NEW

DescaleJet® ULTRA

25% MORE IMPACT – SAVE WATER & ENERGY

Spraying Systems Co.®

Experts in Spray Technology

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25% MORE IMPACT – SAVE WATER & ENERGY

DescaleJet ULTRA nozzles are the next-generation descaling nozzle engineered to deliver greater descaling effectiveness, tighter spray consistency, and improved operating reliability for demanding hot-rolling applications.

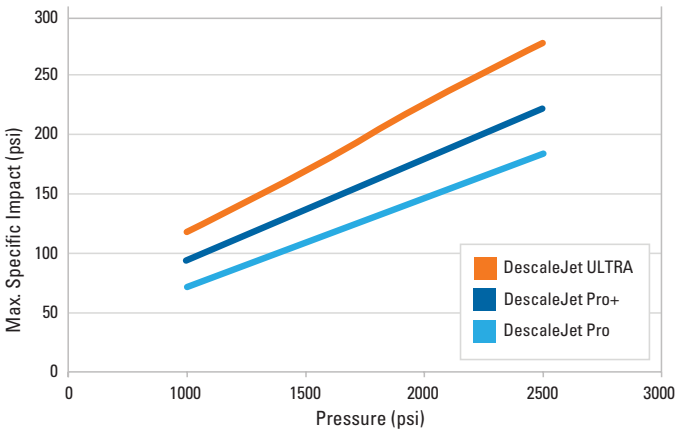
DescaleJet ULTRA nozzle's patent-pending technology combines higher impact, improved spray geometry, tighter tolerances, durable stainless steel construction, and enhanced clog resistance in a single nozzle assembly.

For mills seeking greater process stability, this level of control improves descaling uniformity and simplifies system setup.

IMPACT RESULTS 25% HIGHER THAN THE DESCALEJET PRO+ SERIES

Compared with the previous generation, DescaleJet ULTRA increases impact by 25% or more, enabling more effective scale removal while using less water.

Impact vs. Pressure at 8" spray height



SPECIFICATIONS:
Spray angles: 15° through 40°, rated at 2175 psi (150 bar)
Flow rate range: 2.95 to 51.6 gpm at 2175 psi (11 to 195 lmp at 150bar)
Orifice material: Tungsten Carbide
Nozzle material: Stainless Steel 316
Max operating pressure: 5400 psi (375bar) Tip bodies -1 , -2, -3, -4 ~8000 psi (550bar) Tip body -5

Pricing, delivery times and service offerings may vary outside of North America.
Contact your local Spraying Systems Co. Representative for information.

IMPROVED SPRAY FOOTPRINT & GEOMETRY

DescaleJet ULTRA nozzles enhance process capability through tighter manufacturing control. A straighter footprint and tighter spray geometry improve overlap control and surface uniformity – critical for reducing variation and maintaining quality.

DURABLE CONSTRUCTION MAXIMUM SERVICE LIFE

DescaleJet ULTRA nozzles are manufactured from stainless steel with tungsten carbide tips, providing excellent durability and extended service life for long-term reliability under harsh, high-pressure mill operating conditions.

WATER & ENERGY SAVINGS

By concentrating hydraulic energy more efficiently at the target surface, DescaleJet ULTRA nozzles reduce water use and lower pumping and electricity demands – helping mills meet stringent CO_2 reduction targets.

NEW STRAINER DESIGN

DescaleJet ULTRA nozzles feature a new strainer design that optimizes the balance between filtration efficiency and clog resistance to further support dependable performance.

REFINED SPRAY PATTERN & THICKNESS

A refined spray pattern improves both the effective impact area and the straightness of the footprint, resulting in more uniform coverage across the strip surface. In addition, reduced spray thickness creates a more focused, well-defined flat spray, improving energy concentration and delivering more consistent descaling performance.

CONTROLLED SPRAY ANGLE & FLOW RATE

The DescaleJet ULTRA nozzle is manufactured to tightly controlled spray-angle and flow-rate tolerances, supporting predictable nozzle-to-nozzle performance across the header. These controls help maintain consistent impingement conditions, improve repeatability, and minimize variation in spray coverage and performance from one nozzle position to the next.

CHANGE WITH CONFIDENCE

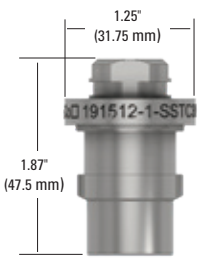
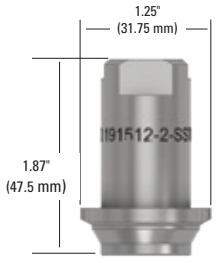
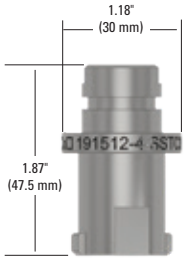
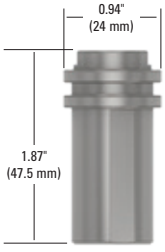
Using advanced spray impact modeling and analysis tools, we can simulate your operating conditions, validate DescaleJet ULTRA nozzle performance against existing nozzles, and fabricate headers to ensure optimal performance.

