



Everloy  
Spray Nozzles

# Roll Life Improvement as a Result of Enhanced Roll Cooling Nozzle Technology

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# Yuengling

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**OUR BEER** CLICK ON ANY TYPE YUENGLING  
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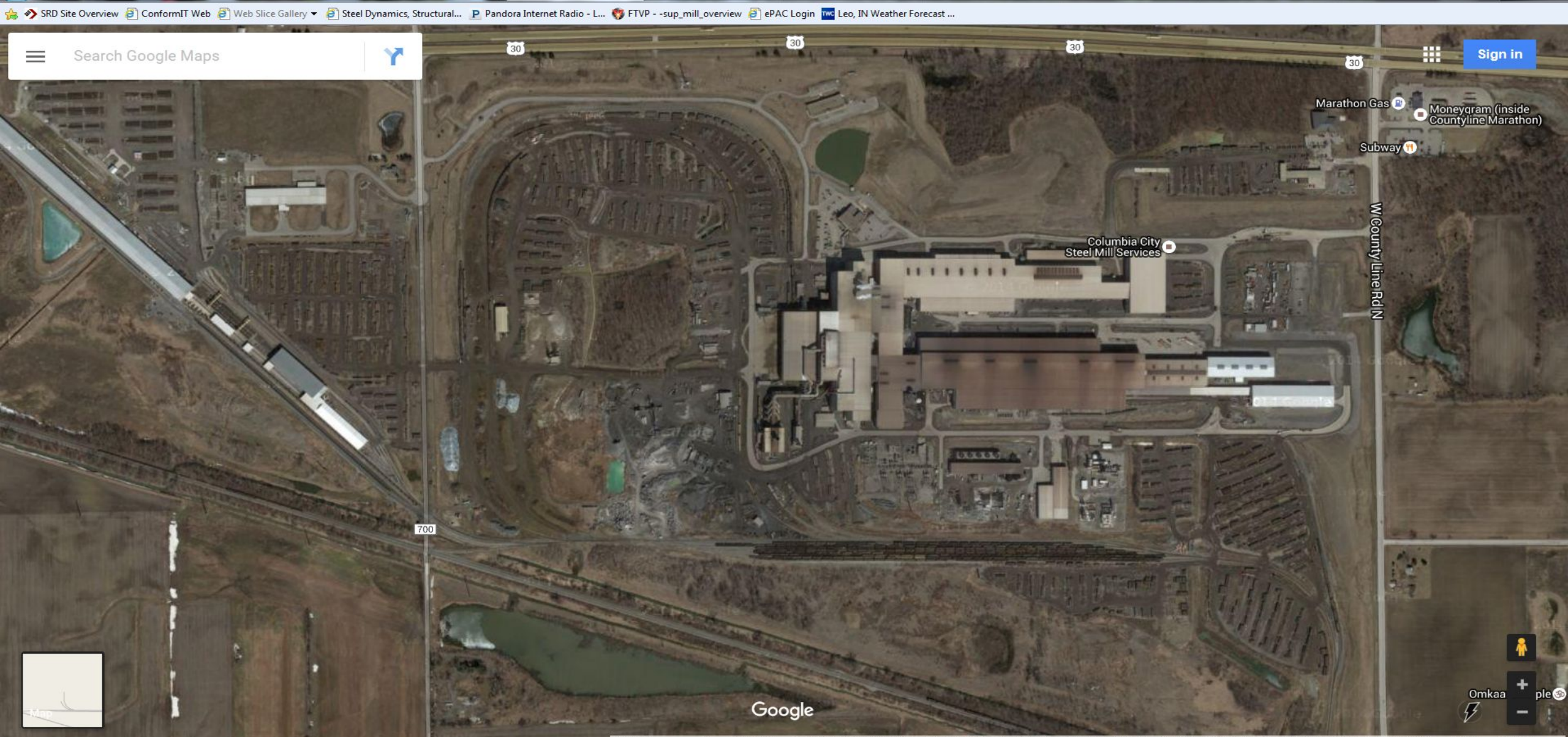
**DISCOVER HOW YOUR YUENGLING IS BREWED**



## THE FLAVORS OF YUENGLING

A balance of American six-row and imported two-row barley malt with choice Cluster and Cascade hops gives each Yuengling beer its distinctive flavor. Time honored brewing, quality ingredients and longer aging times allow each of these craft-brewed beers to develop an appearance, aroma, taste and mouthfeel that are uniquely Yuengling.





































