

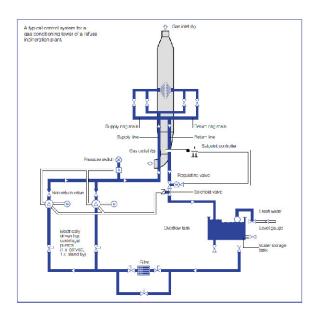
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SPRAY EVAPORATIVE COOLERS

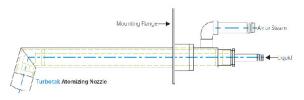
In anticipation of more stringent regulations for the control of dioxin / furan I-TEQ emissions from steel producing electric arc furnaces, cement kilns, and secondary aluminum recovery operations, Amerair reintroduces its spray evaporative cooler product line.

The first of the two design features upon which successful spray evaporative coolers are based is proper spray atomization. To this end Amerair offers both hydraulic "spill back" and compressed air atomized nozzles. Spill back spray nozzles utilize high pressure hydraulic pumps with return throttling valves to provide the feed spray as shown in the schematic below:



Alternately, compressed air atomization systems are used when lower gas volumes or lower inlet temperatures dictate. An example of such is shown to the right.









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Proper application of either spray technology requires thorough knowledge of heat and mass transfer through the evaporative cooling process. Amerair utilizes proprietary software that accounts for: nozzle atomization performance, controlled temperature differential and ground level adiabatic saturation temperature to determine the heat and mass transfer rate to set the tower residence time. This ensures continuous dry operation at the tower outlet.

Gas Conditions and Nozzle Performance

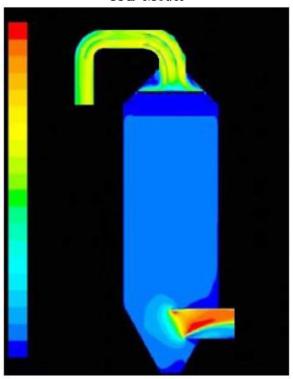
| INLET TEMPERATURE de 720 | | Gas Volume Inlet ACFM | 544977 | | | |
|--------------------------------|------------|---------------------------|-----------------|--|--|--|
| | | Added 10/0 AOFM | 79405 | | | |
| OUTLET TEMPERATURE : 350 | | Added Compressed Air ACFM | 667.02 | | | |
| | | Total Vol | 725049 | | | |
| WET BULB TEMP deg F 151 | | Vessel Section area | 1519.8 | | | |
| Dismela | % in Class | wit area | Size Class base | | | |
| ENTER DROPLET SIZE COL 1 | 00L2 | | | | | |
| DISTRIBUTION IN COLUM 3582 | 0.01 | 4028.8 | 398 | | | |
| AND % IN EACH CLASS IN 3213 | 0.01 | 3241.5 | 357 | | | |
| COLUMN 2 (19 entries for 345.5 | 0.08 | 28128 | 384 | | | |
| each is required, units 2025 | 0.74 | 96540 | 225 | | | |
| are microns) (legin with 156.5 | 3.11 | 239174 | 174 | | | |
| largest and end with 127.8 | 7.20 | 369458 | 142 | | | |
| smallest 101.7 | 11.37 | 369367 | 113 | | | |
| ân | 14.40 | 256662 | 90 | | | |
| 63.9 | 13.43 | 172190 | 71 | | | |
| 513 | 12.83 | 106021 | 57 | | | |
| 40.5 | 9.85 | 50726 | 45 | | | |
| 32.4 | 8.43 | 27791 | 36 | | | |
| 25.2 | 4.80 | 9746.8 | 28 | | | |
| 20.7 | 4.44 | 5917.5 | 23 | | | |
| 162 | 3.10 | 2552.9 | 18 | | | |
| 126 | 2.02 | 1005 | 14 | | | |
| 9.9 | 1.17 | 369.76 | 11 | | | |

