DAMA

GREENER INNOVATION FOR THE
MANUFACTURING PROCESS
Increase production.
Reduce consumption.
That's your new added value.

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CASE STUDY OF A 10 MW SAF USING DAMA TECHNOLOGY

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REFORMULATION OF THE FURNACE CHARGING MIX CHEMISTRY

PRELIMINARY CHECK OF:

- **Chromite chemical analysis**
- **Reducing agent (Coke)chemical analysis**
- **Chemical analysis of the product, classified by: Fe-Cr, Cr, Si, C, P, S**
- **Chemical analysis of the slag, classified by: Cr_2O_3, SiO_2, Al_2O_3, MgO, CaO**

REFORMULATION OF THE FURNACE CHARGING MIX CHEMISTRY

GOAL: DOUBLE LEVEL perfect separation of the metal from the slag inside the furnace

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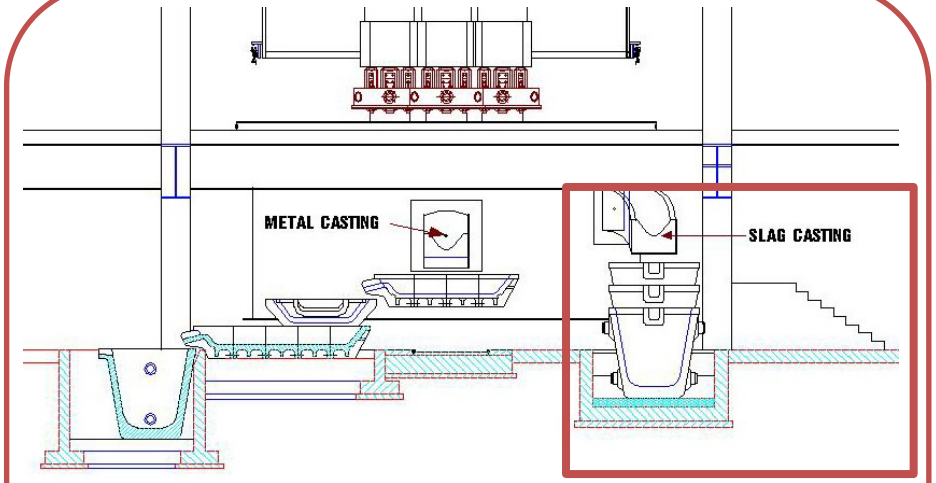
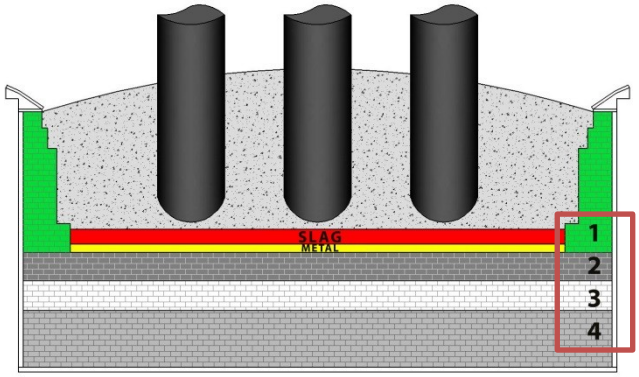
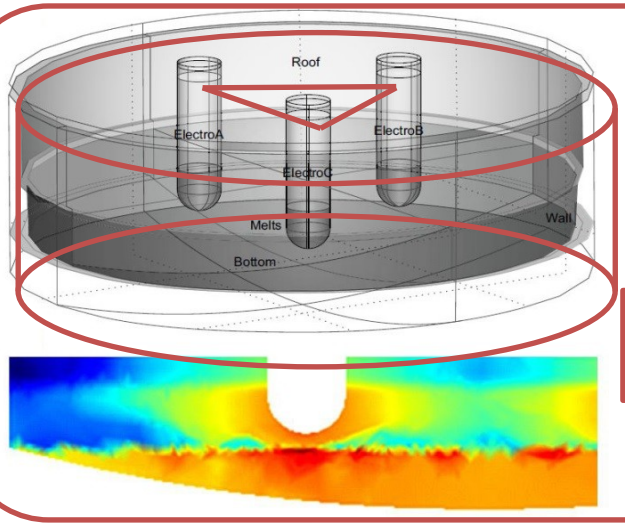
FURNACE TECHNOLOGICAL UPDATE



Designing of a new casting pit layout to allow the separated tapping of the two liquid phases.



Selection of a new refractory lining suitable for the containment and preservation of the material in the liquid state.



Sizing of the crucible in terms of diameter and volume.

Recalculation of electrodes wheelbase as a function of the transformer power.

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GOAL:

- Chemical reduction process optimization
- Reduced energy consumption
- Alternating castings with distinct tapping for ferro-alloy and slag
- Simplified production process

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FURNACE FEED AND FERROCHROME PROCESSING TIMELINES

10 MW SAF

FURNACE DAILY PRODUCTION

- Fe-Cr = 54 ton

[Fe-Cr:Slag] RATIO=[1:1.5]

- Slag = 80/82 ton

DAMA Fe-Cr ingot mould capacity = 21 ton

DAMA single slag casting volume = 7 m^3

DAILY PRODUCTION PROGRAM

3 SHIFTS / DAY
[8 hours per shift]
3 Fe-Cr castings /day
[1 metal casting per shift]
6 SLAG castings /day
[2 slag castings per shift]

Single Fe-Cr casting per shift = 18 ton

Single slag casting per shift = 14 ton

DAILY FURNACE FEED
Charging mix weight = 190 ton

[2600 kg = 1 Fe-Cr ton]

[238 charging mixes/day]

[10 charging mixes/hour]