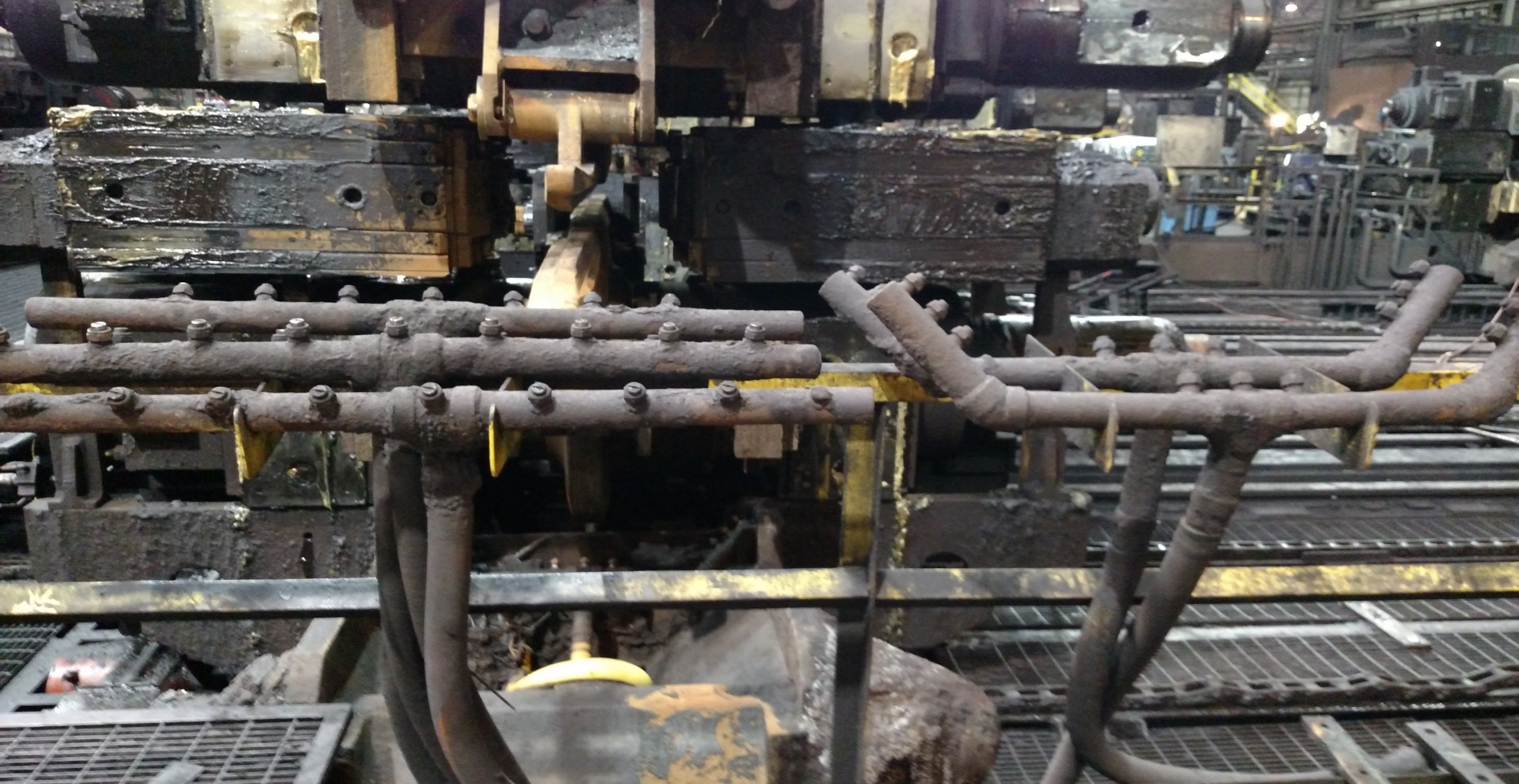














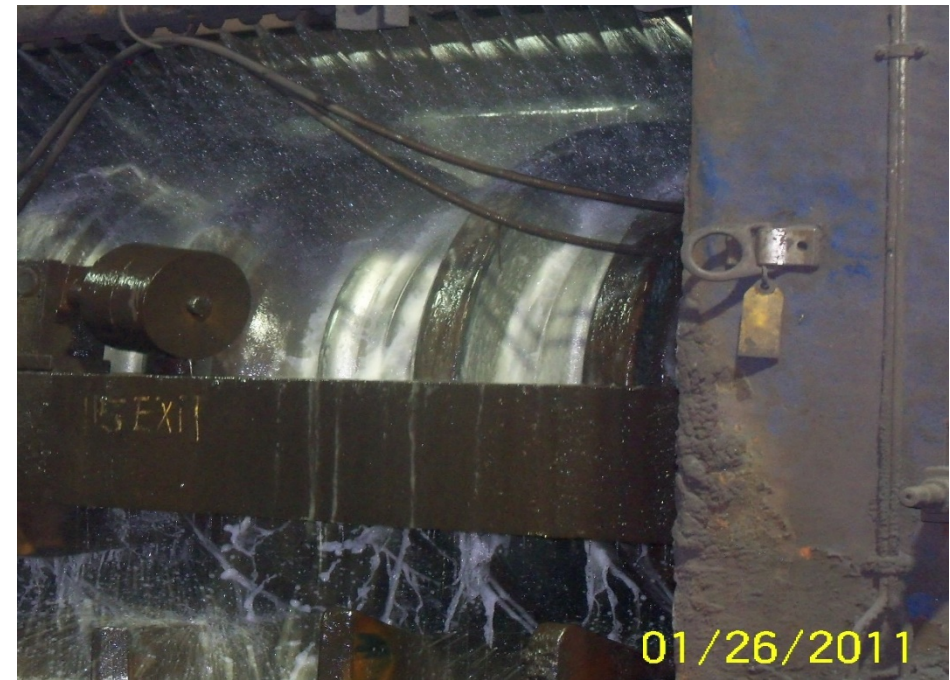


# BD Mill Spray Pattern Comparisons

**Old Nozzles**



**Everloy Nozzles**







# Objective: Eliminate Premature Roll Wear

- Initial Condition
  - Evaluate current nozzle spray angle given existing header configuration
  - Evaluate current nozzle spray width given existing header configuration
  - Understand current nozzle connection to existing headers







# Results

- Condition after enhancements
  - Selected Everloy KSAMR technology with thickening spray pattern which increases cooling area
  - Increased spray angles to ensure proper spray coverage
  - Increased spray thickness for more uniform cooling
  - Modified tip to fit current header configuration, allowing “drop in” replacement







# Results

- Additional Nozzle Modifications
  - Increased nozzle shoulder thickness to ensure proper installation
  - Increased over all filter length
  - Increased filter slit length
  - Tip material is hardened stainless for improved nozzle life







