

Fate of Mercury in Synthetic Gypsum

DOE/NETL Mercury Control Technology R&D Program Review



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December 12, 2006

Presentation Outline

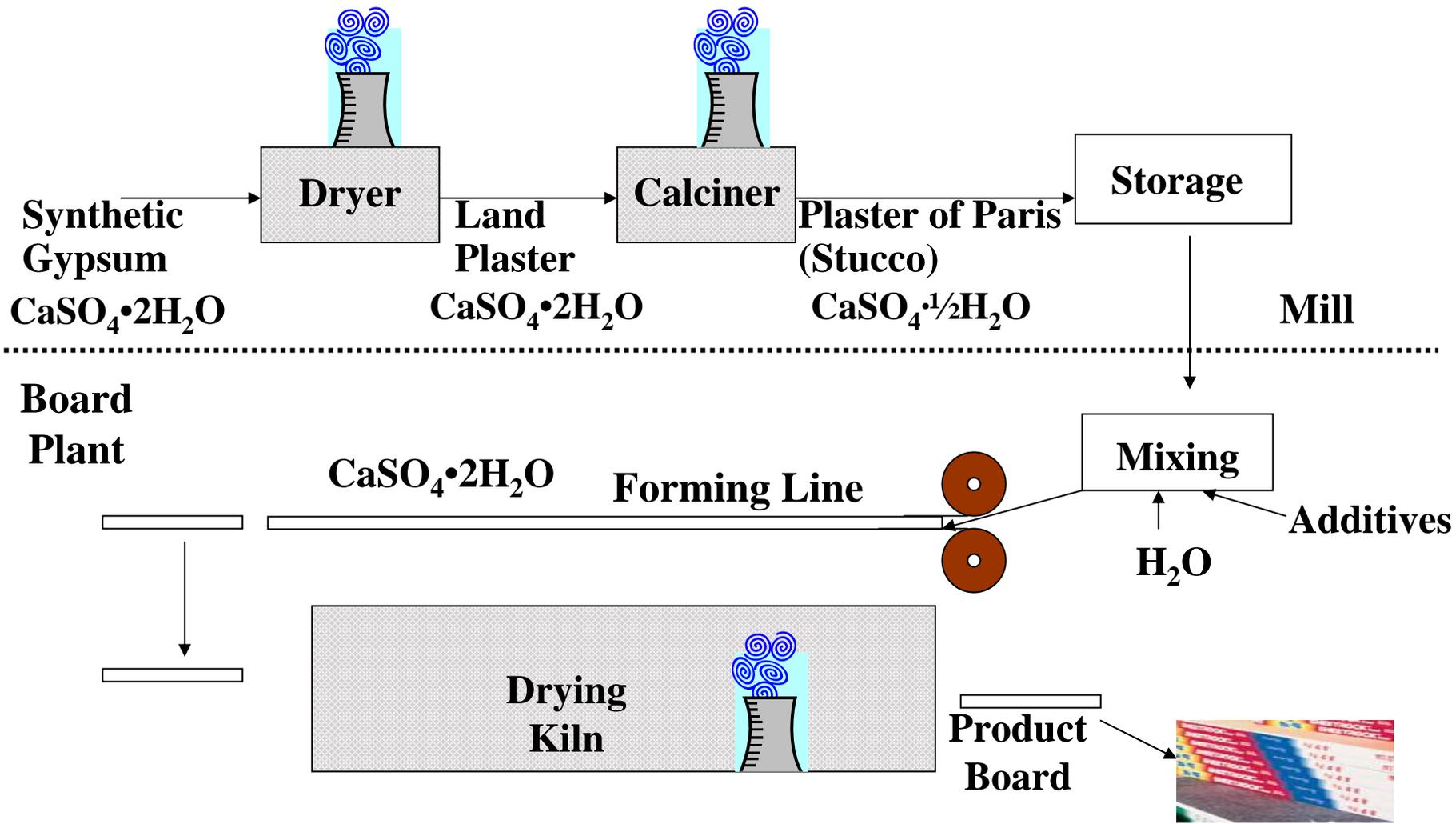
- **Project Test Matrix** (what synthetic gypsum sources, why)
- **Wallboard Production Process**
- **Sample Collection Sites** (where in the process)
- **Ontario Hydro Results** (% Hg Released)
- **Bulk Samples Results** (% Hg Loss)
- **Wallboard Industry Estimates**
(Based on project results and annual wallboard industry usages)
- **Extrapolated Industry Estimates**
(Compared to national mercury emissions)