DAMA number of charging mixes per day = 238 per hour = 10

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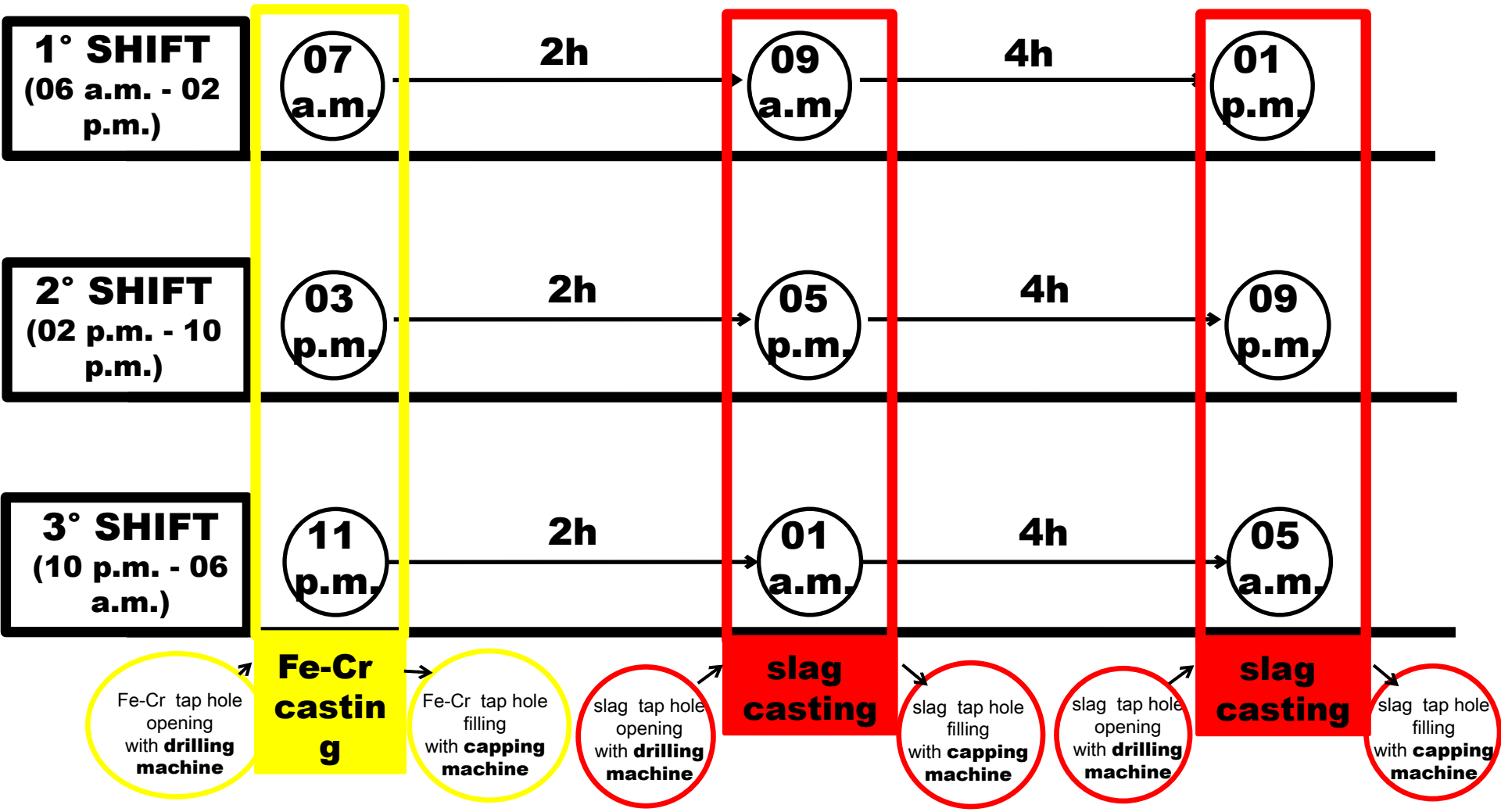
FURNACE FEED AND FERROCHROME PROCESSING TIMELINES



REMARKS

1. **CONTINUOS FURNACE FEEDING [10 selected charging mixes every single hour]**
2. **PRECAUTIONARY APPROACH:** Coke and Slag sampling + chemical analysis before 1° shift
3. **PRECAUTIONARY APPROACH:** Processing report after every single shift

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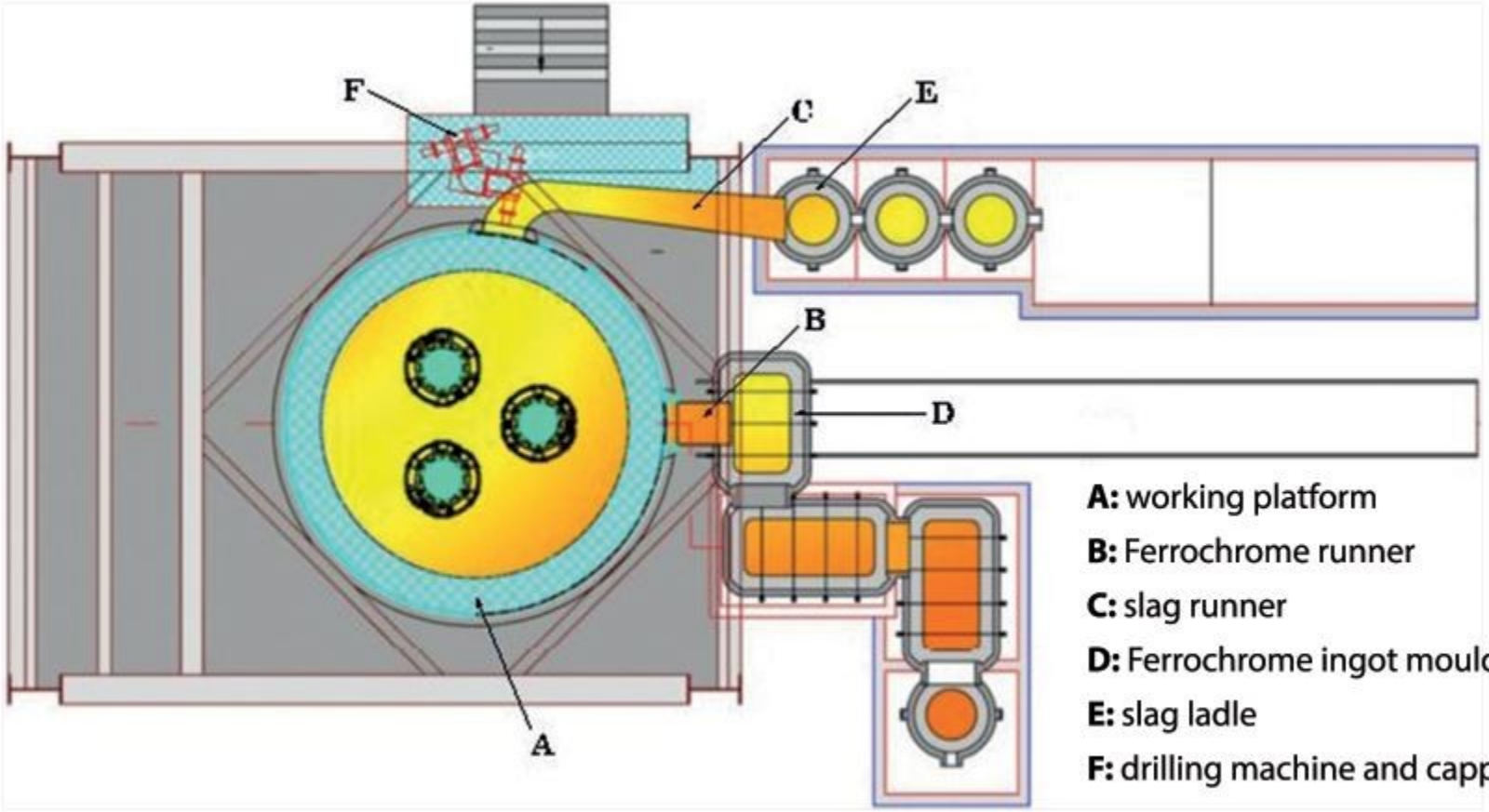
FERROALLOY PROCESSING: INSIDE THE DAMA CRUCIBLE

