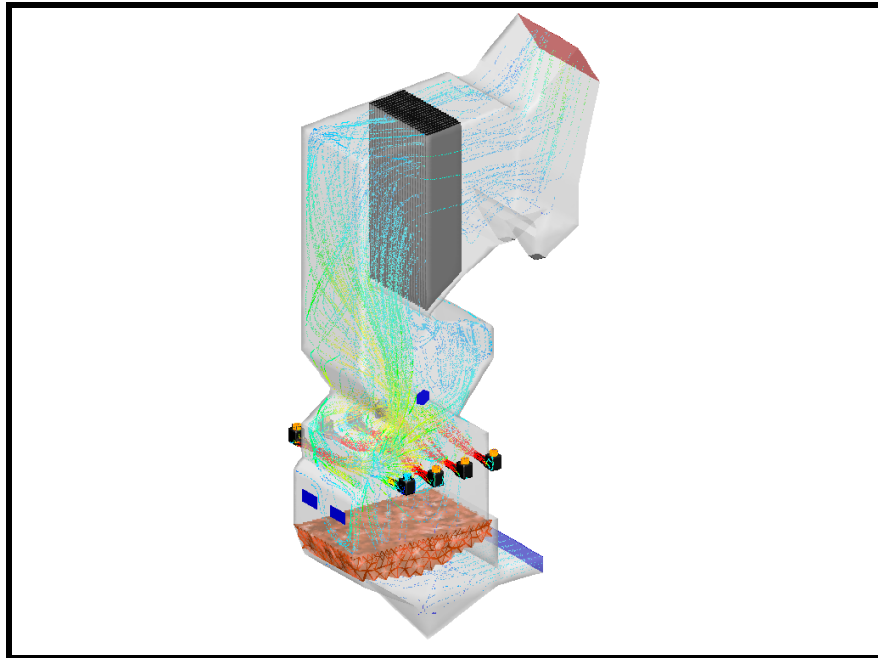


PROJECT CAPABILITIES

COMPUTATIONAL FLUID DYNAMICS (CFD) MODELING

- **Chemical Recovery Boilers**
- **Biomass Boilers**
- **Waste-to-Energy Boilers (MSW & RDF)**



JANSEN uses Computational Fluid Dynamics (CFD) modeling software to analyze fluid flow patterns, fuel combustion processes, fuel capacity, emissions performance, and heat transfer profiles in various boiler-related equipment. The scope of services typically includes boiler data collection, set-up of a model to evaluate current performance, and the use of this model to evaluate conceptual improvements. CFD modeling by JANSEN is conducted in-house by JANSEN engineers.

Applications

Typical areas where JANSEN applies CFD modeling to predict, evaluate, and/or optimize performance of boiler equipment include:

- Modifications to the combustion air delivery system.
- Evaluation of temperature and oxygen distribution in combustion furnaces.
- Optimization of the liquor distribution in recovery boilers.
- Heat transfer analysis in superheaters, generating banks, and economizers.
- Analysis of flow pattern and particulate distribution in inlet ducting to precipitators.
- Evaluation of combustion conditions in waste fuel- and fossil fuel-fired boilers.
- Evaluation of boiler emissions performance (TRS, CO, VOC, SO₂, NO_x, particulates).
- Spray cooler, scrubber, and cascade/cyclone evaporator performance predictions.
- Evaluation of DNCG and CNCG incineration.

Selected References (see next page)

