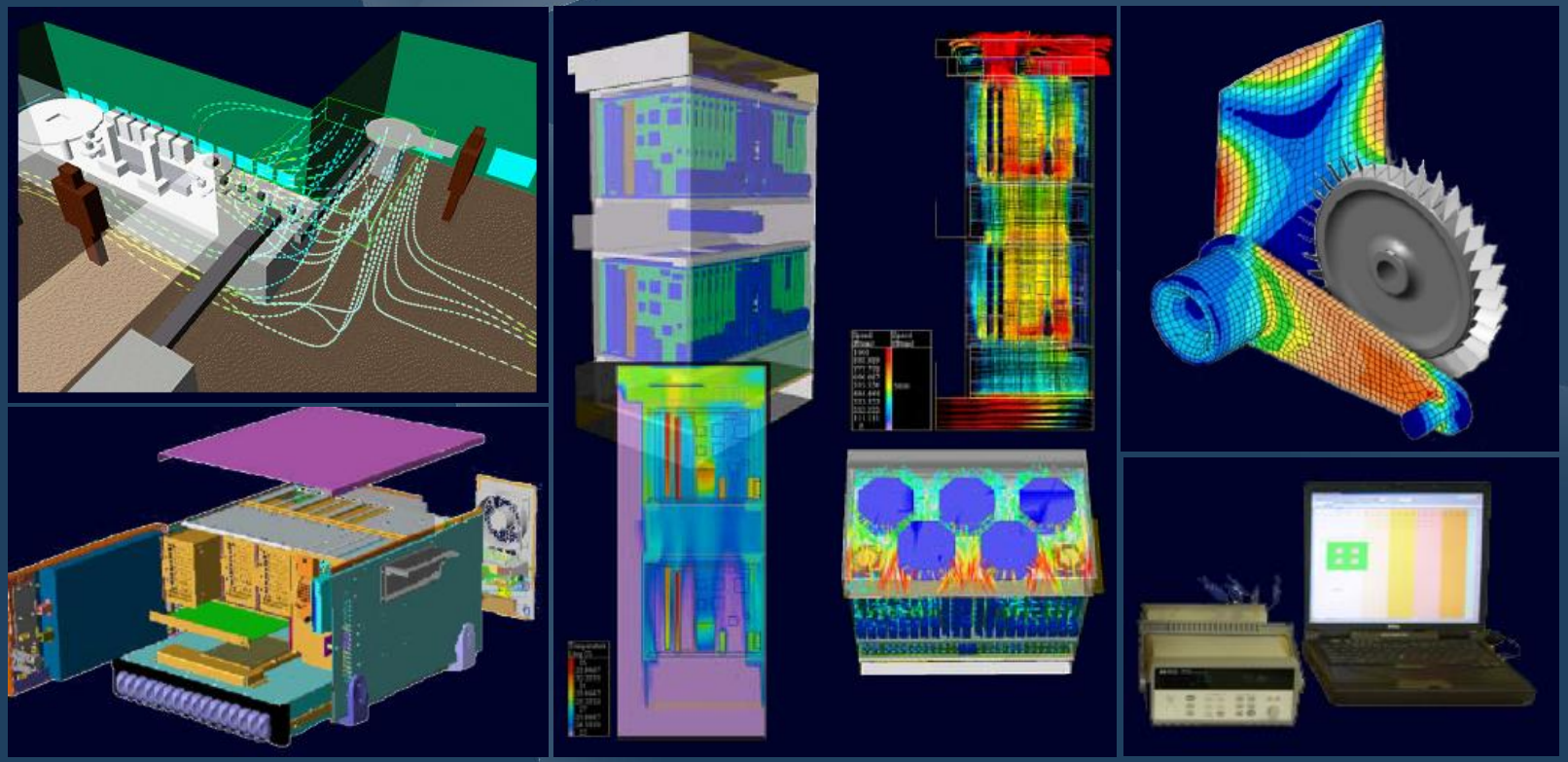
TDMG

Mechanical Engineering Consultants

PROVIDING FLOW, THERMAL & STRESS ANALYSIS AND TESTING SERVICES



MECHANICAL ENGINEERING CONSULTANTS

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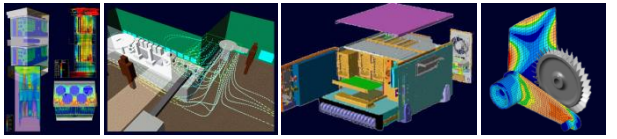
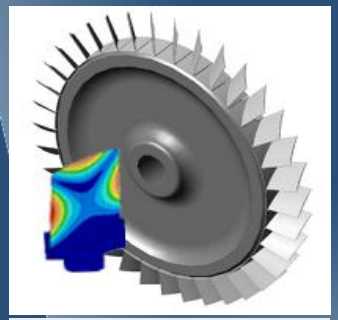


COMPANY PROFILE

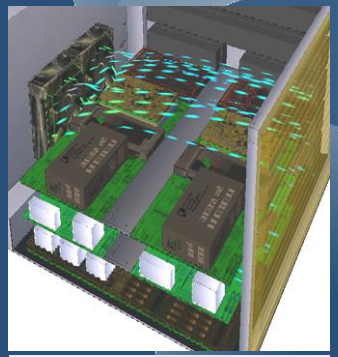
TDMG is a Mechanical Engineering Consulting firm focused on providing high quality and leading edge engineering services. We pride ourselves on providing accurate results and solving technical challenges efficiently by applying innovative solutions.

TDMG has a proven track record showing simulation results closely matching actual product performance. As a result of our respected reputation, clients are highly satisfied and confident in our work & output, all of which assists in making critical product decisions.

Since 1997, TDMG has demonstrated success in all technology sectors including the electronics, medical, military, industrial, building and aerospace industries.