DescaleJet® ULTRA PERFORMANCE DATA

Flow Rate at Stated Pressure

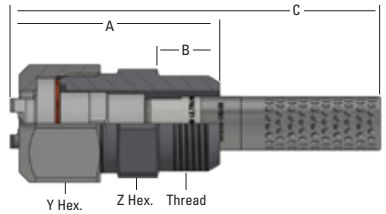
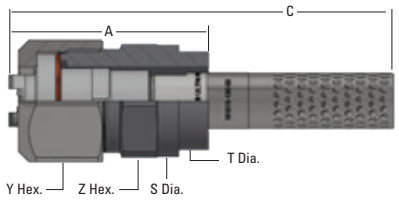
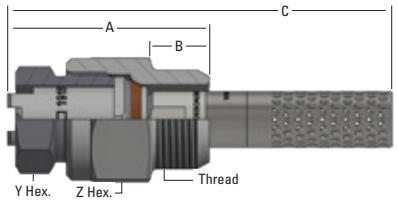
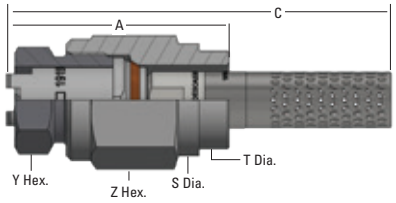
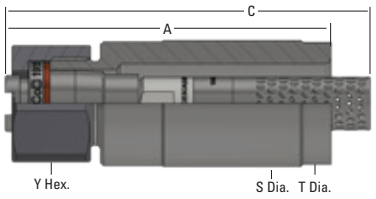
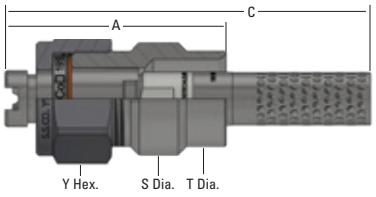
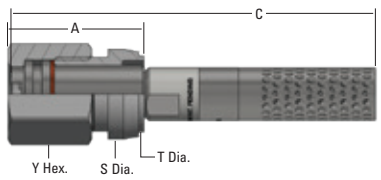
Capacity Code	PSI (Flow rate in gpm)										Bar (Flow rate in lpm)							
	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	70	100	150	200	250	300	350	400
_04	2	2.4	2.8	3.2	3.5	3.7	4	4.2	4.5	4.7	7.6	9.1	11.2	12.9	14.4	15.8	17.1	18.2
_05	2.5	3.1	3.5	4	4.3	4.7	5	5.3	5.6	5.9	9.5	11.4	14	16.1	18	19.7	22	23
_06	3	3.7	4.2	4.7	5.2	5.6	6	6.4	6.7	7	11.4	13.7	16.7	19.3	22	24	26	28
_07	3.5	4.3	4.9	5.5	6.1	6.5	7	7.4	7.8	8.2	13.3	16	19.5	23	26	28	30	32
_08	4	4.9	5.7	6.3	6.9	7.5	8	8.5	8.9	9.4	15.3	18.2	23	26	29	32	35	37
_09	4.5	5.5	6.4	7.1	7.8	8.4	9	9.5	10.1	10.6	17.2	21	26	30	33	36	39	42
_10	5	6.1	7.1	7.9	8.7	9.4	10	10.6	11.2	11.7	19.1	23	28	33	37	40	43	46
_12	6	7.3	8.5	9.5	10.4	11.2	12	12.7	13.4	14.1	23	28	34	39	44	48	52	55
_15	7.5	9.2	10.6	11.9	13	14	15	15.9	16.8	17.6	29	35	42	49	55	60	64	69
_20	10	12.2	14.1	15.8	17.3	18.7	20	22	23	24	39	46	56	65	73	79	86	92
_25	12.5	15.3	17.7	19.8	22	24	25	27	28	30	48	57	70	81	91	99	107	114
_30	15	18.4	22	24	26	29	30	32	34	36	58	69	84	97	109	119	128	137
_35	17.5	22	25	28	31	33	35	38	40	42	67	80	98	113	127	139	150	160
_40	20	25	29	32	35	38	40	43	45	47	77	92	112	129	145	158	171	183
_45	23	28	32	36	39	43	45	48	51	53	86	103	126	146	163	178	192	206
_50	25	31	36	40	44	47	50	54	56	59	96	114	140	162	181	198	214	228
_55	28	34	39	44	48	52	55	59	62	65	105	126	154	178	199	218	235	251
_60	30	37	43	48	52	57	60	64	68	71	115	137	168	194	217	237	256	274
_70	35	43	50	56	61	66	70	75	79	83	134	160	196	226	253	277	299	320