# BD Mill Work Roll Comparisons

**Roll Condition Before Nozzle Change**



**Roll Condition After Nozzle Change**



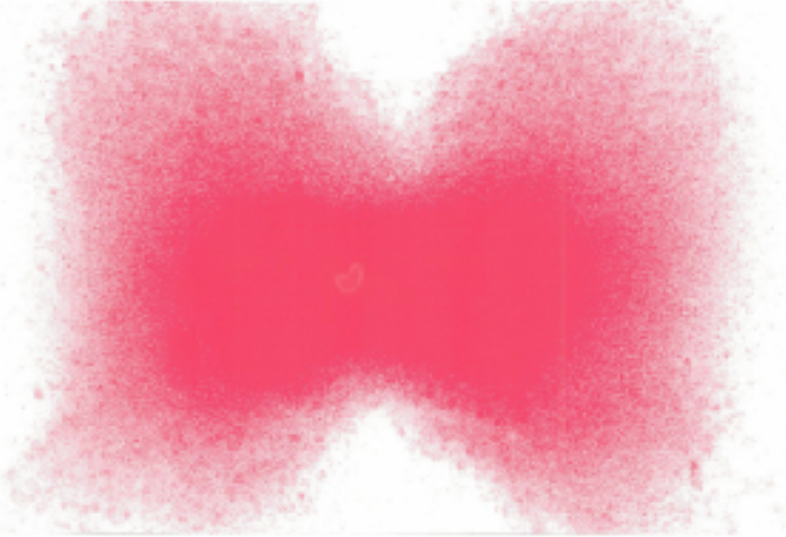





# Everloy KSAM Technology

- **Spray Pattern**

Nozzle model No. : KSAM5045    Pressure : 1.0 MPa    Spray height : 100mm

| <i>Typical flat fan without Filter<br/>(Competitor`s product)</i>  | <i>KSAM5045 with Filter</i>  |
|--|--|
|  <p><i>(with Turbulent flow)</i></p> |  <p><i>(with Straightening flow)</i></p> |





# Everloy KSAM Technology – Increased Impact Force

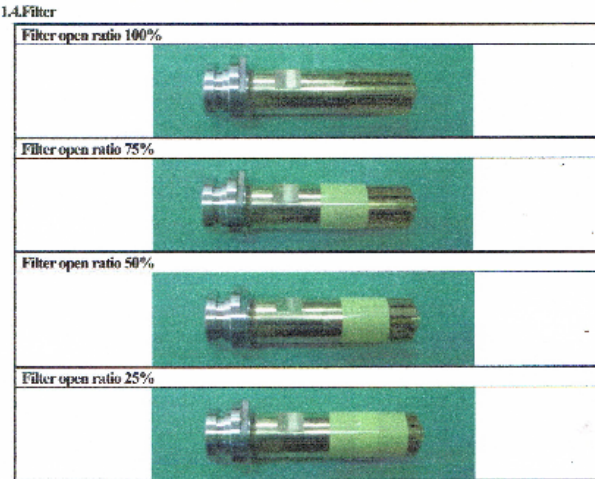
| Nozzle Identification | Max. Impact - N/mm2 |         |         | %        | %        |
|-----------------------|---------------------|---------|---------|----------|----------|
|                       | 90 psi              | 120 psi | 150 psi | Increase | Increase |
| 3/4KSAM3950           | 0.0087              | 0.0110  | 0.0135  | 53       |          |
| 3/4KSAM4750           | 0.0100              | 0.0129  | 0.0150  |          | 53       |
| H3/8U50100            | 0.0051              | 0.0067  | 0.0088  | x        |          |
| H1/2U50120            | 0.0064              | 0.0082  | 0.0098  |          | x        |





# Everloy KSAM Technology – Filtering Capability

1.4.Filter P2



## 2.Test result

| Nozzle model No.        | Pressure (psi) | Filter open ratio(%) | Flow rate (l./min) | Max impact force per unit area (N/mm <sup>2</sup> ) |
|-------------------------|----------------|----------------------|--------------------|---|
| 3/4KSAM4750 with filter | 150            | 100                  | 86                 | 0.025   |
|                         |                | 75                   | 86                 | 0.025   |
|                         |                | 50                   | 85(-1.2%)          | 0.025   |
|                         |                | 25                   | 80(-7.0%)          | 0.023(-8.0%)  |
| 3/4KSAM7050 with filter | 150            | 100                  | 128                | 0.036   |
|                         |                | 75                   | 128                | 0.036   |
|                         |                | 50                   | 125(-2.3%)         | 0.035(-2.8%)  |
|                         |                | 25                   | 119(-7.0%)         | 0.033(-8.3%)  |





# Flat Roll Hot Mill Nozzle Plugging

- Pictured debris in cooling tower and supply water
  - Selected KSAM Technology for filtering capabilities
  - Benefits Experienced
    - Eliminated nozzle plugging
    - Significantly reduced band peel
    - Increased roll life
    - Improved shape throughout mill