DAMA SAF layout



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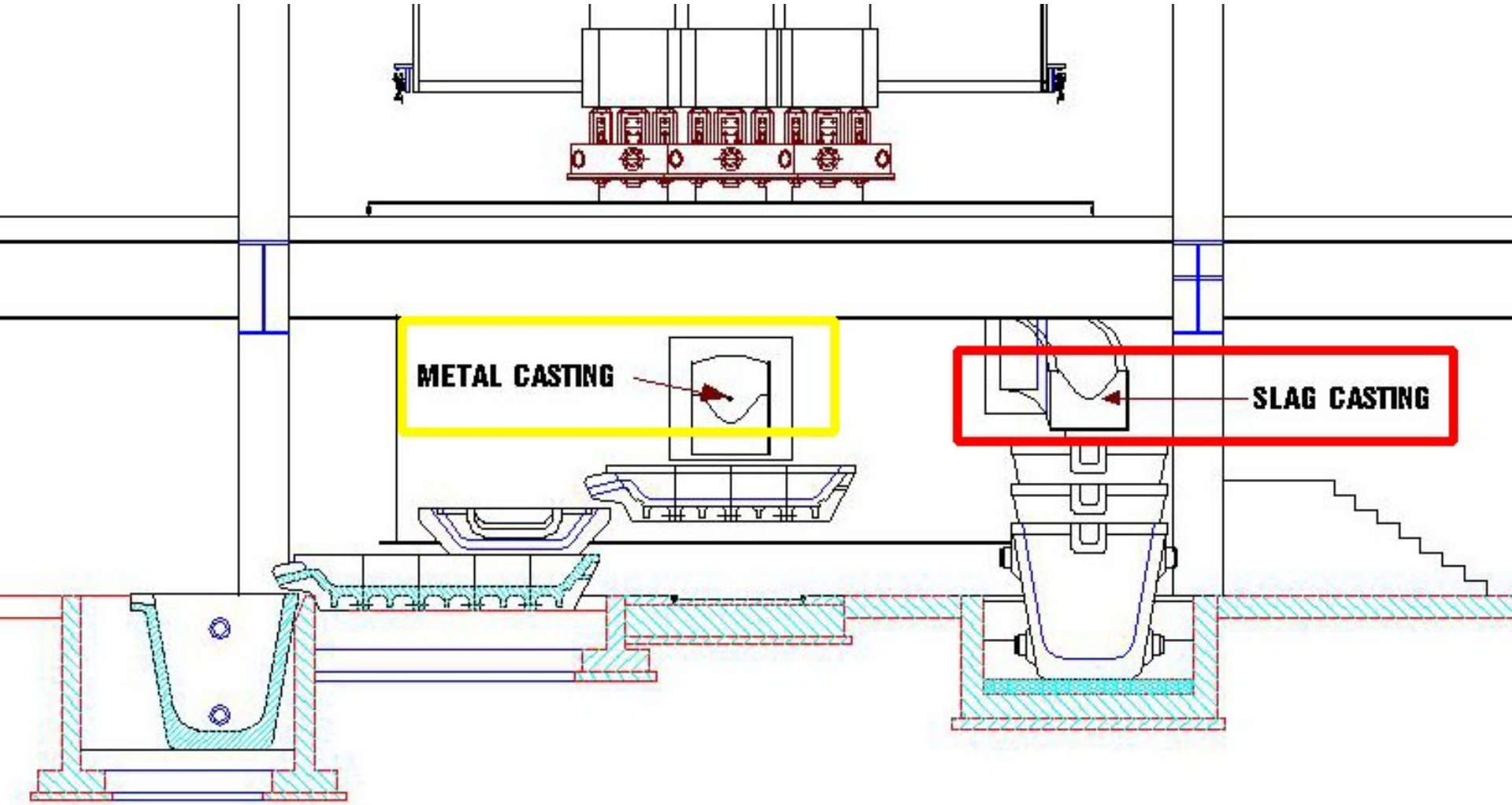