DescaleJet® ULTRA TIP BODIES DIMENSIONS

DescaleJet® Pro+ Tip Bodies				
Tip Body used with 191511-1-___+SSTC****E Assembly	Tip Body used with 191511-2-___+SSTC****E Assembly	Tip Body used with 191511-3-___+SSTC****E Assembly	Tip Body used with 191511-4-___+SSTC****E Assembly	Tip Body used with 191511-5-___+SSTC****E Assembly
				

For complete ordering information, contact your local sales engineer or request the data sheet PL191511.

DescaleJet® ULTRA DIMENSIONS

Nozzle	Nozzle Version	A (mm)	B (mm)	C (mm)	Y Hex. (mm)	Z Hex. (mm)	Thread	S Dia. (mm)	T Dia. (mm)
	**98015-1-T-SS** **191511-1-***+SSTC****E**	2.87" (72.9)	.84" (21.4)	5.12" to 6.89" (130 to 175)	1-5/8" (41.3)	1-1/2" (38.1)	1"NPT 1"BSPT	—	—
	**98015-1-W-SS** **191511-1-***+SSTC****E**	2.63" (66.7)	—		1-5/8" (41.3)	1-1/2" (38.1)	—	1.48" (37.1)	1.30" (33)
	**98015-2-T-SS** **191511-2-***+SSTC****E**	2.70" (68.7)	.84" (21.4)		1-1/4" (31.8)	1-5/8" (41.3)	1"NPT 1"BSPT	—	—
	**98015-2-W-SS** **191511-2-***+SSTC****E**	2.97" (75.4)	—		1-1/4" (31.8)	1-5/8" (41.3)	—	1.48" (37.7)	1.30" (33)
	**98015-3-W-SS** **191511-3-***+SSTC****E**	4.57" (116)	—		1.60" (41)	—	—	1.80" (45)	1.70" (43.4)
	**98015-4-W-SS** **191511-4-***+SSTC****E**	3.55" (90.1)	—		1.60" (41)	—	—	1.57" (40)	1.34" (34)
	**98015-5-W-__-SS** **191511-5-***+SSTC****E**	1.50" to 4.20" (38 to 106)	—		1.25" (31.7)	—	—	1.26" (32)	1.06" (27)

IT'S NOT JUST OUR NOZZLES DELIVERING IMPACT

NO ONE COMES CLOSE TO OUR STEEL PRODUCTION EXPERIENCE OR SPRAY EXPERTISE

It takes more than the right nozzle to produce quality steel – even nozzles as good as ours. Using spray modeling and analysis, we simulate harsh steel plant conditions and factor in all possible variables. Computational Fluid Dynamics (CFD) analysis determines spray performance, prior to fabrication. And, finally, our precision fabrication ensures optimal placement, coverage, and overlap.

In addition to better performance, Spraying Systems Co. DescaleJet nozzles come with unmatched service, including:

LOCAL SUPPORT

Our local spray experts will help you balance impact, cooling and efficiency, reducing water and energy consumption, and lowering CO_2 emissions without sacrificing performance or quality.

Their office is on your plant floor, and each is backed by a deep bench of engineering expertise at our regional offices and labs.

PERFORMANCE VALIDATION BEFORE YOU PURCHASE

Change over to DescaleJet ULTRA nozzles with confidence. Using advanced spray impact analysis tools, we can simulate your operating conditions, and validate performance against existing nozzles.

COMPETITIVE PRICING AND QUICK, LOCAL DELIVERY

Robust manufacturing at our factory in the USA means delivery of nozzles in days, not weeks or months. Protect against supply chain disruption by working with a local supplier.

WEAR-LIFE TESTING

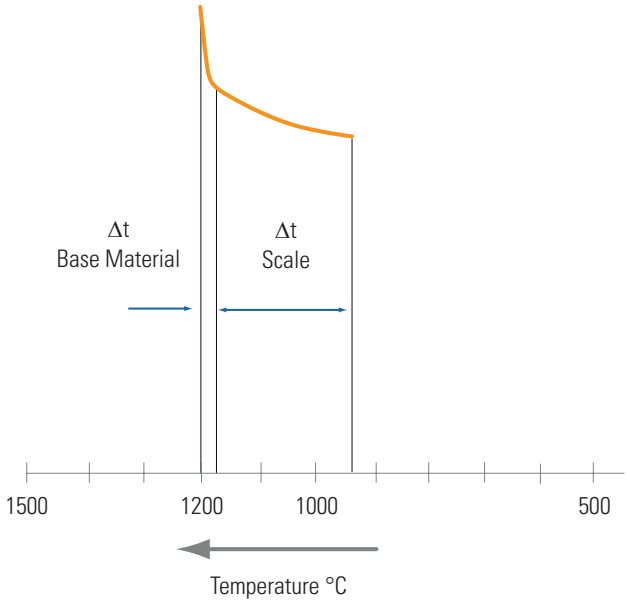
Testing in our lab will determine the optimal replacement interval for nozzles to prevent quality problems due to slight changes in impact and coverage.