USG/ DOE The Fate of Mercury in Synthetic Gypsum Used for Wallboard Production – Project Test Matrix

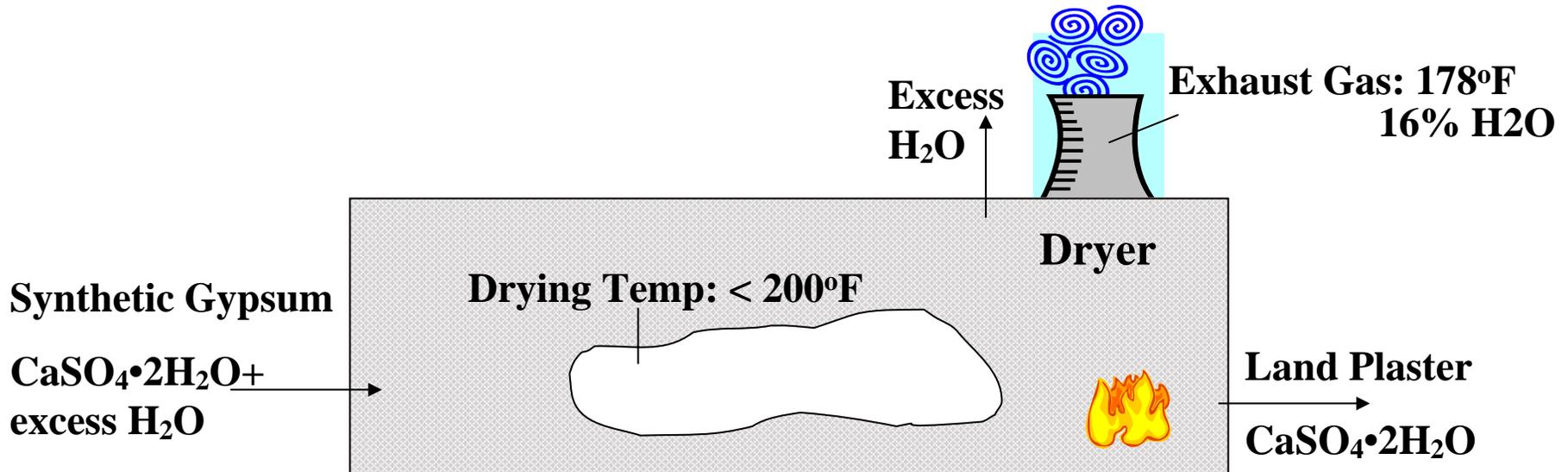
Task	1	2	3	4	5	6
Power Plant	A	A	B	C	D	D
Coal Type	HS Bit	HS Bit	HS Bit	TX lignite	HS Bit	HS Bit
FGD Reagent	Limestone	Limestone	Limestone	Limestone	Limestone	Limestone
Forced Oxidation Mode	In Situ	In Situ	In Situ	In Situ	In Situ	In Situ
Gypsum Fines Blow Down?	No	No	Yes	No	Yes	Yes
SCR Status	On Line	Bypassed	On Line	No SCR	Bypassed	Bypassed
USG Plant	1	1	2	3	4	4
FGD Hg Control Additive?	No	No	No	No	No	Yes TMT-15