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FERROALLOY PROCESSING: INSIDE THE DAMA CRUCIBLE

DAMA SAF front view

DAMA SAF side view

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DAMA Fe-Cr processing

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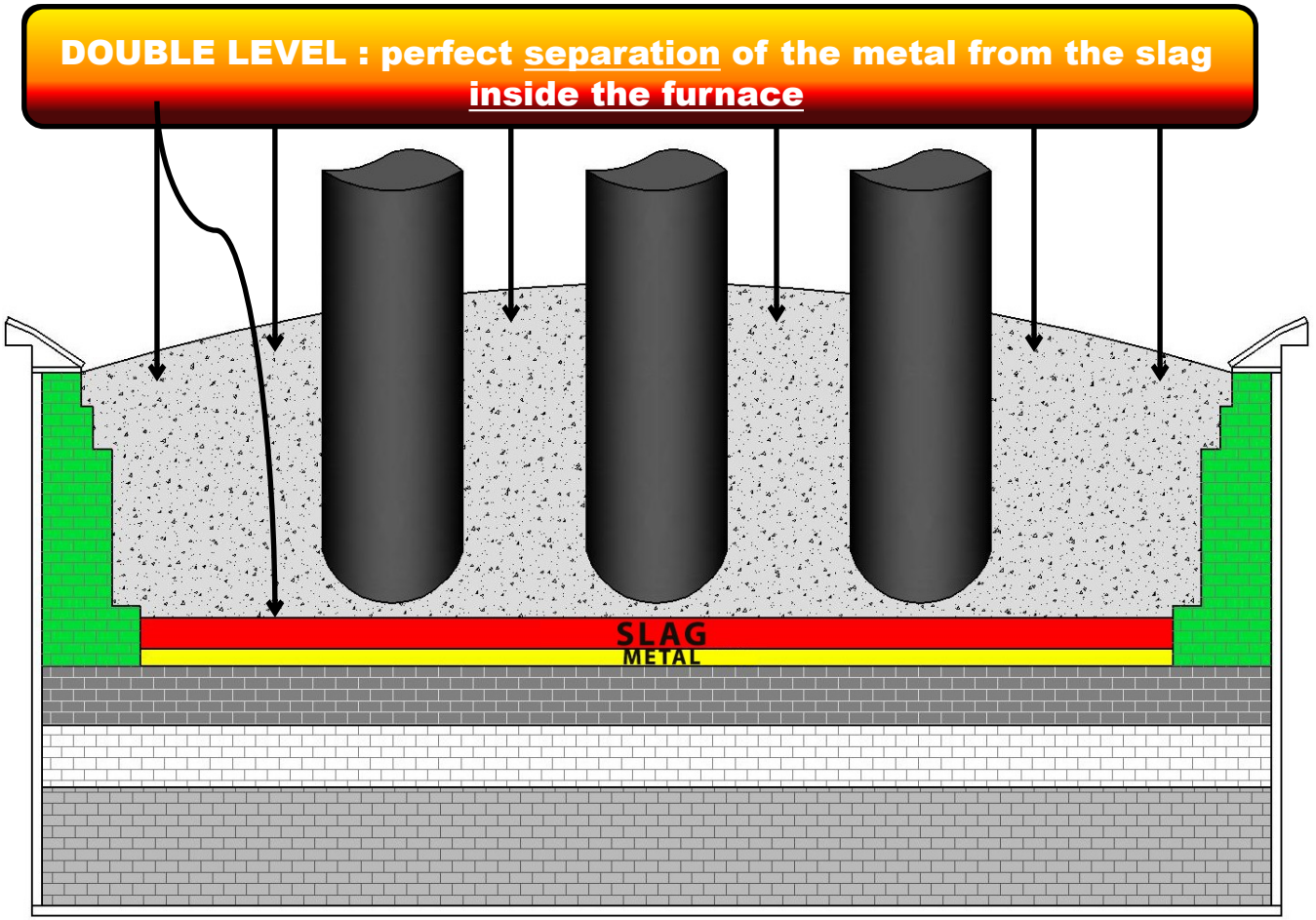
FERROALLOY PROCESSING: INSIDE THE DAMA CRUCIBLE

1. Furnace pre-heat and feed



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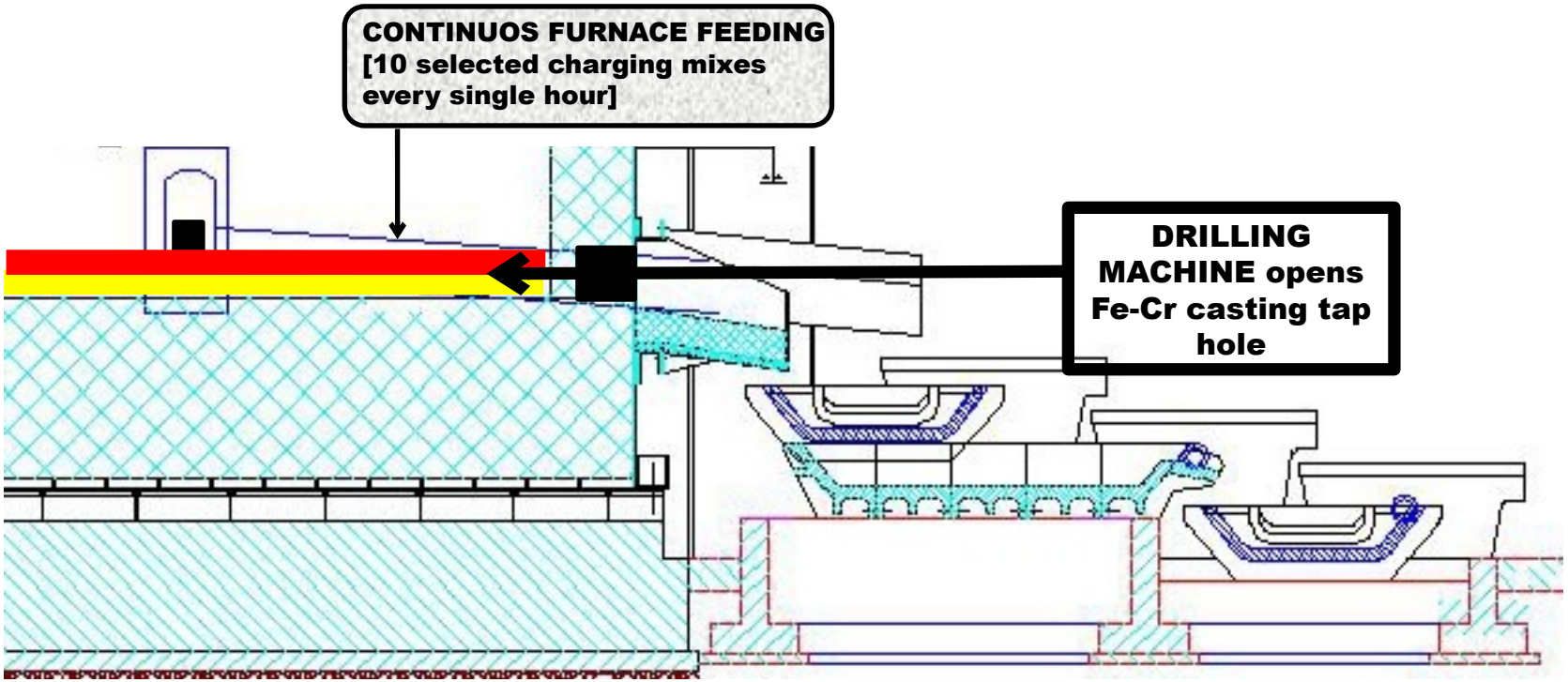
FERROALLOY PROCESSING: INSIDE THE DAMA CRUCIBLE