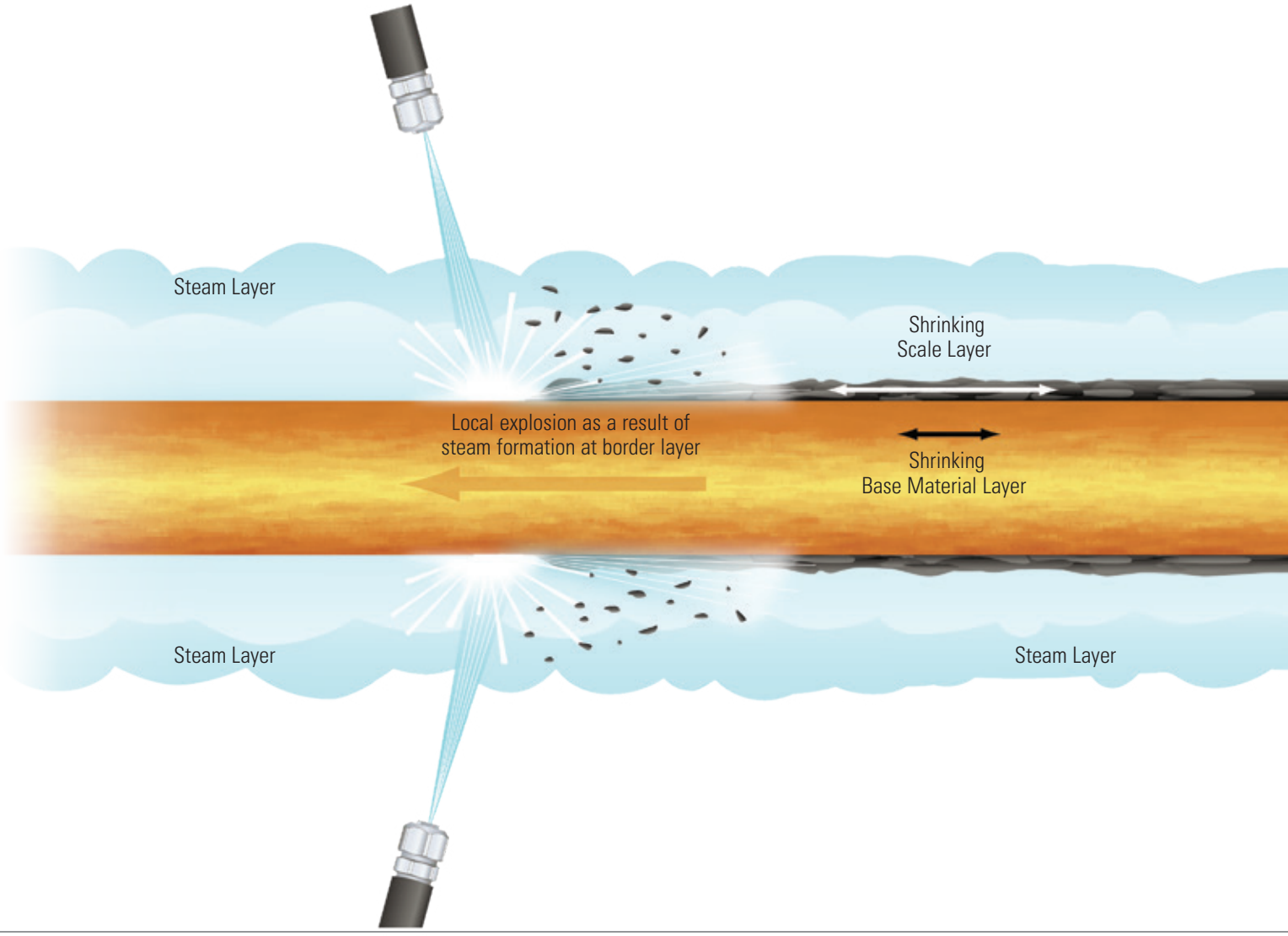
DESCALING: UNDERSTANDING IMPACT

In order to effectively remove scale, it is important to understand the role water plays in the process. The water applied to the surface causes both the scale and the base material to shrink. This shrinkage forms cracks in the surface and separation between the scale and the base material. The force of the spray produced by the nozzles causes the water to penetrate the cracks and reach the base material.