Evaporative Tracking, time & temp

| | | _ | | | | | | | | _ | | | | | | | - | | | | Volume |
|------|-------|-------|-------|-------|-------|-------|-------|-------------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|--------|
| 0.00 | 200 | - | 333.5 | 274.1 | 179.6 | 142.2 | 1148 | 91.4 | 725 | 57.6 | 45.9 | 365 | 26.8 | 23.0 | 18.5 | 14.4 | 113 | 90 | 7.2 | 32 | 725040 |
| 0.00 | 683.5 | 338.5 | 330.2 | 270.8 | 176.2 | 138.9 | 111.4 | 86.0 | 69.0 | 54.1 | 42.4 | 329 | 25.1 | 19.1 | 14.4 | 9.9 | 5.7 | 00 | 0.0 | 0.0 | 702610 |
| | | | | | | | | | | | | | | | | | | | | | |
| 0.04 | 650.4 | 333.2 | 338.9 | 267.5 | 173.0 | 135.6 | 108.1 | 84.6 | 65.7 | 50.7 | 38.9 | 29.3 | 213 | 15.1 | 2.2 | 2.8 | 0.0 | 0.0 | 0.0 | 0.0 | 557790 |
| 0.06 | 621.5 | 330.1 | 323.8 | 2844 | 169.8 | 132.4 | 1049 | 81.4 | 62.4 | 47.4 | 35.5 | 258 | 17.7 | 11.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 9545C4 |
| 0.08 | 598.0 | 327.1 | | 201.4 | 198.6 | 129.4 | 101.9 | 76.4 | 59.3 | 44.3 | 32.3 | 22.4 | 140 | 6.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 546007 |
| 0.10 | 573.5 | 3243 | 318.0 | 258.5 | 163.9 | 126.5 | 98.9 | 75.4 | 56.3 | 41.2 | 29.1 | 19.1 | 10.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 535052 |
| 0.12 | 563.6 | 321.5 | 315.2 | 255.8 | 161.1 | 123.7 | 96.1 | 72.6 | 53.4 | 38.3 | 26.1 | 158 | 60 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 62,000 |
| 0.14 | 535.8 | 318.8 | 312.5 | 253.1 | 158.4 | 121.0 | 93.4 | 59.8 | 50.6 | 35.4 | 23.1 | 125 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 611876 |
| 0.16 | 520.0 | 316.2 | 339.9 | 250.5 | 155.8 | 118.4 | 90.8 | 67.1 | 47.9 | 32.6 | 202 | 9.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 602148 |
| 0.18 | 505.7 | 313.7 | 307.4 | 248.0 | 1533 | 115.8 | 88.2 | 64.5 | 63 | 29.9 | 17.3 | 5.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 50000 |
| 0.20 | 452.8 | 311.3 | 304.9 | 245.5 | 150.8 | 1133 | 85.7 | 52.0 | 42.7 | 27.2 | 14.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 585467 |
| 0.22 | 481.3 | 308.9 | 302.6 | 243.1 | 148.4 | 110.9 | 83.2 | 59.5 | 40.2 | 24.6 | 115 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 578362 |
| 0.24 | 470.7 | 306.5 | 300.2 | 240.8 | 148.0 | 108.5 | 80.8 | 57.1 | 37.7 | 22.0 | 8.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 00 | 0.0 | 0.0 | 571802 |
| 0.26 | 461.1 | 304.2 | 297.9 | 238.4 | 143.7 | 106.2 | 78.5 | 54.7 | 25.3 | 19.5 | 4.5 | 00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 00 | 0.0 | 0.0 | 5/5000 |
| 0.28 | 452.4 | 302.0 | 295.7 | 238.2 | 141.4 | 103.9 | 76.2 | 52.4 | 32.9 | 16.9 | 0.0 | 00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 560654 |
| 0.30 | 646.5 | 299.8 | 293.5 | 234.0 | 139.2 | 101.7 | 740 | 50.1 | 30.5 | 14.4 | 0.0 | 00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 555846 |