2. Fe-Cr tap hole opening and Fe-Cr casting



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FERROALLOY PROCESSING: INSIDE THE DAMA CRUCIBLE

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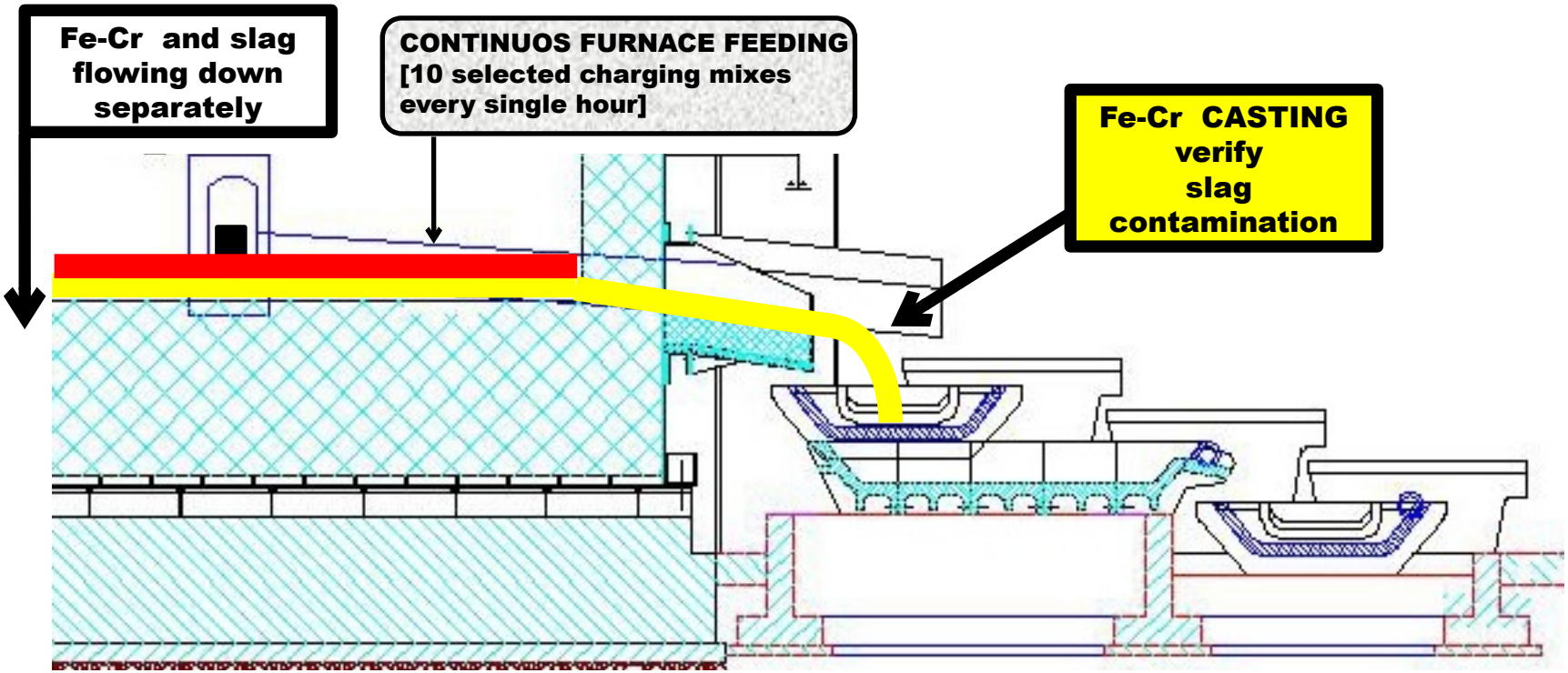