The heat from the steel surface causes a local explosion of the water as steam is formed. The combination of the explosion and the impact force detaches the scale from the steel surface and the water washes away the scale.

Steel grade, furnace temperature, soaking time and other factors all play a role in scale formation and how difficult it will be to remove. The effectiveness of the removal process is dependent on the impact and spray pattern of the water applied by the nozzles on the moving strip of steel.





DESCALING: UNDERSTANDING IMPACT

IMPACT BASICS

The total impact from a spray can be estimated by using this equation:

Total Force = $\rho \bullet Q \bullet v$

Ft:	Total Force
ρ:	Fluid Density
v:	Exit Velocity of Spray
Q:	Total Volume Flux

$F = .0527 \bullet gpm \bullet psi_g^{.5}$

$F = .24 \bullet lpm \bullet bar^{.5}$

F is total impact and is expressed in units of lbs. (N).

THERE ARE TWO TYPES OF IMPACT:

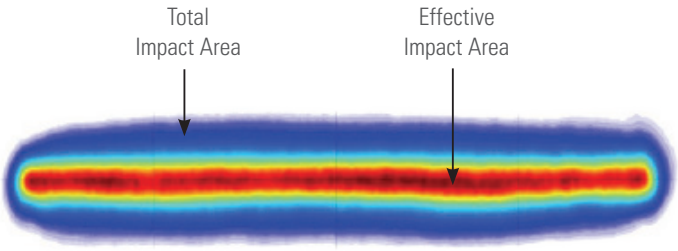
1. Lateral impact, sometimes called lineal impact, is force per unit width and shows the volumetric distribution pattern and the evenness of the impact across the spray.

- It is usually expressed in lb./in. or kg/cm
- It provides a relative indication of cleaning effectiveness

2. Specific impact is the total impact force divided by a unit area.

Area = coverage • thickness

- Average specific impact is the total impact force/total impact area
- Maximum specific impact is the total impact force/effective impact area



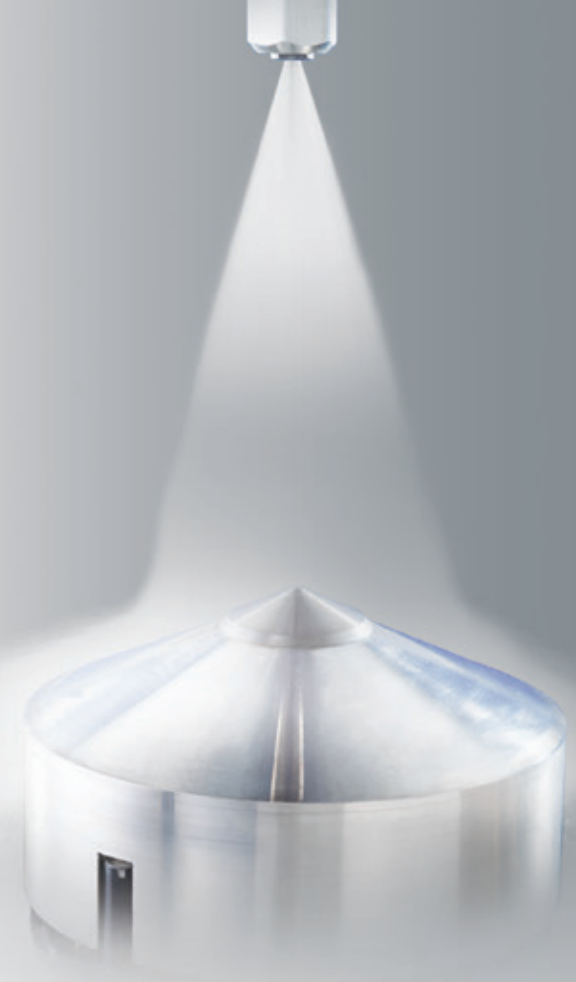
SPECIFIC IMPACT CAN BE REDUCED BY A NUMBER OF FACTORS:

- **Loose soil**
- **Standing liquid**
- **Deceleration** – As sprays travel through the air to reach the target surface, drops decelerate and the momentum of the spray is reduced. Nozzle size, pressure, spray style and spray height all play a role in deceleration and how to overcome it
- **Spray height** – Closer target distances result in higher normalized impact pressure. It also results in smaller coverage area per nozzle. Lowering spray height is not a quick and easy way to achieve better descaling
- **Pressure** – Increasing pressure will also increase total impact, but it also affects spray pattern. The increase in impact pressure is often not as much as expected
- **Nozzle turbulence** – Turbulence has a negative impact on nozzle performance, the wear life of the nozzle and header and descaling effectiveness. Increasing pressure increases nozzle turbulence