STRESS ANALYSIS OF GAS TURBINE EQUIPMENT



FLOW ANALYSIS OF TELECOM EQUIPMENT

TDMG APPROACH

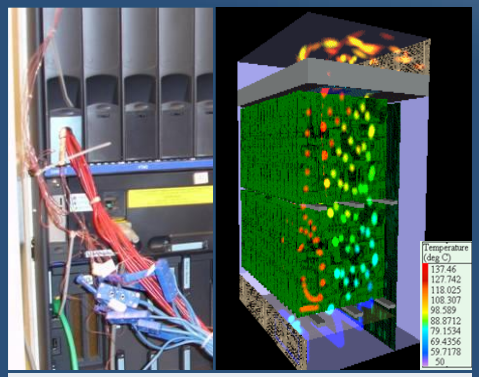
TDMG provides

- Direct, personalized service
- Innovative methods to solve technical challenges
- Creative, efficient and cost-effective solutions

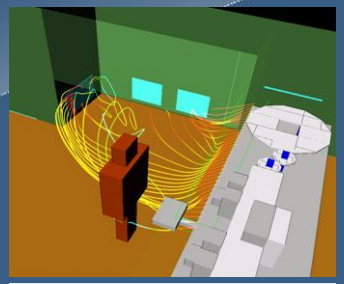
SERVICE OFFERING

- CFD/Thermal Analysis & Simulation
- Building Flow & Ventilation Analysis
- Thermal & Flow Testing
- Stress Analysis & FEA Simulation
- Product Design
- Project Management.

TDMG has supported programs in many ways from providing advice on product design, assisting with product architecture development, evaluating product performance during the development phase, developing the product from initial concept to production and any combination in between.



THERMAL TEST & ANALYSIS OF COMMERCIAL ELECTRONICS



VENTILATION ANALYSIS OF BUILDING ENVIRONMENTS

PRODUCT DESIGN OF OPTICAL TEST EQUIPMENT

TDMG CONTACT

Mr. Bruno Zoccali
President

TDMG INC.