Selected References - CFD Modeling

Alabama River Pulp Company - Perdue Hill, AL
 Appleton Papers - Roaring Spring, PA
 APRIL Group - Rizhao, China
 AssiDomän Sepap - Štetf, Czech Republic
 Atlantic Power Corp. - Williams Lake, BC
 Bahia Specialty Cellulose S.A. - Camaçari, BA, Brazil
 Boise Cascade Corp. - Int'l Falls, MN (2 units)
 Boise - DeRidder, LA (2 units)
 Boise - Wallula, WA
 Bracell Ltd. - Lençóis Paulista, Brazil
 Bukocel - Hencovce, Slovakia
 CAIG, S.A., Ingenio Madre Tierra Santa Lucia, COTZ, - Guatemala (2 units)
 Canadian Kraft Paper Industries - The Pas, MB
 Capital Power - Southport, VA
 Cargill - Mairinque, Brazil
 Cargill - Três Lagoas, Brazil
 Carvajal - Cali, Colombia (3 units)
 CBC - Lenzing, Brazil
 CDM Smith - Boston, MA
 CDM Smith - El Dorado, AR
 Clearwater Paper - Lewiston, ID
 Clearwater Paper - McGehee, AR
 Confidential Customer - Canada
 Corn Products International - Winston-Salem, NC (2 units)
 Covanta Energy - Hartford, CT
 Covanta Energy - Niagara Falls, NY
 Daishowa America - Pt. Angeles, WA
 Daishowa Marubeni - Peace River, AB
 Dominion Virginia Power - Altavista, VA
 Dominion Virginia Power - Hopewell, VA
 Dominion Virginia Power - Hurt, VA
 Domtar Industries - Ashdown, AR (2 units)
 Domtar Corporation - Nekoosa, WI
 Domtar Corporation - Plymouth, NC
 Domtar Corporation - Rothschild, WI (2 units)
 Domtar Corporation - Windsor, QC
 Domtar Papers - Cornwall, ON
 DTE Energy - Cassville, WI
 DTE Energy - Stockton, CA
 Eurocan Pulp & Paper - Kitimat, BC
 Evergreen Packaging - Canton, NC
 FMC Corporation - Green River, WY
 Georgia-Pacific Corporation - Brunswick, GA
 Georgia-Pacific Corporation - Camas, WA (2 units)
 Georgia-Pacific Corporation - Clatskanie, OR
 Georgia-Pacific Corporation - Crossett, AR
 Georgia-Pacific Corporation - Diboll, TX
 Georgia-Pacific Corporation - Monticello, MS
 Georgia-Pacific Corporation - New Augusta, MS
 Georgia-Pacific Corporation - Old Town, ME
 Georgia-Pacific Corporation - Palatka, FL (2 units)
 Georgia-Pacific Corporation - Pineland, TX
 Georgia-Pacific Corporation - Prosperity, SC
 Georgia-Pacific Corporation - Port Hudson, LA
 Glatfelter - Chillicothe, OH
 Graphic Packaging International - West Monroe, LA
 Great River Energy - Elk River, MN
 Great River Energy - Minneapolis, MN
 Harmac Pacific Inc. - Nanaimo, BC
 Hitachi Zosen Inova - Norcross, GA
 Incauca S.A.S. - Cali, Colombia
 Inland Paperboard and Packaging - Orange, TX
 International Paper Company - Augusta, GA (2 units)
 International Paper Company - Bastrop, LA
 International Paper Company - Bogalusa, LA (2 units)
 International Paper Company - Cantonment, FL
 International Paper Company - Corrigan, TX
 International Paper Company - Courtland, AL
 International Paper Company - Franklin, VA
 International Paper Company - Georgetown, SC (2 units)
 International Paper Company - Jay, ME
 International Paper Company - Mansfield, LA (2 units)
 International Paper Company - Mogi Guaçu, S.P., Brazil
 International Paper Company - Orange, TX
 International Paper Company - Pine Bluff, AR
 International Paper Company - Pineville, LA
 International Paper Company - Port Wentworth, GA
 International Paper Company - Prattville, AL
 International Paper Company - Saillat, France
 International Paper Company - Luiz Antônio, S.P., Brazil (2 units)
 International Paper Company - Selma, AL
 International Paper Company - Texarkana, TX
 International Paper Company - Ticonderoga, NY
 International Paper Company - Vicksburg, MS
 KapStone Papers - Charleston, SC
 Ketchikan Pulp Company - Ketchikan, AK
 Kimberly-Clark Corporation - Everett, WA
 Koch Cellulose - Brunswick, GA (2 units)
 Kruger-Wayagamack, Inc. - Trois Rivières, QC
 Longview Fibre - Longview, WA (2 units)
 Louisiana-Pacific - Chetwynd, BC
 Louisiana-Pacific - Roaring River, NC
 Maine Energy - Biddeford, ME
 Mead Paper - Chillicothe, OH
 Mead Paper - Escanaba, MI
 Mead Paper - Stevenson, AL
 MeadWestvaco - Covington, VA (2 units)
 MeadWestvaco - Phenix City, AL (3 units)
 Minnesota Power - Duluth, MN (2 units)
 Mondi Group - Ružomberok, Slovakia (2 units)
 Neucel Specialty Cellulose - Port Alice, BC (2 units)
 NewPage Corporation - Escanaba, MI (3 units)
 NewPage Corporation - Wickliffe, KY (2 units)
 Packaging Corporation of America - Counce, TN
 Packaging Corporation of America - Tomahawk, WI
 Packaging Corporation of America - Valdosta, GA (2 units)
 Plum Creek - Columbia Falls, MT (2 units)
 Process Equipment/Barron Industries - Pelham, AL
 Rayonier, Inc. - Jesup, GA (3 units)
 ReEnergy Holdings - Lyonsdale, NY
 Resolute Forest Products - Saint Félicien, QC
 Riverside Forest Products - Armstrong, BC
 RockTenn Company - Demopolis, AL (2 units)
 RockTenn Company - Fernandina Beach, FL (2 units)
 Sappi North America - Cloquet, MN
 Sappi North America - Muskegon, MI (2 units)
 Sappi North America - Skowhegan, ME (3 units)

Selected References - CFD Modeling (cont'd)

Simpson Tacoma Kraft Co. - Tacoma, WA (2 units)
Smurfit-Stone - Brewton, AL (2 units)
Smurfit-Stone - Hodge, LA
Smurfit-Stone - Missoula, MT
Smurfit-Stone - Stevenson, AL
Smurfit-Stone - West Point, VA
SP Newsprint - Newberg, OR
Stora Enso North America - Biron, WI
Tembec - Chetwynd, BC
Thilmany Paper - Kaukauna, WI
Veolia Dade County - Miami, FL
Veolia Waste-to-Energy - Burnaby, BC
Visy Pulp and Paper - Tumut, Australia
Von Roll America Inc. - East Liverpool, OH
WestRock - Fernandina Beach, FL
Westvaco Corporation - Silsbee, TX
Westvaco Corporation - Wickliffe, KY
Weyerhaeuser Canada Ltd. - Prince Albert, SK
Weyerhaeuser Company - Columbus, MS
Weyerhaeuser Company - Kamloops, BC
Weyerhaeuser Company - Longview, WA
Weyerhaeuser Company - Springfield, OR
Weyerhaeuser Company - Valliant, OK
Wheelabrator Energy - Auburndale, FL
Wheelabrator Energy - Baltimore, MD
Wheelabrator Energy - Portsmouth, VA
Wheelabrator Inc. - Spokane, WA
Willamette Industries - Bennettsville, SC
Willamette Industries - Campti, LA
Xcel Energy - Ashland, WI
Xcel Energy - Red Wing, MN