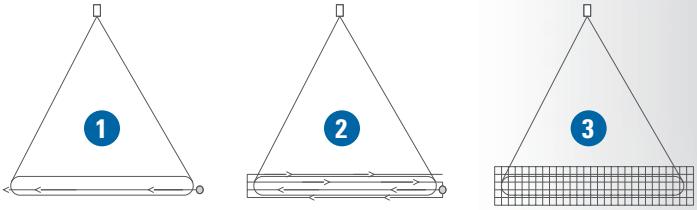
All of these factors affect impact and descaling effectiveness so it is important to achieve balance between them to optimize your system. To accomplish this, we head to our spray laboratories to measure the impact and spray patterns of our descaling nozzles. We use proprietary equipment to collect and analyze data. We do not rely on calculated data because theoretical equations cannot factor in the effects of turbulence, spray rebound or splashback – all which can have a significant effect on impact.

WHY AND HOW WE MEASURE IMPACT

As noted earlier, calculated data doesn't account for splashback. We know this because we compare theoretical data to measured data. To ensure accurate impact measurement, we designed test equipment that measures data in two axes so we can precisely determine impact in pounds force, lateral distribution, coverage, transverse distribution and spray thickness.



HERE'S HOW OUR IMPACT TESTER WORKS:



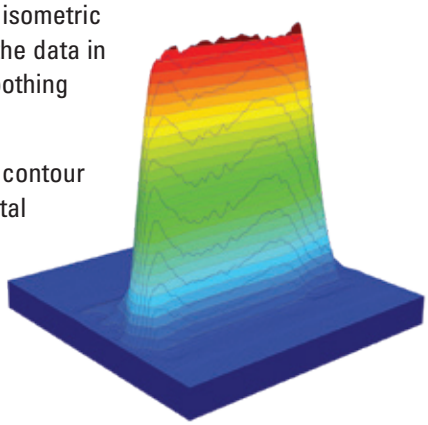
1. The load cell first moves to the outside of the spray pattern.
2. Then it transverses through the spray, taking measurements at predetermined intervals.
3. The load cell continues going back and forth through the spray unit until the entire spray area has been covered.

DATA FROM OUR TESTING LOOKS LIKE THIS:

Impact Line Plot
The lateral impact plot provides accurate coverage information – both total coverage and effective coverage. It also shows the evenness of the impact distribution across the spray pattern.

Impact Profile
Our data also shows a 3D isometric view of the spray. This is the data in raw form. There is no smoothing nor fitting.

In addition, we produce a contour plot which provides the total spray thickness and area. A view of the specific impact provides the impact pressure values.



WHAT YOU NEED TO KNOW TO ANALYZE IMPACT DATA

1. Is impact calculated or measured? Measured data is always superior.
2. When looking at specific impact values, what spray area footprint dimensions were used? Total spray area or effective spray area? Was this area measured or calculated?

Even if all values are measured, they are not measured the same way. Nozzle feeds are different, impact equipment is different and analysis methodology varies. It is not possible to compare the values collected by one manufacturer to the values collected by another manufacturer. The best way to compare nozzle performance is to run tests on the same equipment.

We invite you to use our laboratories for your analysis.

HEADER DESIGN AND SPECIFICATION GUIDELINES

Selecting the best nozzle for your operation is just the first step in successful descaling. All the factors below also play a role. Ultimately, it is achieving a balance between the impact and overall system efficiency.

KEY CONSIDERATIONS IN DESCALE HEADER DESIGN:

FLOW RATE

- Higher flow rates provide greater total impact forces
- Higher operating costs result since higher capacity pumps that use more energy are required

PRESSURE

- Higher operating pressure provides greater total impact force
- Nozzle wear increases along with pressure and nozzle costs and maintenance time will be higher

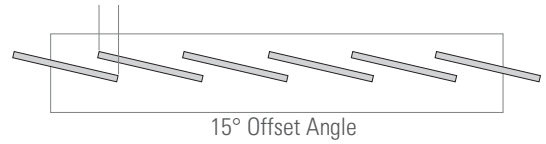
SPRAY DISTANCE

- Impact decreases as the distance from the target increases
- As distance increases, fewer nozzles are required reducing purchase cost and maintenance time. The risk of nozzle damage is also decreased
- Closer spray distances result in higher impact but also require tighter tolerances in spray coverage. If coverage is not precise, stripes of scale may not be removed or striping may occur in areas over-cooled because of too much water overlap

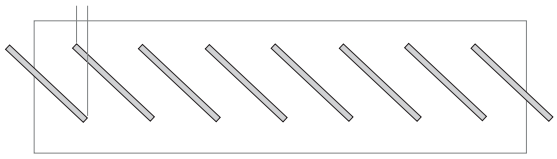
OFFSET ANGLE

- Nozzles should be positioned to prevent interference from adjacent sprays and maintain overlap – 15° is typical