*HS Bit – High Sulfur Bituminous; TX Lignite – Texas Lignite

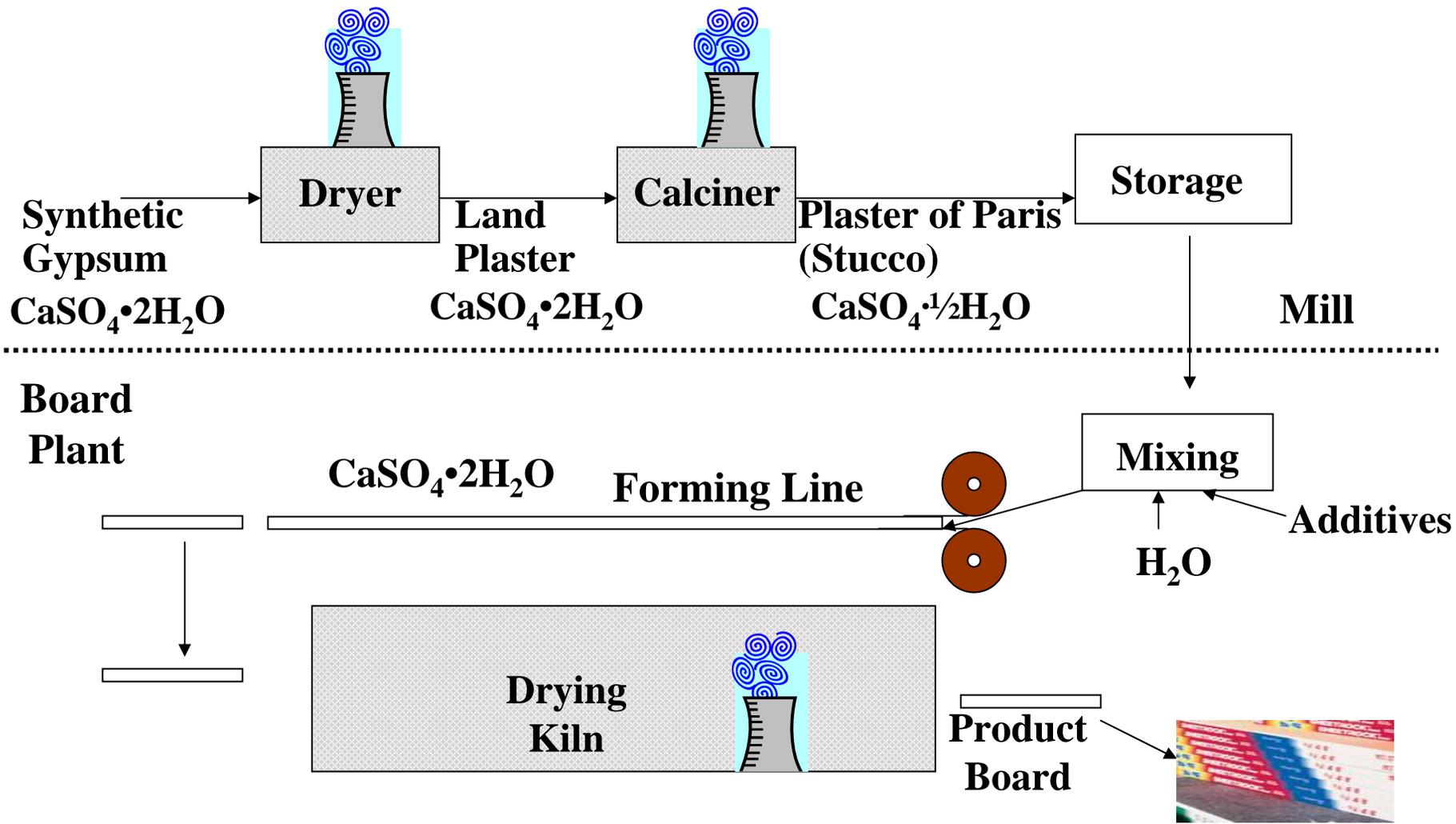
Simplified Flow Diagram of Synthetic Gypsum used for Wallboard Production



