A Comparison of Lime Feeding Systems

Proven Solutions to Traditional Problems:

Comparing Lime Slaking, Traditional Low Density Lime, and High Density Lime Systems

Nathan Teeters

MERRICK

Discussion Topics

- Introduction to Lime types and Slurry preparation
- Design considerations for storing, feeding, and flow promotion of dry lime
- Discussion on the type of equipment used in each type of system
- The problems of Lime systems

Lime Types

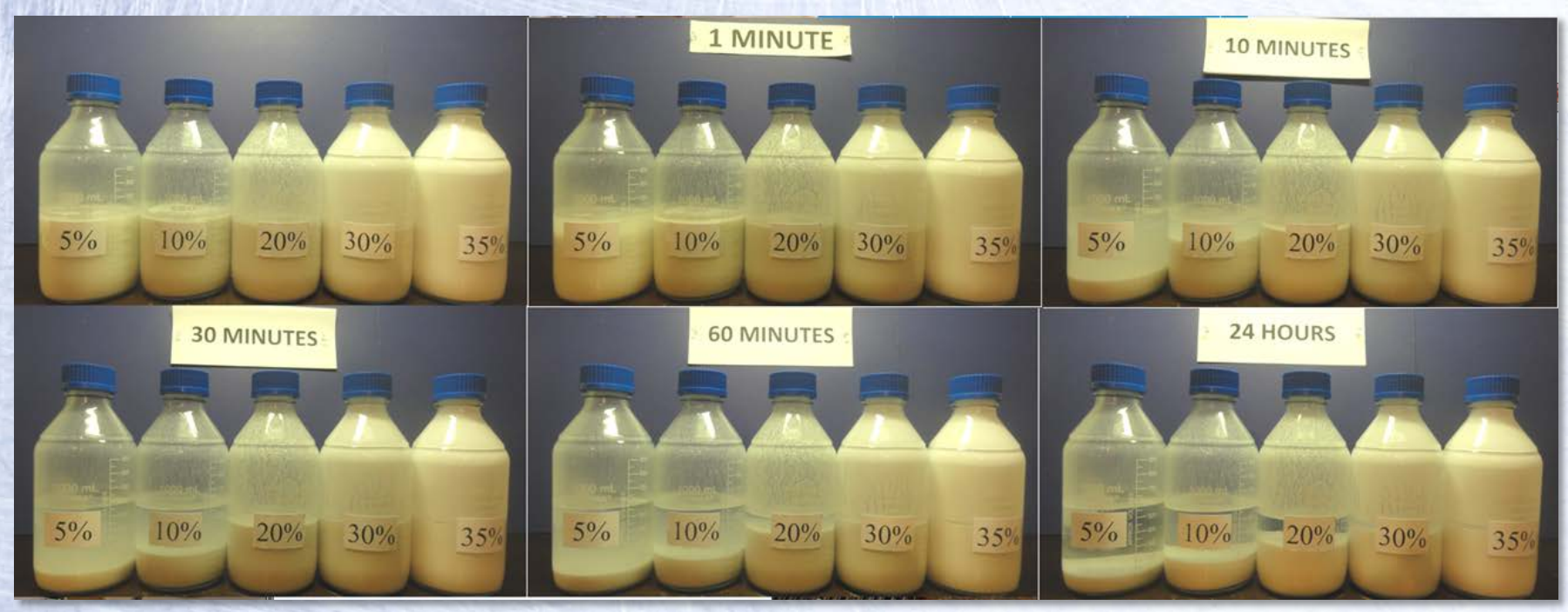
- Calcium Oxide (CaO) - AKA Pebble Lime or Quicklime
  - Bulk Density 55-60 lbs/ft^3
  - Must be slaked: $CaO + H_2O \rightarrow Ca(OH)_2$
  - Must have grit removed

- Calcium Hydroxide ($Ca(OH)_2$) - AKA Slaked Lime or Hydrated Lime
  - Bulk Density 25-35 lbs/ft^3

Slurry Preparation

- Calcium Oxide
    - Slaking
    - Grit Removal
    - Holding/Aging
    - Recirculation
- Calcium Hydroxide
    - Low Density Hydrated Lime Slurry
        - Recirculation
    - High Density Hydrated Lime Slurry
        - 30-40% Concentration by weight