5° Offset Angle



15° Offset Angle



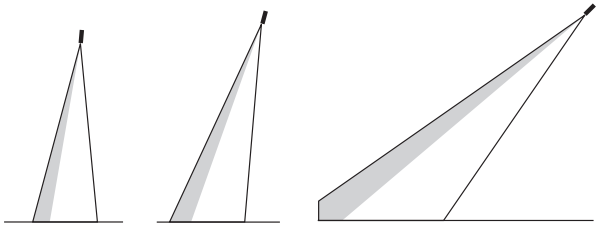
45° Offset Angle

OVERLAP

- Standard overlap is considered ¼" to ½"
- 100% overlap equals ½ coverage

LEAD ANGLE

- Nozzles should be positioned so that force has both a horizontal and vertical component – 15° is typical



SPRAY PATTERN

- Nozzles that produce smaller patterns at equivalent conditions to other nozzle styles are desirable. The smaller the area of the spray, the more force per unit area. For example, if a 40 capacity nozzle produces 42 lbs. (19 kg) of total force and the area being sprayed is 1 sq. in. (6.5 sq. cm) compared to 1.5 sq. in. (9.7 sq. cm) the force is 42 psi (3 kg per sq. cm) compared to 28 psi (2 kg per sq. cm)

JET STABILIZERS

- Use jet stabilizers to reduce turbulence in the nozzle for improved impact performance

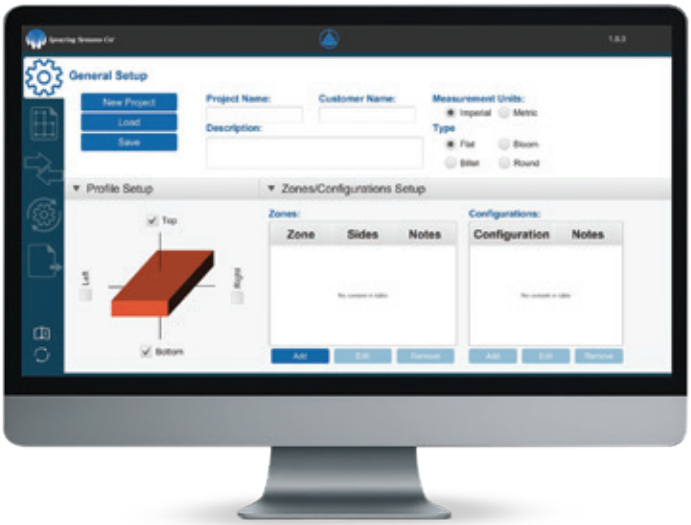
HEADER DESIGN

- To minimize spray instability, headers must be sized properly to minimize liquid velocity changes. Multiple feed points should be considered and feeds at the end of headers should be avoided
- Avoid designs that may create internal swirl near nozzle feed points and/or increase feed turbulence
- To minimize velocity changes and eliminate pressure drop across the header, velocity should be kept to less than 12 ft./sec. (3.7 m/sec.) for optimal results

HEADER DESIGN, MODELING AND FABRICATION

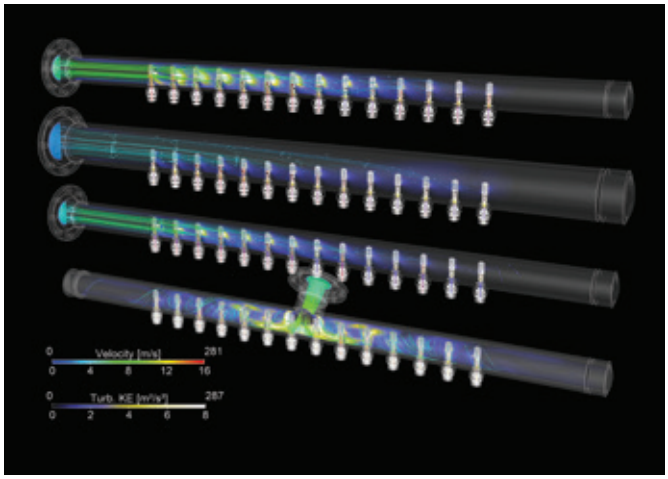
PROPRIETARY DESCALEWARE® SOFTWARE SIMPLIFIES HEADER DESIGN AND ENSURES PERFORMANCE

Our proprietary software uses impact and coverage data collected in our spray laboratories to determine header layout and nozzle selection. User-specific conditions such as slab or billet width, overlap, lead angle, twist angle, flow rate and pressure are entered. The software determines which nozzles provide the desired performance and graphically displays the header layout. Nozzle type, spacing, coverage, spray height, lead angle and impact values are shown on the layout.