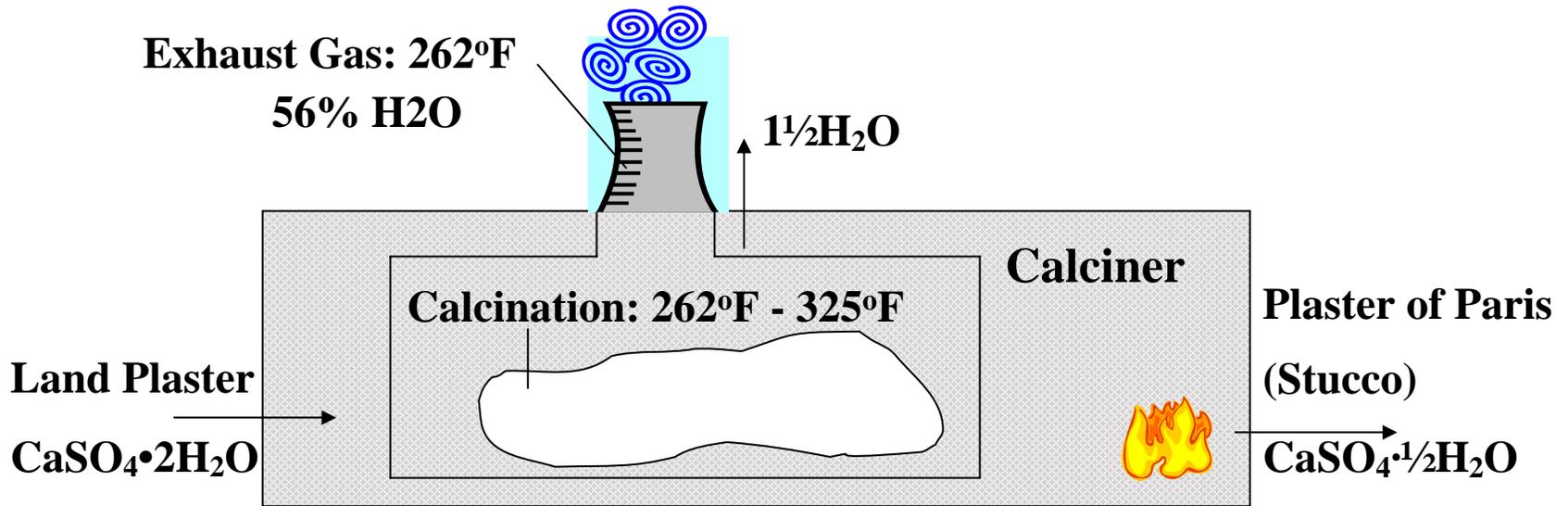
Mill Dryer



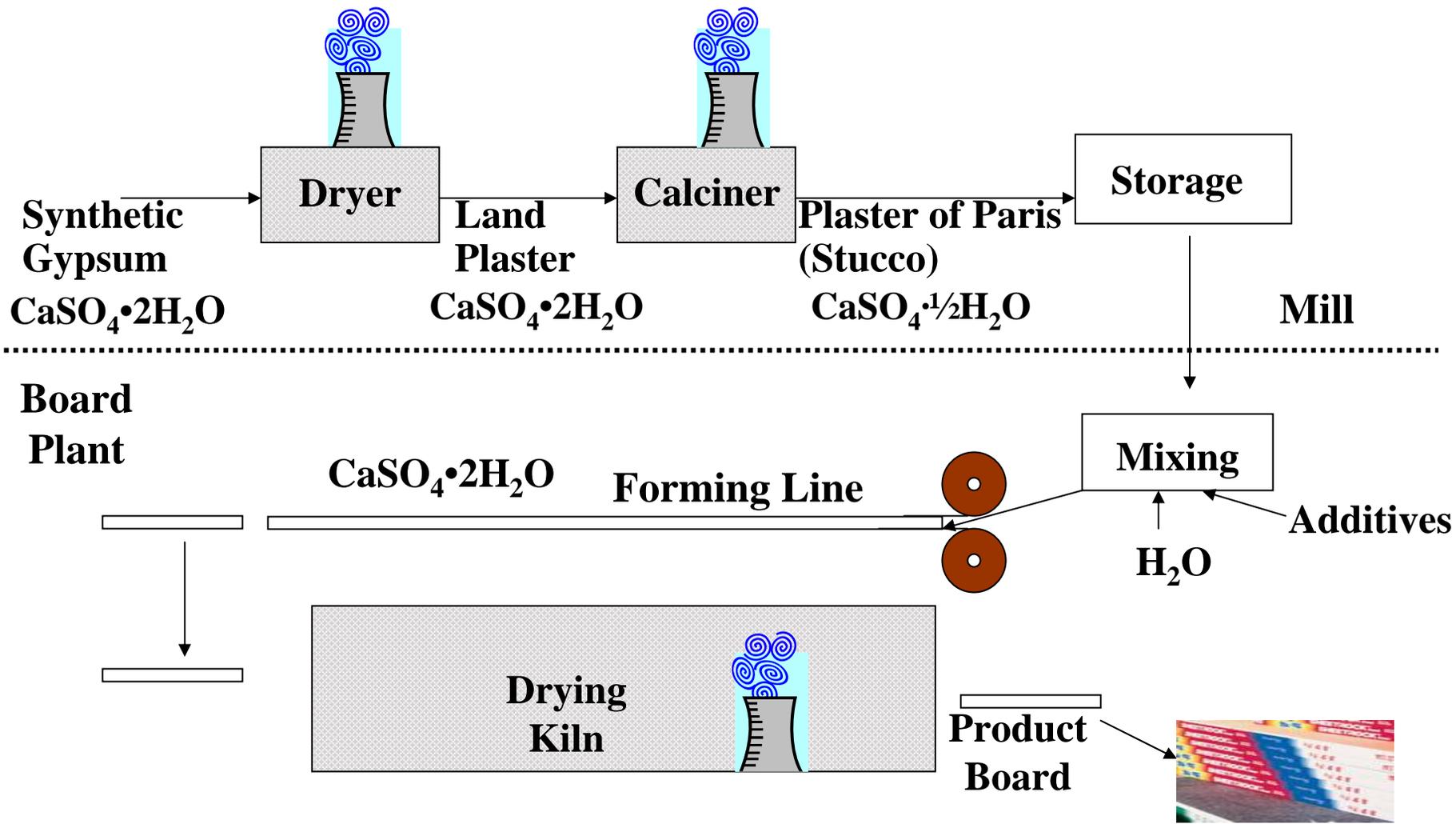
Simplified Flow Diagram of Synthetic Gypsum used for Wallboard Production