100 Alexis-Nihon
Suite 102
St Laurent, Quebec
H4M 2N6

Tel: (514) 381-9115
Fax: (514) 381-7511
e-mail: info@tdmginc.com
www.tdmginc.com

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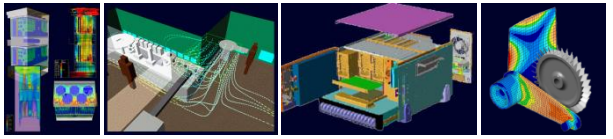
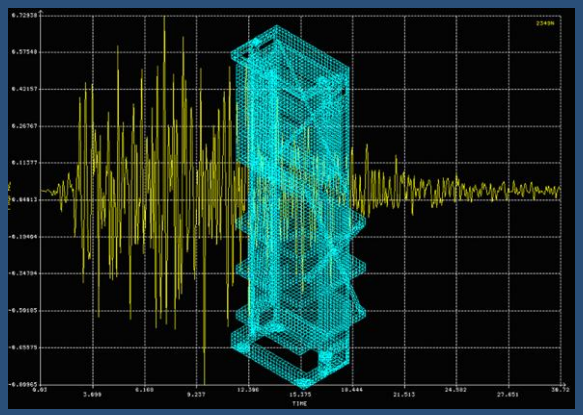


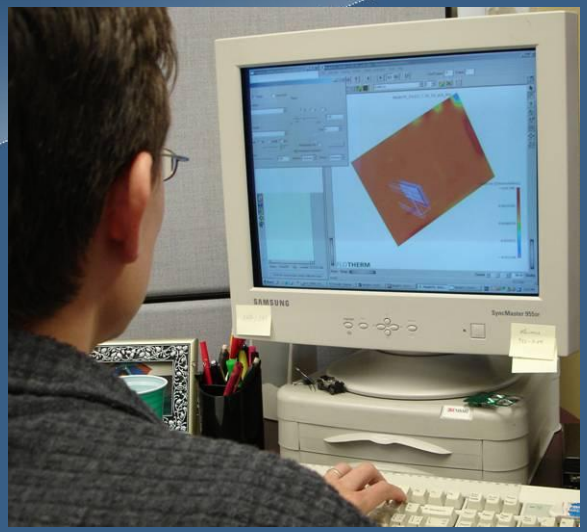
CFD & THERMAL ANALYSIS

- Solve flow & thermal design issues
- Use advanced CFD and thermal simulation tools to predict flow and thermal characteristics of different design architectures
- Present product designs that meet thermal requirements
- Optimize designs by evaluating flow and aerodynamic influences (pressure drop, drag, lift, etc)
- Identify thermal margins in products
- Assess product performance in its intended environment
- Determine mixing characteristics (concentration levels) of flows involving two or more fluids



STRESS & VIBRATION ANALYSIS

- Solve structural & vibration design issues
- Use FEA simulation methods to identify product structural safety margins
- Identify product natural frequencies & response under vibratory loading (vibration), whether it be sinusoidal or random
- Optimize product configuration for cost, deflection and weight by performing finite element structural analysis
- Optimize equipment function under transient loading conditions (shock) by using advanced dynamic analysis methods
- Define and maximize component life based on low or high cycle fatigue and creep and crack propagation analysis of the product materials
- Present product stress profiles
- Perform analysis of systems exhibiting fluid-structural interaction such as structural harmonic vibration imparted by vortex shedding



FLOW & VENTILATION ANALYSIS

- Evaluate flow distribution in clean rooms, data centers, hospital quarantine rooms, atriums and many other applications
- Identify moisture level & distribution in indoor swimming pools and water parks
- Optimize plenum size and configuration for HVAC systems
- Evaluate smoke & carbon monoxide levels in emergency exit corridors for scenarios involving localized fire events