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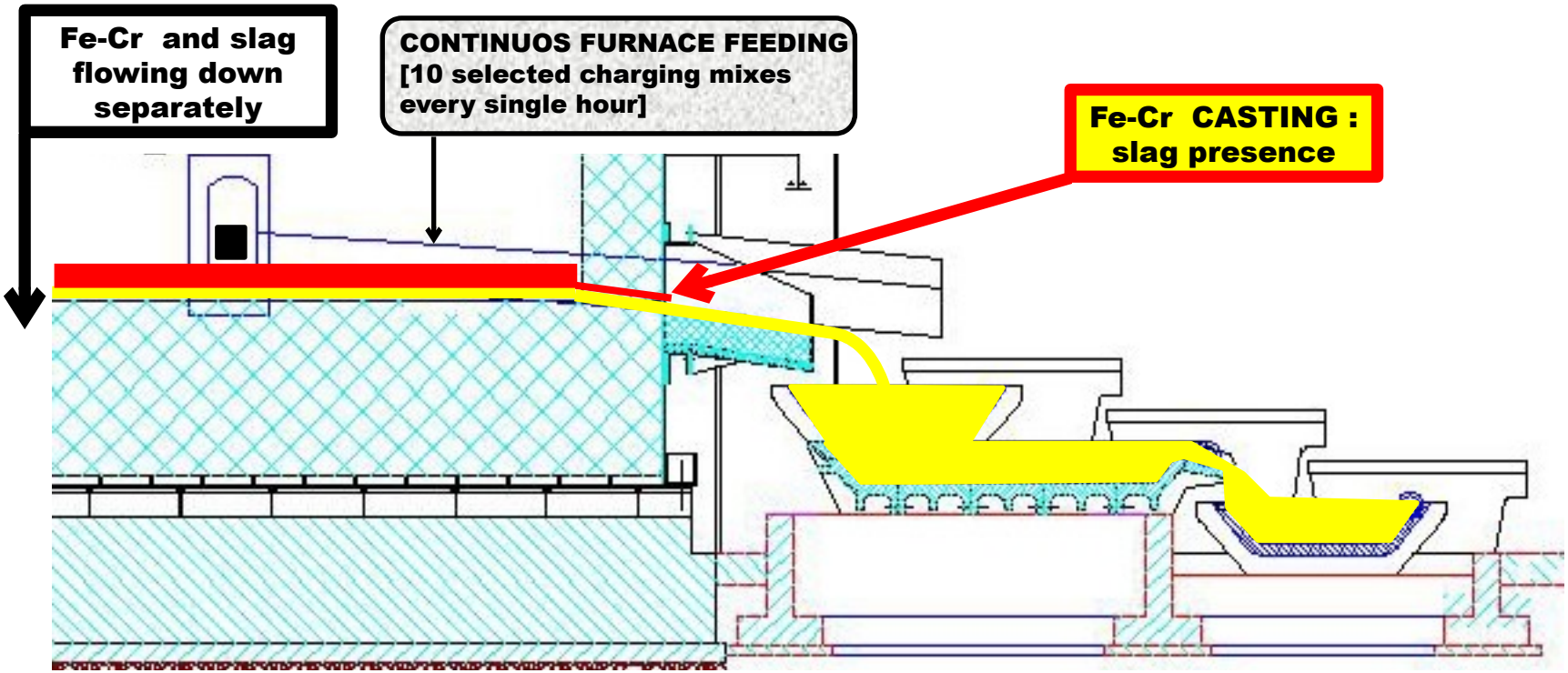
FERROALLOY PROCESSING: INSIDE THE DAMA CRUCIBLE

3. Tapping with capping machine



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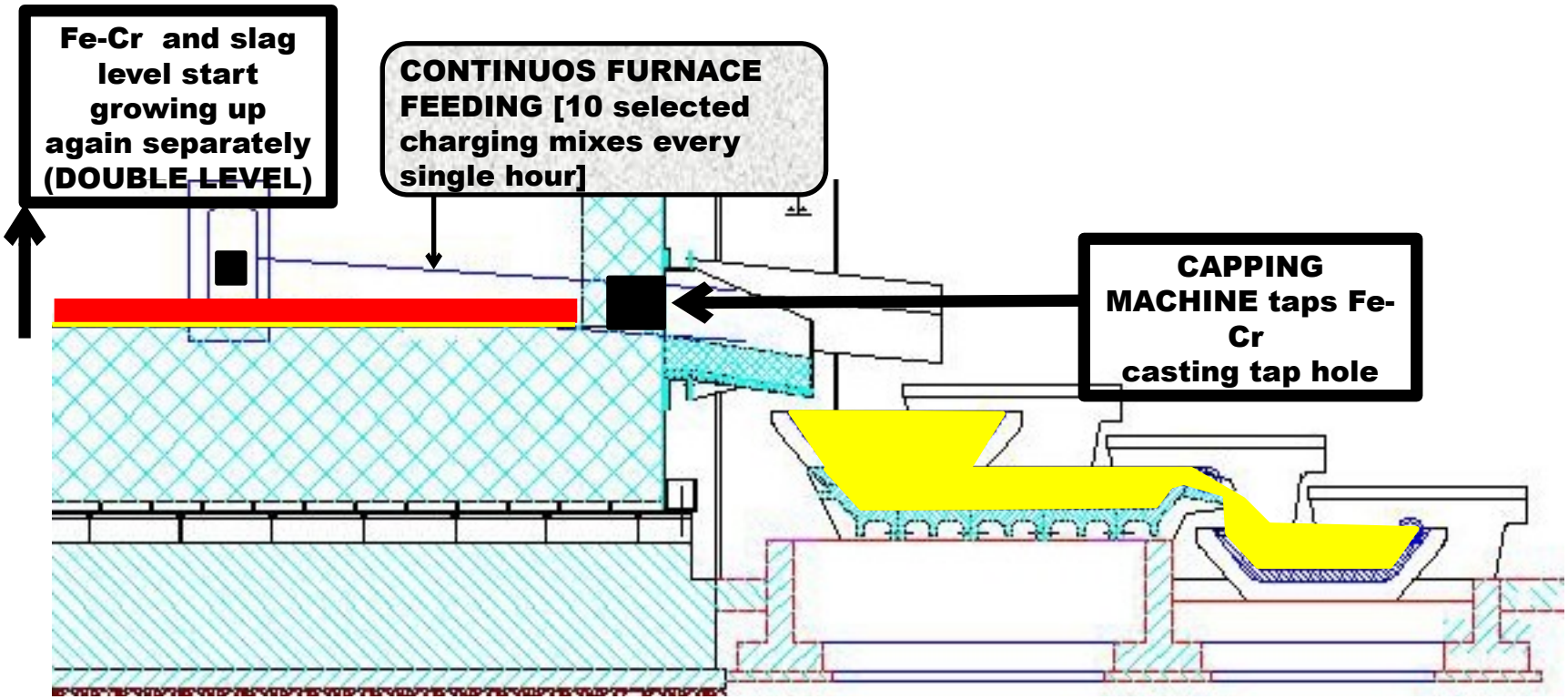