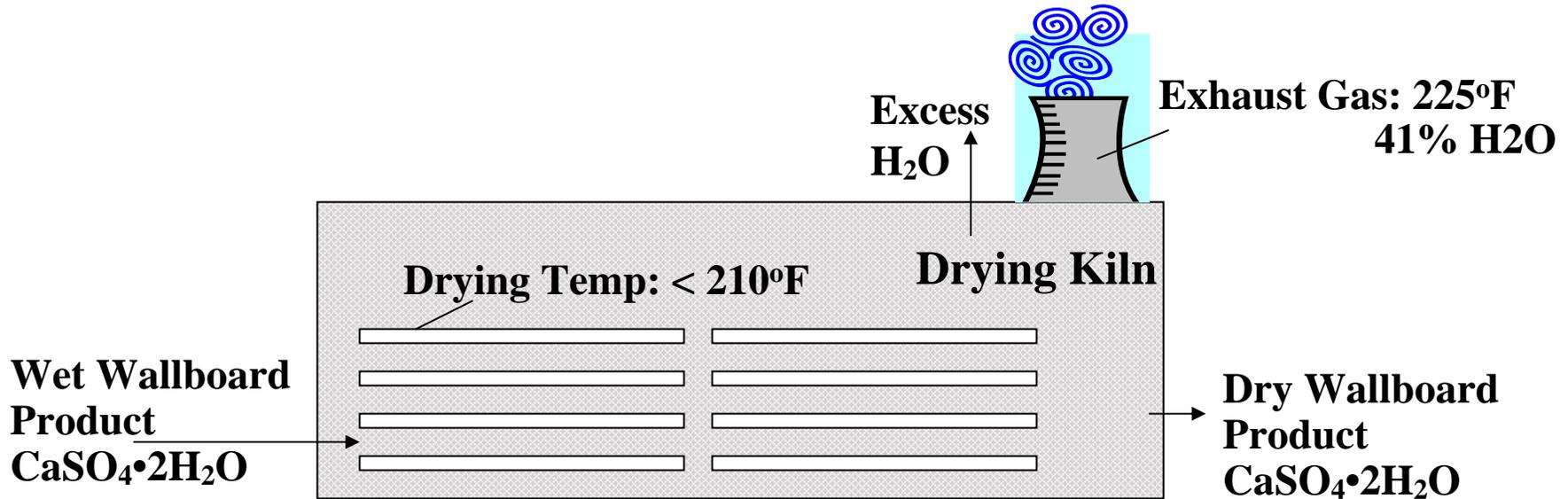
Mill Calciner



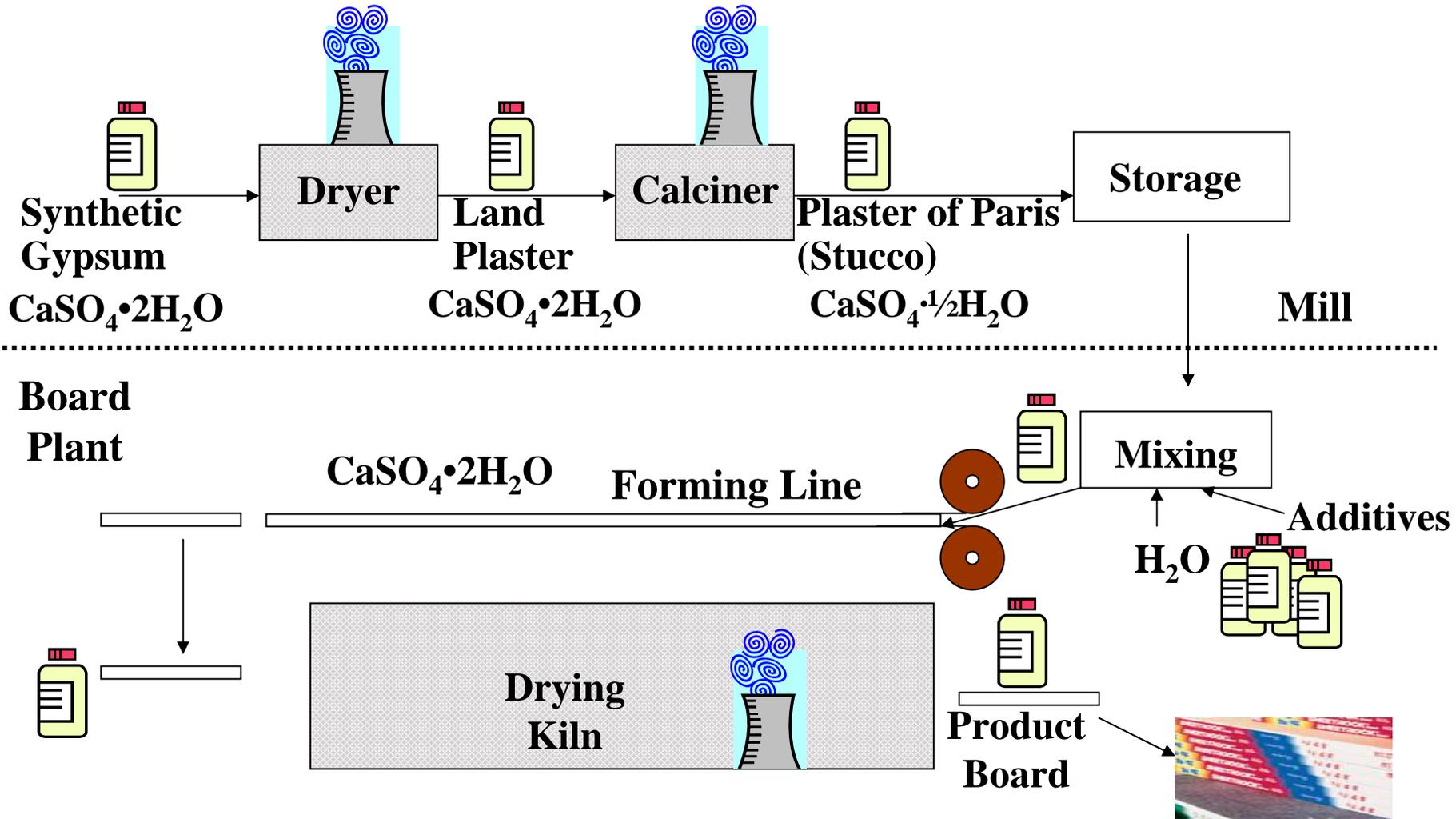
Simplified Flow Diagram of Synthetic Gypsum used for Wallboard Production



Board Plant Dryer (Kiln)



Sample Collection Sites



USG/ DOE The Fate of Mercury in Synthetic Gypsum Used for Wallboard Production Results