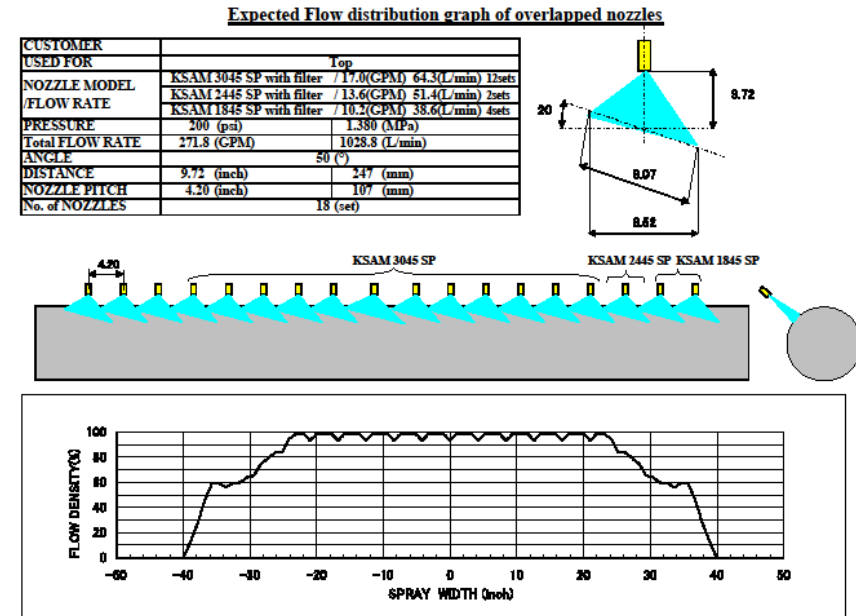






# Condition: Loss of Strip Crown

- Applied Everloy Modeling & KSAM Technology to combat loss of strip crown
  - Implemented Radial Crown cooling practice to supplement roll contour control
  - Supplemented design criteria based off rolled width distribution
  - Eliminated incidences of negative strip crown







# Basic Recommendations For Work Roll Cooling

- Ensure that the cooling water pressure is adequate. Pressure for work roll cooling systems should be in the range of 100 psi to 225 psi.
- Position headers for maximum heat extraction. Headers should be positioned as close as possible to the roll bite on the delivery side with the sprays out of the pool that is developed.
- Headers should be positioned symmetrically about the top and bottom work rolls circumferentially from the roll bite. The volume of the water and the positions it is applied in should also be symmetric about the top and bottom rolls circumferentially from roll bite.
- Select nozzles that provide a concentrated spray that matches well with the effective area used in spray overlap and flow density calculations.
- Ensure system filtration of the cooling water is appropriate to prevent clogged nozzles or select a nozzle with attached filter to provide this filtration.
- Design the spray overlaps to provide a flow density distribution with a variation of less than 5%.
- Use header pressures to examine each branch of work roll cooling system to ensure that the flows generated are balanced.





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## Descale: Impact Force vs. Erosion

Impact Force...the higher the value, better descale results?

Erosion as defined by Webster: the act of wearing away or eroding : the state of being eroded

New generation descale nozzle technology provides increased erosion at similar impact forces with lower water volumes





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# Descalge Nozzle Technology Comparisons

## Direct Comparison

| Nozzle Model No. | Pressure | Flow Rate | Spray    | Spray   | Max Impact Force | Erosion Amount | Erosion |
|------------------|----------|-----------|----------|---------|------------------|----------------|---------|
|                  | PSI      | (GPM)     | Distance | Width " | N/mm2            | g              | g/inch  |
| DNEX 1125        | 3500     | 27.9      | 6.98     | 3.86    | 1.76             | 0.21           | 0.054   |
| DNEX 0926        | 3500     | 22.2      | 6.98     | 3.97    | 1.49             | 0.13           | 0.033   |
| 25083            | 3500     | 28.7      | 6.98     | 3.56    | 1.49             | 0.06           | 0.017   |