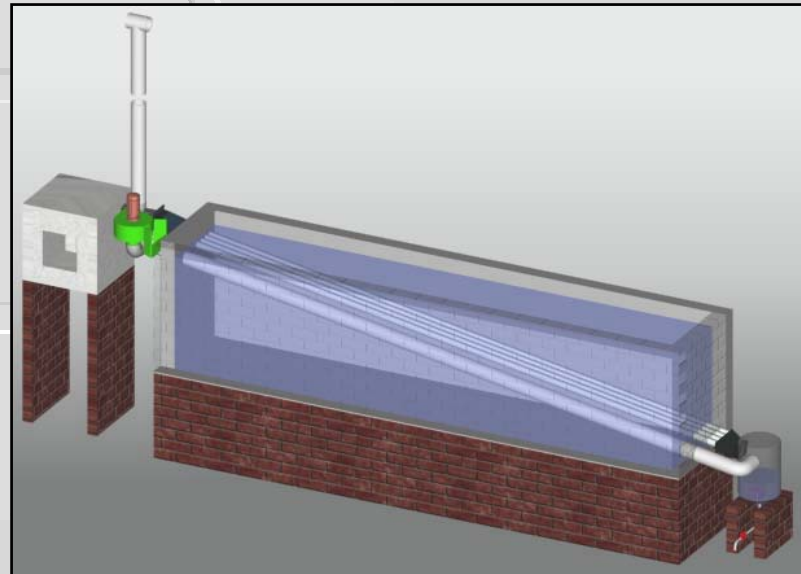
## Basic concept:

**Furnace:** traditional burning in ventilated fume hood

**Condensing unit:** Cooling exhaustion gases and condense liquid mercury



## Design:





# Examples of “Community retorts”

Community retorts of

- Huanca
- Relave



General Views

Open burning chamber

Condensor tubes

Mercury tank

# Acceptance of “Community retorts”

- Miners have complete control over the process, done in the same traditional way as always.
- Gold has exactly the same aspect as usual.
- Recovered mercury can be reused





# Performance of “Community retorts”

## “Technical Mercury recovery”

Long-term observation  
during 3 - 4 months:

**75 - 85%**



REUNTA COMUNAL  
COMITÉ DE SALUD  
SALMUCHA

FECHA	PESO DE ENVASE	PESO RECUPERADO	HORA
29/06/03	44.89	3.34	
	33.57	9.52	
	1.93	0.40	
	4.20	1.08	
	1.76	0.71	
	95.62	16.30	
	41.73	10.49	
	15.00	15.26	
	130.00	27.32	
	60.23	10.62	
	64.05	9.72	
	20.73	13.01	
	15.24	5.99	
	32.47	6.02	
Total	741.57	146.35	Sumados

# Performance of “Community retorts”

## “Social Mercury Recovery”:

**% of population using the equipment: > 95%**

- **Community and gold buyers need to agree on necessity to reduce mercury emissions**
- **The community is required to organize** (cooperative, miner’s or buyer’s association, operation committee, etc.)
- **The whole community participates in the construction of the community retort**
- **Utilities from mercury sales are invested in benefit of the community**

*200 miners \* 1 g/day \* 300 days = 60 kg Au/Year = 120 kg Hg/year = 4,000 us\$/a*



# Performance of “Community retorts”

## “Total Mercury Recovery”:

**Has to be measured as reduction of total mercury emissions on community level**

**Technical Recovery : approx. 80 %**

**“Social” Recovery : 95 %**

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**Total Recovery : 75 %**

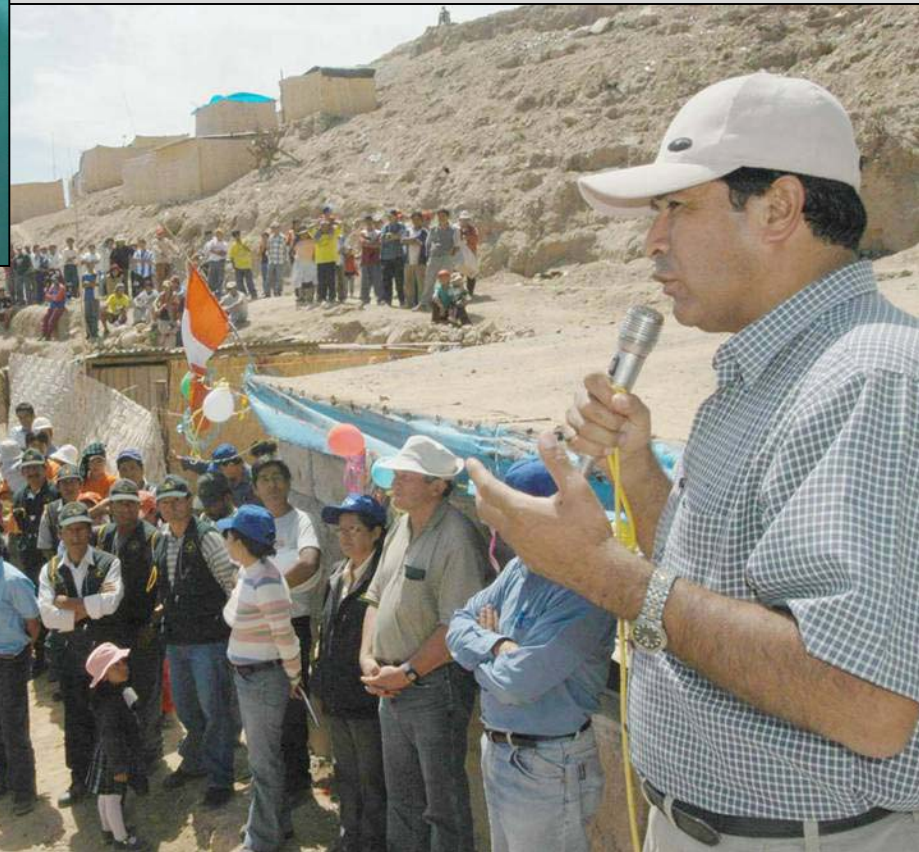
# Constructing a “Retorta comunal” in Cerro Rico





# Inauguration by the State Governor

Encouraging the environmental efforts of the community by support from authorities, in order to legalize and formalize Artisanal Mining



# Conclusion and Recommendation #1

Hand held retorts - when used - are the best solution (95-99% recovery)  
The recovery of Community retorts is lower (75-85% recovery)

In case of resistance against hand held retorts, prefer that  
95% of the miners recover 85% of mercury (= 75%), than  
5% of the miners recovering 100% (= 5%)

***Don't try to change habits to fit the technology  
change the technology to fit the habits !***

Don't simply copy the designs ! Study the miner's habits !

Apply simple design criteria, design site-specific devices according to  
habits and available materials



# Conclusion and Recommendation #2

Very few work has been done so far on technology for recovering mercury from open circuits

Similar resistance like in Peru or Ecuador against hand held retorts is reported from numerous countries

***Compiling and disseminating available “open circuit technology” could dramatically reduce mercury emissions !***



Thank You  
Muchas Gracias