Ontario Hydro Results Percent of Total Mercury Released



Task Parameters (Incoming Hg content)	Dryer	Calciner	Kiln	Plant Emissions (gr/hr)
Task 1 HS Bit w/SCR (0.96 ppm Hg)	1%	2%	2%	4.1
Task 2 HS Bit w/o SCR (1.1 ppm Hg)	<1%	3%	5%*	7.8 *
Task 3 Fines Blow Down (0.21 ppm Hg)	1%	41%	4-21%*	8.2 *
Task 4 TX Lignite (0.21 ppm Hg)	<1%	<1%	<1%	0.32
Task 5 Fines Blow Down (0.20 ppm Hg)	<2%	50%	<2%	2
Task 6 Fines Blow Down w/TMT-15 (0.15 ppm Hg)	TBD	TBD	TBD	TBD

*** Losses in the Dryer Kiln for Tasks 2 & 3 are estimated based on solids analysis**

USG/ DOE The Fate of Mercury in Synthetic Gypsum Used for Wallboard Production Results

Ontario Hydro Results – Speciation



	Dryer			Calciner (%)			Kiln (%)		
	particulate	oxidized	elemental	particulate	oxidized	elemental	particulate	oxidized	elemental
Task 1	3	--	97	5	3	92	2	7	91
Task 2	5	--	95	1	10	89	NA	NA	NA
Task 3	1	68	31	0	1	99	NA	NA	NA
Task 4	4	11	86	28	10	62	0	35	65
Task 5	2	22	79	0	1	99	1	23	84

USG/ DOE The Fate of Mercury in Synthetic Gypsum Used for Wallboard Production Results

Bulk Samples Results Percent of Total Mercury Loss average of 3 ± Std dev.



	Dryer	Calciner	Kiln
Task 1	1.3 ± 4.0	1.4 ± 2.5	-0.9 ± 6.8
Task 2	3.7 ± 1.3	8.4 ± 1.4	5.5 ± 2.4
Task 3	-1.5 ± 13	43 ± 3	21 ± 5
Task 4	-2.3 ± 6.1	6.6; 3.6	4.6; 6.1
Task 5	12.6 ± 5.5	30 ± 6	-3.4 ± 2.3
Task 6*	-12.8 ± 6.9	37.9 ± 3.4	-4.4 ± 0.1

* Preliminary USG results

USG/ DOE The Fate of Mercury in Synthetic Gypsum Used for Wallboard Production Results

Bulk Samples Results Percent of Total Mercury Loss average of 3 ± Std dev.



	Dryer (OH)	Calciner (OH)	Kiln (OH)
Task 1	1.3 ± 4.0 (1%)	1.4 ± 2.5 (2%)	-0.9 ± 6.8 (2%)
Task 2	3.7 ± 1.3 (<1%)	8.4 ± 1.4 (3%)	5.5 ± 2.4 (N/A)
Task 3	-1.5 ± 13 (1%)	43 ± 3 (41%)	21 ± 5 (N/A)
Task 4	-2.3 ± 6.1 (<1 %)	6.6; 3.6 (<1 %)	4.6; 6.1 (<1 %)
Task 5	12.6 ± 5.5 (<2 %)	30 ± 6 (50 %)	-3.4 ± 2.3 (<2 %)
Task 6*	-12.8 ± 6.9 (N/A)	37.9 ± 3.4 (N/A)	-4.4 ± 0.1 (N/A)

* Preliminary USG results

Wallboard Industry Estimates based on USG/DOE Study

Mercury emitted per dry gypsum processed	times	Industry use [#]	Potential Estimated Emissions Wallboard Industry Total
Task 1: 0.045 grams/ton	*	8,178,079 tons	800 pounds
Task 2: 0.08 grams/ton	*	8,178,079 tons	1500 pounds
Task 3: 0.09 grams/ton	*	8,178,079 tons	1600 pounds
Task 4: 0.01 grams/ton	*	8,178,079 tons	200 pounds
Task 5: 0.09 grams/ton	*	8,178,079 tons	1600 pounds
Task 6: TBD grams/ton	*	8,178,079 tons	TBD pounds

[#] Based on ACAA 2005 Coal Combustion Product (CCP) Production and Use Survey 8,178,079 (Short Tons) Used in Wallboard Production



Percent of Total U.S. Human Caused Direct Mercury Emissions by Year by Industry – A Future Estimate

