



## **New Technologies for Hypochlorite Production**

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### New Technologies for Hypo Production

- Benefits of HSLs Hypo
  - Chemistry Advantages
  - Production Advantages
  - Shipping Advantages
- HSLs Hypo Production Technologies
  - 50% Caustic
  - 32% Caustic
- Additional Systems

## What is High Strength Low Salt Hypo?

- 30% by wt. NaOCl with 8.5% by wt. NaCl
- 13% by wt. NaOCl with 3.7% by wt. NaCl
- 6% by wt. NaOCl with 1.7% by wt. NaCl

Traditional Hypo:

- 13% by wt. NaOCl with 10.4% by wt. NaCl
- 6% by wt. NaOCl with 4.7% by wt. NaCl

## Traditional Hypo vs. HSLs Hypo

| Traditional Hypo |       |        | HSLs Hypo |       |        |
|------------------|-------|--------|-----------|-------|--------|
| NaOCl            | NaCl  | SG     | NaOCl     | NaCl  | SG     |
| Wt. %            | Wt. % |        | Wt. %     | Wt. % |        |
| 30.0%            | X     | X      | 30.0%     | 8.5%  | 1.3459 |
| 25.0%            | X     | X      | 25.0%     | 7.1%  | 1.2936 |
| 20.0%            | X     | X      | 20.0%     | 5.7%  | 1.2391 |
| 16.5%            | 13.0% | 1.2622 | 16.5%     | 4.7%  | 1.1997 |
| 15.0%            | 11.9% | 1.2382 | 15.0%     | 4.3%  | 1.1824 |
| 13.0%            | 10.4% | 1.2052 | 13.0%     | 3.7%  | 1.1592 |
| 10.5%            | 8.3%  | 1.1610 | 10.5%     | 3.0%  | 1.1296 |
| 8.0%             | 6.3%  | 1.1210 | 8.0%      | 2.3%  | 1.0994 |
| 6.0%             | 4.7%  | 1.0920 | 6.0%      | 1.7%  | 1.0750 |
| 3.0%             | 2.4%  | 1.0490 | 3.0%      | 0.9%  | 1.0376 |

## What are the Advantages?

- Superior Product compared to Traditional Hypo due to chemistry advantages
- Reduced chlorine and caustic consumption per gallon produced
- Improved stability and reduced weight allow more flexibility of logistics
  - Lower specific gravity will reduced the overall weight load for shipment of same volume
  - Increased volume per shipment for same load weight

## What are the Advantages (cont'd)?

### For Salt to Bleach Plants

- Recovery of salt for raw material savings
- Lower electrolytic power consumption/cost (3%)
- Lower brine treatment chemical consumption/cost (40%)
- Lower salt consumption/cost (40%)
- More margin on hypo sales (3%)

...OR...

- Increase hypo production
- Plant expansion capability
- Opportunities exist to expand plant capacity into new markets

## Chemistry Advantages

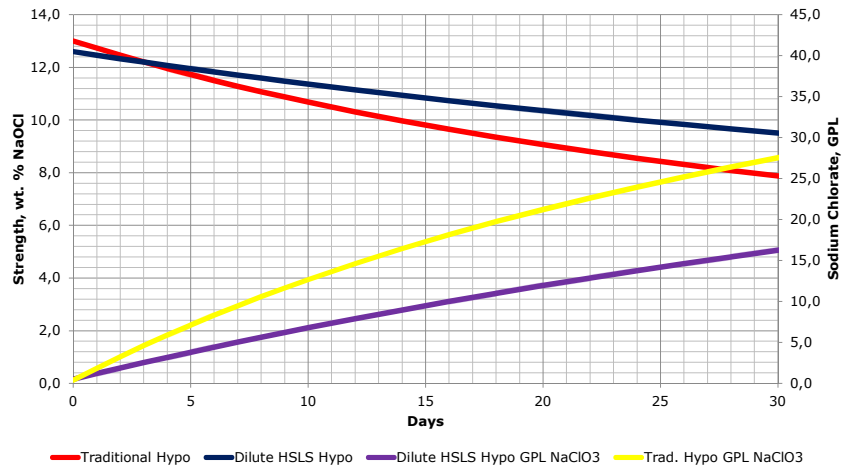
- Reduction in Ionic strength of the solution:
  - Slower decomposition resulting in a longer half-life
  - Less chlorate ion formation
  - Less perchlorate ion formation
  - Less oxygen formation