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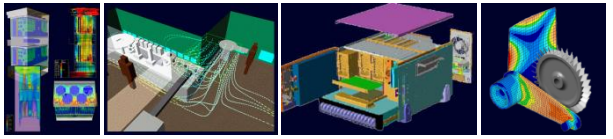
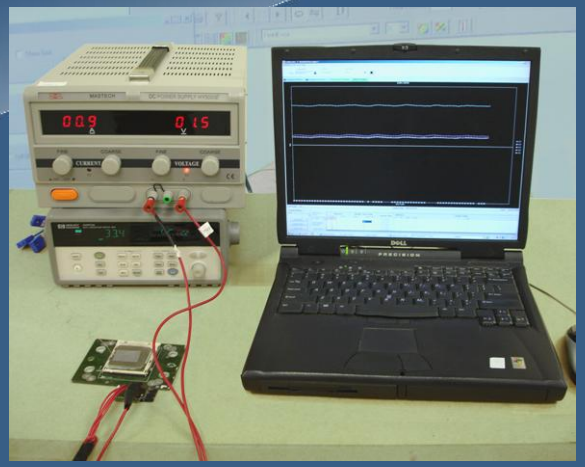


THERMAL & FLOW TESTING

- Test & troubleshoot products
- Capture product air flow characteristics
- Evaluate temperatures, measure heat generated and provide product efficiencies
- Measure fluid flow and heat flux in radiant heat pipe systems
- Measure heat exchanger pressure and flow characteristics
- Evaluate component temperatures relative to air speed
- Perform heatsink and fan characterization testing

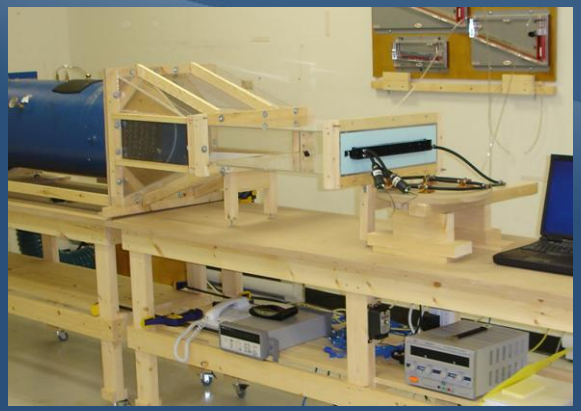
PRODUCT DESIGN

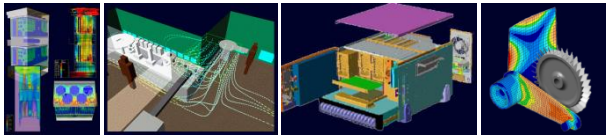
- Design products for the Aerospace, Power & Energy, Telecom, Commercial Electronics, Military and Medical industries
- Assist in the development of product architectures
- Provide multiple design concepts
- Troubleshoot existing design issues
- Reduce cost on existing designs
- Project manage designs into production



TECHNICAL STAFFING

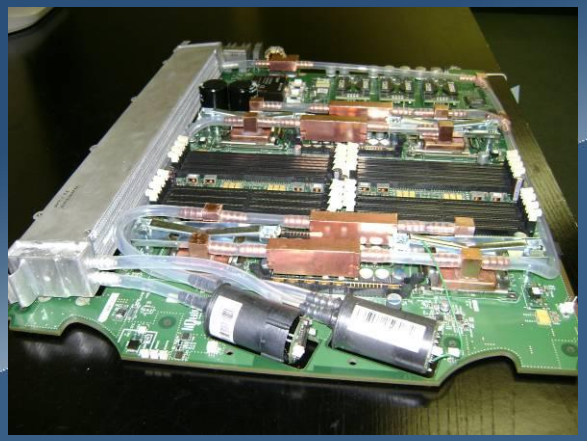
- TDMG provides engineers, designers or draftspersons to respond to specific project requirements
- Our experience allows us to identify the ideal candidate to meet your needs
- Resources that reside either on-site or off-site depending on your needs