| 0.32 | 437.4 | 297.6 | 291.3 | 201.8 | 137.1 | 99.5 | 71.7 | 47.9 | 26.2 | 11.8 | 0.0 | 00 | 0.0 | 00 | 0.0 | 0.0 | 0.0 | 00 | 0.0 | 0.0 | 551408 |
| 0.34 | 430.7 | 295.5 | 289.2 | 229.7 | 134.9 | 97.3 | 69.5 | 45.7 | 25.9 | 9.1 | 0.0 | 0.0 | 0.0 | 00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 547317 |
| 0.36 | 404.6 | 293.3 | 267.0 | 2015 | 132.7 | 95.1 | 57.4 | 43.4 | 73.6 | 6.1 | 0.0 | 00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 540556 |
| 0.38 | 419.0 | 291.2 | 264.9 | 225.4 | 130.6 | 93.0 | 65.2 | 41.2 | 21.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 54010 |
| 0.40 | 414.0 | 289.2 | 262.9 | 223.4 | 128.6 | 91.0 | 63.1 | 39.1 | 19.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 537048 |
| 0.42 | 439.4 | 267.2 | 280.9 | 221.4 | 126.6 | 88.9 | 61.1 | 37.0 | 16.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 534183 |
| 0.44 | 425.0 | 262 | 278.9 | 219.4 | 1245 | 86.9 | 59.0 | 34.9 | 14.5 | 0.0 | 0.0 | 00 | 00 | 00 | 0.0 | 0.0 | 0.0 | 00 | 0.0 | 0.0 | 531514 |
| 0.48 | 401.0 | 283.2 | 238.9 | 207.4 | 122.5 | 848 | 56.9 | 32.8 | 12.2 | 0.0 | 0.0 | 00 | 0.0 | 00 | 0.0 | 0.0 | 0.0 | 00 | 00 | 0.0 | 500031 |
| 0.48 | 397.2 | 261.2 | 274.9 | 215.4 | 120.5 | 82.6 | 549 | 30.6 | 9.7 | 0.0 | 0.0 | 00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 528730 |
| 0.50 | 393.8 | 279.2 | 272.9 | 213.3 | 110.4 | 80.7 | 52.8 | 26.5 | 7.1 | 0.0 | 0.0 | 00 | 0.0 | 00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 524604 |
| 0.52 | 390.6 | 277.2 | 270.9 | 211.4 | 118.4 | 78.7 | 50.7 | 28.4 | 3.8 | 0.0 | 0.0 | 00 | 0.0 | 00 | 0.0 | 0.0 | 0.0 | 00 | 0.0 | 0.0 | 523662 |
| 0.54 | 367.7 | 275.3 | 268.9 | 200.4 | 1145 | 78.7 | 48.7 | 24.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 520880 |
| 0.58 | 385.1 | 273.4 | 267.1 | 2075 | 112.6 | 748 | 46.6 | 72.3 | 0.0 | 0.0 | 00 | 00 | 00 | 00 | 0.0 | 0.0 | 0.0 | 00 | 00 | 00 | 510205 |
| 0.58 | 362.7 | 271.5 | 265.2 | 205.7 | 110.7 | 72.9 | 44.9 | 20.2 | 0.0 | 0.0 | 0.0 | 00 | 00 | 00 | 0.0 | 0.0 | 0.0 | 00 | 0.0 | 0.0 | 517800 |
| 0.60 | 380.4 | 269.6 | 263.3 | 203.7 | 108.6 | 71.0 | 429 | 18.1 | 0.0 | 0.0 | 0.0 | 00 | 00 | 00 | 0.0 | 0.0 | 0.0 | 00 | 0.0 | | 518302 |
| | | | | | | | | | | | | | | | | | | | | | |

The second design feature required for successful evaporative cooler design is proper gas flow distribution that ensures spray distribution in the gas and eliminates side wall wetting. Amerair utilizes CFD modeling in all of its spray tower designs to position and size its proprietary inlet and outlet distribution devices for proper flow distribution and flawless performance.

CFD Model



Whether meeting CISWI standards, EAF I-TEQ requirements or other process gas cooling needs, let the experts at Amerair provide the correct tower application and sizing.