## Chlorine and Caustic for HSLs Hypo

- With lower decomposition rates, diluted HSLs hypo can be shipped at a lower strength than traditional hypo.
- Assuming a storage time of 3 days to ship no less than 12.0%
- Traditional Hypo is typically manufactured at 13.0%.
- HSLs Hypo could be diluted to 12.6%.
- Difference accounts for 3.0% savings in raw materials.

## Reduced Shipping Strength

### Diluted HSLs Hypo vs. Traditional Hypo @ 32°C

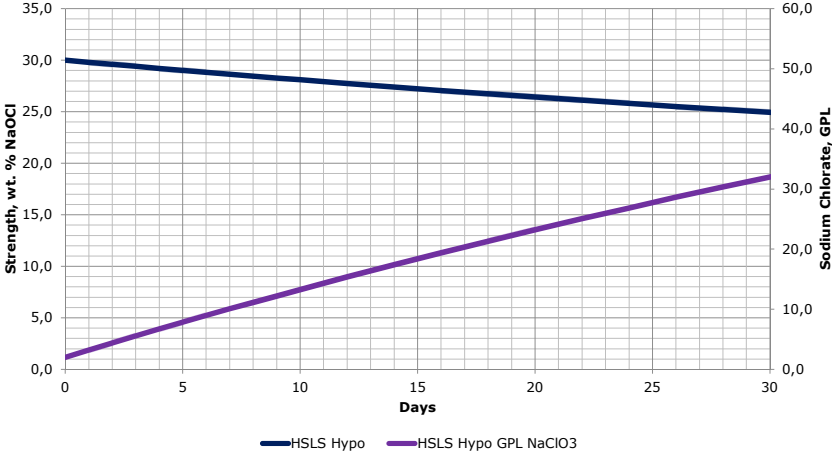


## HSLs Hypo Shipping Advantages

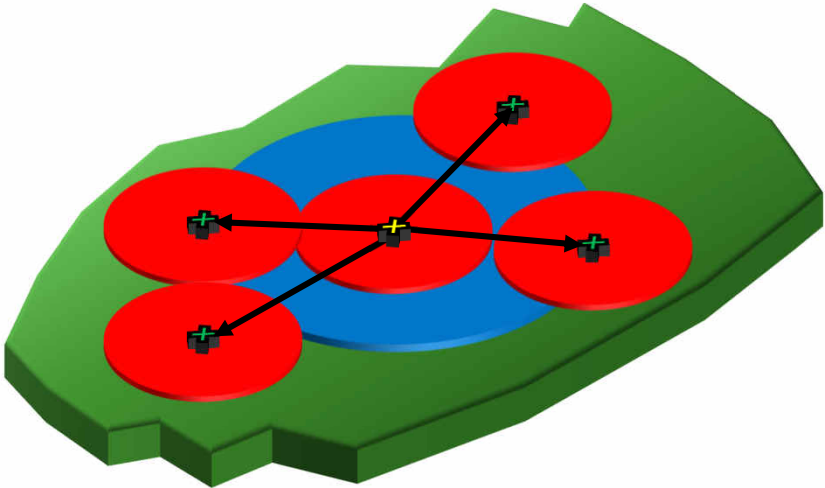
- HSLs Hypo is stored on producers site at 10°C.
- One tank truck load (16 m<sup>3</sup>) of 13.0% diluted HSLs Hypo contains 1,500 kgs. less salt than tradition hypo.
- 16 m<sup>3</sup> tank truck load of 30% wt. equals 44 m<sup>3</sup> of 13% wt.
- High dilution ratio allows for shipment flexibility.
  - Shipment of 30% wt.
    - Economically ship 2.75 time farther
    - Increase total delivered volume by 2.75, diluted at distribution center or customer site
  - Shipment of diluted product
    - Increased stability allows for decreased shipping strength