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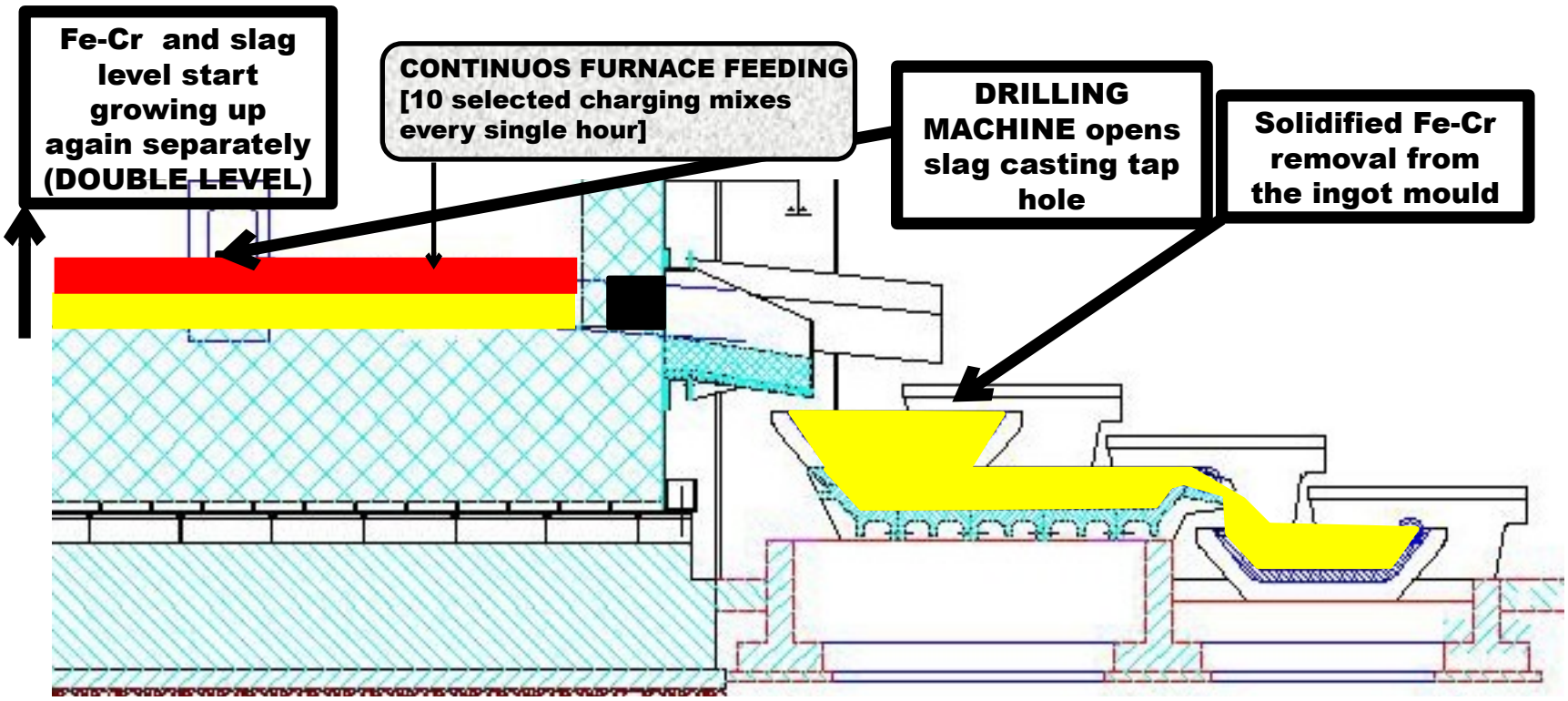
FERROALLOY PROCESSING: INSIDE THE DAMA CRUCIBLE