COMPUTATIONAL FLUID DYNAMICS (CFD) MODELING DETERMINES ACTUAL PERFORMANCE PRIOR TO FABRICATION

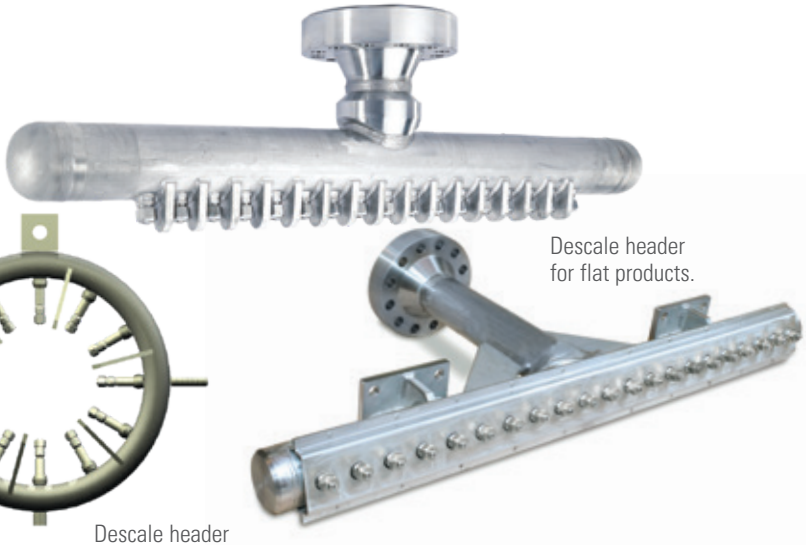
The use of CFD in descale header design is becoming more widely used because it enables the header design to be validated using actual operating conditions. If performance expectations aren't met, alternative designs and operating conditions can be modeled to determine what modifications may be required. CFD can also be used to troubleshoot problems with existing descale headers by analyzing feeds, elbows, angles and more.



This figure compares four Descale/Hescale Header configurations (from top to bottom): (1) Original Header, (2) Increased-Diameter Header, (3) Original Header at Reduced Flow, and (4) Central-Feed Header. For each configuration, the internal flow field is visualized using turbulent kinetic energy (TKE) contours along with velocity-colored streamlines indicating flow paths through the header.

FABRICATION TO MEET EXACTING STANDARDS

Once header layout and validation design are complete, fabrication is the next step. To ensure optimal performance and eliminate integration problems, using a single supplier for nozzles and headers is recommended. We have decades of experience with descale header fabrication for flats, billets, sheets, rounds and more in addition to our proven track record in descale nozzle design.



Descale header for flat products.

Descale header for round billets.

PREVENTIVE MAINTENANCE OPTIMIZE SPRAY PERFORMANCE AND LOWER OPERATING COSTS

Spray nozzles are designed for long-lasting, trouble-free performance. However, like all precision components, spray nozzles do wear over time. Descaling performance can suffer and costs can rise. How quickly wear occurs is dependent on a variety of factors. Some installations require attention every shift while others can operate for hundreds of hours without maintenance.

Nozzle wear is usually not noticeable in the early stages. As it progresses, the signs of wear are visible and costly. Operating costs will rise and product loss is likely. Monitor nozzles closely and take the appropriate action before wear affects your operations.

PREVENT PROBLEMS BY ESTABLISHING A NOZZLE MAINTENANCE PROGRAM

- Visually inspect spray patterns and watch for changes in angle and distribution. Flat spray patterns will narrow with wear and the edges of the spray will get heavier
- Check flow rate and pressure at a system level. Wear can be detected by increases in flow rate or decreases in system pressure
- Check steel quality. Wear compromises impact pressure and process changes may be detectable
- Use cleaning tools significantly softer than the construction of the nozzle. Never clean a nozzle orifice with metal objects
- Soak nozzles in mild solvents to loosen debris for easier removal
- Develop maintenance schedules and implement consistently

AVOID THE ULTIMATE MAINTENANCE NIGHTMARE: THERMAL SHOCK

In certain operating conditions, hot steel may travel beneath nozzles that are not actively spraying water. Without adequate protection, these nozzles can experience thermal shock in one of two ways:

1. The heat will cause the nozzle's stainless steel tip holder to expand. The carbide insert is pressed into the tip holder and expansion will loosen it. When water passes through it, the tip will spin. This is common in headers where the spray height is high.
2. The heat will cause the carbide temperature to increase to a point where it will crack when cool water passes through. The water pressure may push carbide pieces out of the nozzle. This often occurs when headers are close to the strip surface.

To mitigate the risk of thermal shock, the nozzles must be protected when not actively in use and exposed to hot steel. Orifice inserts are available in hardened stainless steel as an added preventive measure against thermal shock.

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