# Storage HSLs Hypo

## HSLs Hypo @ 10°C



# HSLs Hypo Shipping



## Salt Savings for HSLs Hypo

- Approximately 1,500-1,700 kg of NaCl consumed to produce 1,000 kg of chlorine
- 1,000 kg of chlorine reacted to 30% NaOCl = 615 kg of NaCl savings by reclaiming salt
- 615 kg of reclaimed salt = 34-37% needed for original electrolysis
- Reclaimed salt is very pure; if returned back to chlor-alkali plant only requires secondary brine treatment

## Salt Purity

| Element / Compound              | mg/kg   |
|---------------------------------|---------|
| NaCl                            | 99.85%  |
| Insolubles                      | <0.005% |
| Al                              | <1.6    |
| Ba                              | <0.17   |
| Ca                              | 0.39    |
| Mg                              | <0.3    |
| Sr                              | <1.6    |
| Fe                              | <0.03   |
| SiO <sub>2</sub>                | 0.67    |
| Na <sub>2</sub> SO <sub>4</sub> | N/D     |

## Operating HSLs Process



The image shows a map of the United States with a blue dot in the Pacific Northwest region. Two black arrows point from this dot to two photographs of industrial facilities. The top photograph shows a large vertical cylindrical tank with various pipes and valves. The bottom photograph shows a complex industrial setup with multiple tanks and piping.

- Rated for 25 STPD of  $\text{Cl}_2$ 
  - 2.4  $\text{m}^3/\text{h}$  of 30%
- Liquid Chlorine
- Reclaim Salt to C/A Plant

## HSLs Hypo Processes

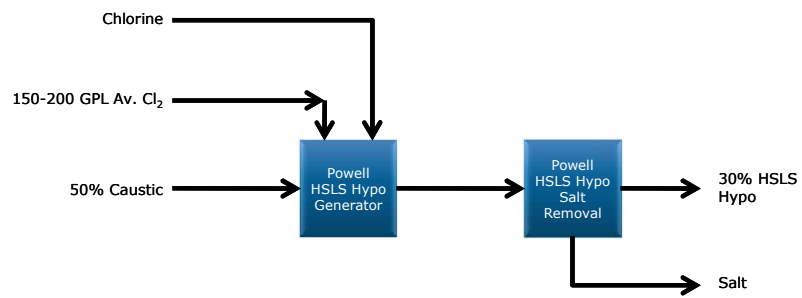


**CHEMETICS®**

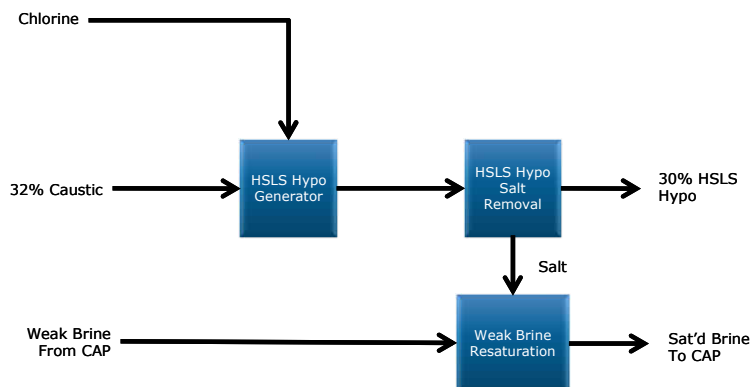
- Powell-Chemetics Cooperation for HSLs Hypo Technologies
- Offering two separate technologies for the production of HSLs Hypochlorite
  - Feed Hypo, 50% Caustic, and Chlorine
  - 32% Caustic and Chlorine