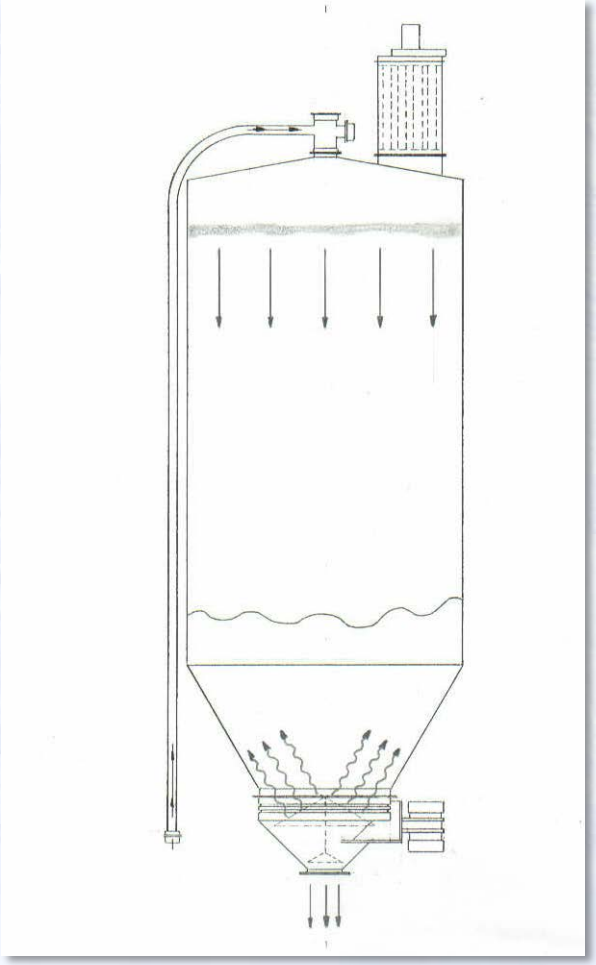
Slurry Preparation



MERRICK
MERRICK INDUSTRIES, INC.

Design Considerations

- Storage Silo
  - Proper Filling
  - Dust Collection
  - Promote Mass Flow
- Lime Feeding Equipment
  - Prevent material segregation
  - Promote consistent flow
  - Do not use compressed air



MERRICK
MERRICK INDUSTRIES, INC.

Types of Equipment

- Calcium Oxide
  - Slaker
  - Grit Removal
  - Holding/Aging Tank
  - Recirculation Pumps
  - Control Valves
- Low Density Hydrated Lime System
  - Mixing/Batch Tank
  - Recirculation Pumps
  - Control Valves

Types of Equipment

- High Density Hydrated Lime System
  - Mixing/Batch Tank
  - Metering Pumps

Problems with Lime Systems: Maintenance

Slaking System	Low Density Lime System	High Density Lime System
Scaling of the pipe lines, troughs, slakers, etc.	Scaling of the pipe lines, troughs, tanks, etc.	N/A HDLS Systems produce significantly less scale
Acid cleaning	Acid cleaning	N/A HDLS Systems produce significantly less scale
Manual cleaning, pigging, etc.	Manual cleaning, pigging, etc.	N/A HDLS Systems produce significantly less scale
Replacement of pipes & valves due to scaling	Replacement of pipes & valves due to scaling	N/A HDLS Systems produce significantly less scale
Cleaning the slaker & grit remover	N/A LDLS Systems do not require grit removal	N/A HDLS Systems do not require grit removal
Removal/Disposal of grit	N/A LDLS Systems do not have grit; only a very minimal amount of impurities in the hydrate, maybe a few lbs/month	N/A HDLS Systems do not have grit; only a very minimal amount of impurities in the hydrate, maybe a few lbs/month

Problems with Lime Systems: Housekeeping

Slaking System	Low Density Lime System	High Density Lime System
Slaking systems are never dust tight	LDLS Systems can be made dust & water tight	HDLS Systems can be made dust & water tight
Dust & Vapor remover must be cleaned regularly	Breather/filter bag & nozzle cleaned once per week	Breather/filter bag & nozzle cleaned once per week
Slaking equipment must be cleaned routinely. Material is usually not re-usable	Slurry batch tanks must be cleaned routinely. Material is usually not re-usable	Slurry batch tanks require a brief wash down once a week but the material is kept inside the slurry tank; a very clean procedure

Problems with Lime Systems: Pumping System

Slaking System	Low Density Lime System	High Density Lime System
Slurry must be pumped at a minimum of 2.5 ft/sec	Slurry must be pumped at a minimum of 2.5 ft/sec	30 to 40% by weight slurries do not settle; pipeline velocity is a moot point
Recirculation loop required	Recirculation loop required	HDLS slurries can be pumped to the use points, stopped and restarted without flushing of the pipelines
Pumps for dilute slurries must be sized to pump the amount of slurry plus the excess required for recirculation; requires automatic dosing valve at point of application	Pumps for dilute slurries must be sized to pump the amount of slurry plus the excess required for recirculation; requires automatic dosing valve at point of application	Pumps for HDLS are always smaller as the amount of slurry required can be up to 7 times less due to the high density

Thank You

MERRICK INDUSTRIES

109 Years of Serving Industry

Thank you for your time, we hope that this presentation has been helpful.

Please contact our office for more detailed information about each of our system types or to discuss specific needs of your application.

For more information about liquid lime handling systems contact
MERRICK - CONSECO!
10 Arthur Drive
Lynn Haven, FL 32444
Ph. +1.850.265.3611
nteeters@merrick-inc.com

MERRICK INDUSTRIES, INC.