4. Slag tap hole opening and slag casting



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FERROALLOY PROCESSING: INSIDE THE DAMA CRUCIBLE

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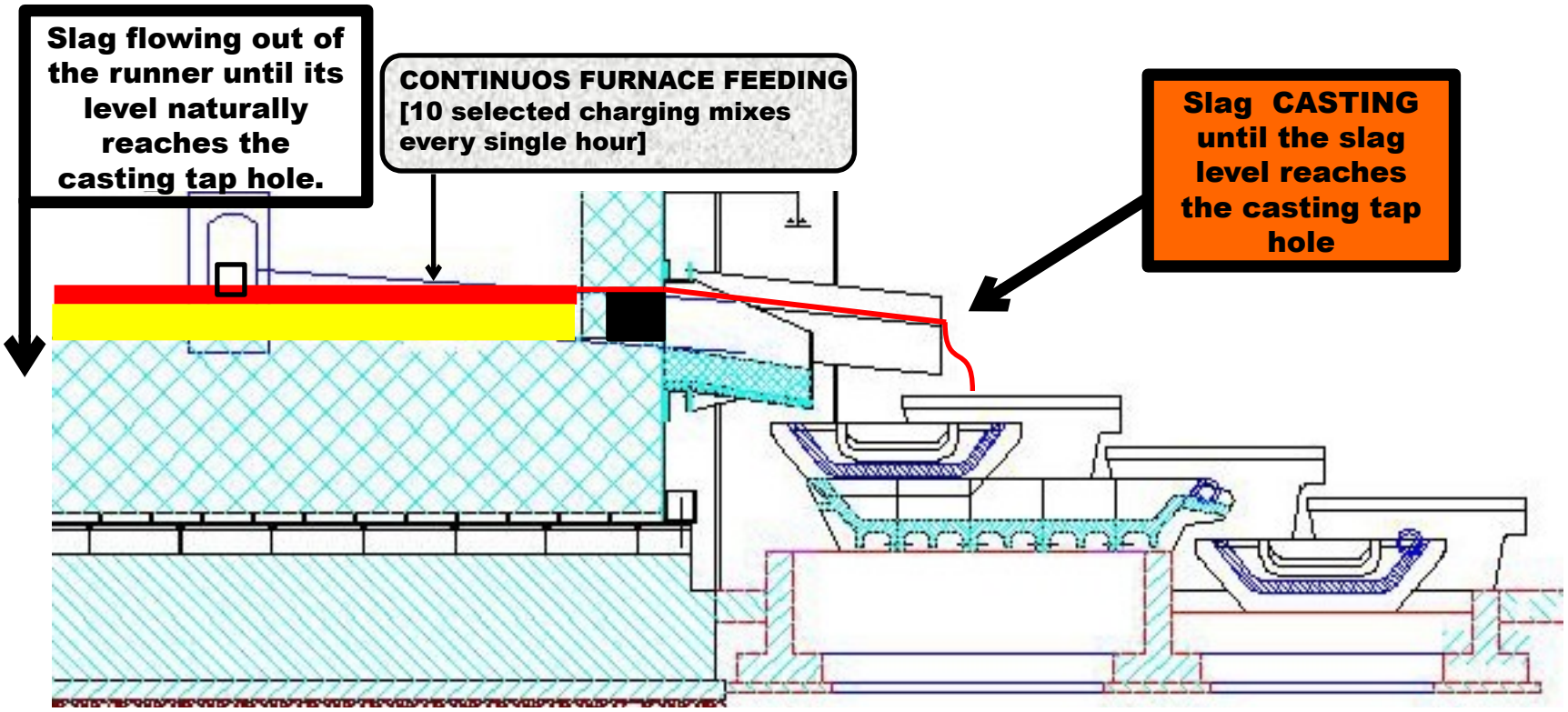

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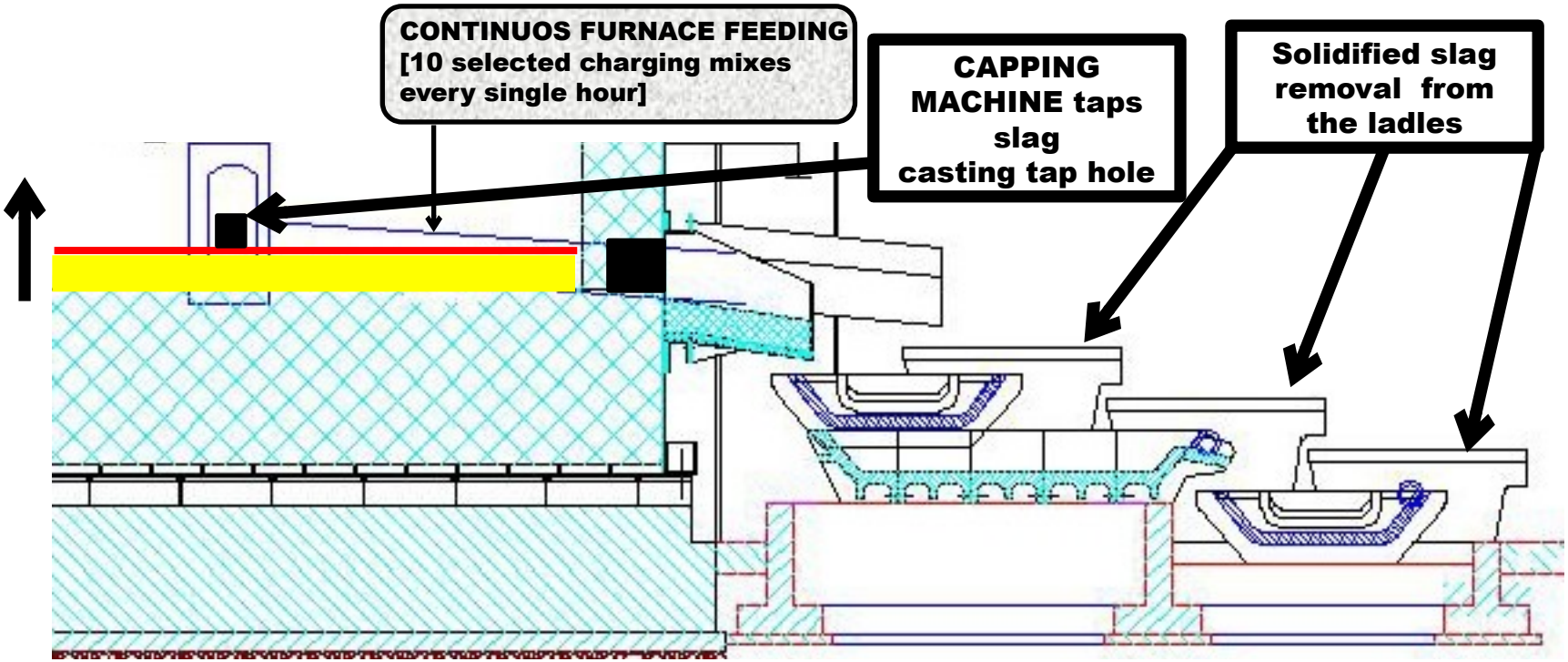
FERROALLOY PROCESSING: INSIDE THE DAMA CRUCIBLE

5. Tapping with capping machine



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CONCLUSIONS

EASY TARGETS REACHED USING DAMA TECHNOLOGY

Market Price Fe-Cr [$/ton]	1.604	**Today Technology**	**DAMA Technology**	Ton & Δ $	Δ%
SAF Power	[MW]	10	10		
Annual production capacity	[ton/ year]	17.800	19.800	2.000	11%
Production Costs	[$]	25.752.424	26.157.457	405.033	2%
Δ Revenue	[$/year]	28.551.200	31.759.200	3.208.000	11%
Δ EBITDA	[$/year]	2.798.776	5.601.743	2.802.967	100%
Δ EBITDA DAMA Process	[$/year]		**2.802.967**		

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