## HSLs Hypo Process Diagram



## HSLs Hypo Process Diagram



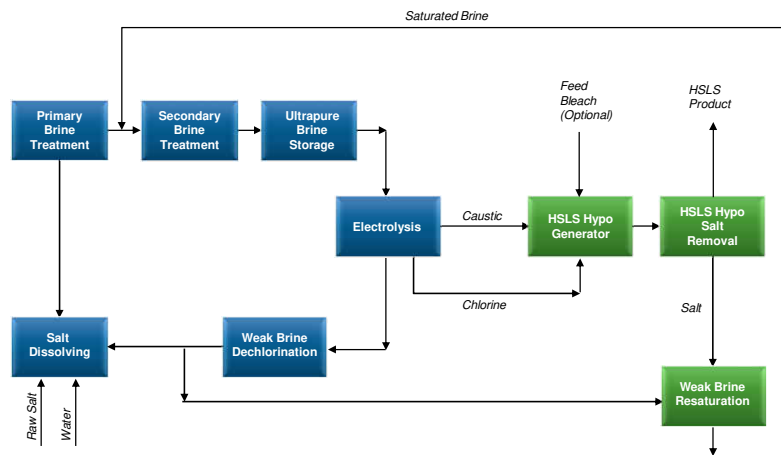
## HSLs Hypo Solution



## HSLs Technology Comparison

| Energy Requirements  |             | Powell | Chemetics |
|----------------------|-------------|--------|-----------|
| 50% NaOH (stm)       | kWh/t NaOCl | 416    | 0         |
| Chiller              | kWh/t NaOCl | 16     | 0         |
| Heat Transfer        | kWh/t NaOCl | 0      | 200       |
| Vacuum Pump          | kWh/t NaOCl | 0      | 3         |
| Total Energy         |             | 434    | 203       |
| Total Energy Savings |             |        | 53%       |

## Integration of the HSLs Process



## Skid-Mounted Chlor-Alkali Process

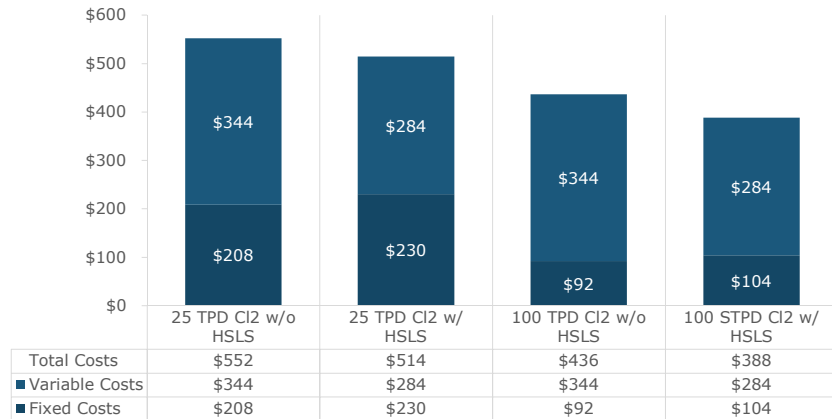


**CHEMETICS®**

- Modularized skid-mounted chlorine and caustic soda production with membrane cell technology
  - Typical capacities 25, 50, 75, 100 TPD of Cl<sub>2</sub>
  - Pre-Assembled and Pre-Tested to reduce onsite construction cost allowing for short time from beginning of construction to commissioning.
  - Flexibility of skid arrangements based on existing site layout
- Lower production costs
- Integration of HSLs Technologies for improved product quality and plant economics

## Plant Economics

### Production Costs Per Tonne of NaOCl



## Summary

### New Technologies for Sodium Hypochlorite Production

- HSLs Hypo – 30% w/w Hypochlorite
  - 50% NaOH Technology
  - 32% NaOH Technology
  - Improved product quality/stability
  - Salt recovery
  - Improved shipment economics
- Chlor-Alkali Systems
  - Modular skid-mounted design
  - Lower production costs
  - Integrated HSLs Hypo technology

## Powell Contact Information

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