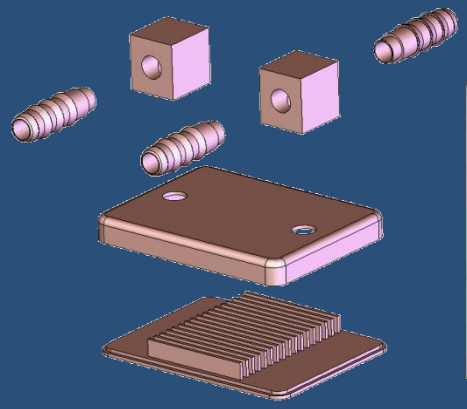




CUSTOM COOLING PRODUCTS

- TDMG's extensive thermal design experience provides the ideal foundation for development of cooling equipment for electronics, medical, aerospace and defense, and other industries.
- TDMG has developed custom cooling systems (both air and liquid based) for its customers.
- TDMG's supplier base is international with access to both local and foreign manufacturing capabilities for prototype and production level systems.
- A few of the cooling systems developed are shown here and are currently in production in commercial applications:
  - High performance heat exchangers
  - Low profile, high heat-spreading heatsinks
  - High performance coldplates
  - Card level liquid cooling system





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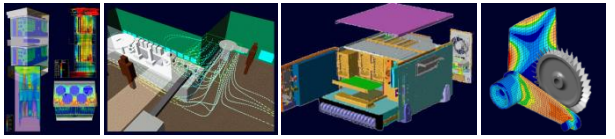


CASE STUDY: HARRIS MicroStar

HARRIS MICROWAVE COMMUNICATIONS, Montreal, Quebec

TDMG provided detailed analysis for the thermal performance of Harris' "MicroStar" product; a point-to-point wireless access solution. TDMG identified critical components and provided the proper cooling solutions essential to ensuring both a functional and reliable product.

The"MicroStar" line used by service providers worldwide.

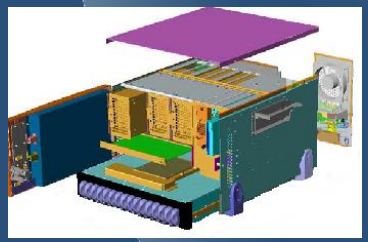
"TDMG provided us with quality thermal analysis; quickly and efficiently responding to all our design changes. We would gladly recommend TDMG to any corporation interested in thermal analysis. Harris would not hesitate to use TDMG's services again in the future…"

Fathy Yowakim Ph. D., Eng
Manager, Mechanical Engineering Dept
Harris Corporation

CASE STUDY: ARRISPHERE OVA

ARRISPHERE, Raleigh, North Carolina

Arrisphere has been using TDMG's services since early 2002 to perform flow and thermal analyses. This has included high-level concept study work at the early stages of development, through to detailed board and component level work in which the IC junction temperatures are determined.



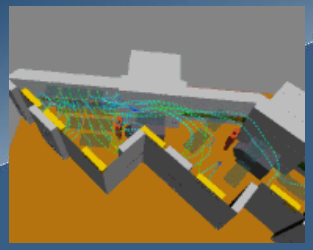
In addition, TDMG has provided mechanical design support to Arrisphere, helping develop finished products. TDMG continues to provide Arrisphere, now Insight Product Development, a significant level of support.

"It is without hesitation that Arrisphere recommends TDMG based on the work performed for our company. Arrisphere would not hesitate in working with TDMG in the future."

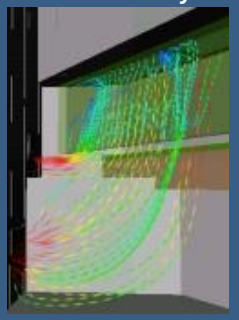
Anthony Annibale, Eng
Senior Partner
Arrisphere LLC

CASE STUDY: HOLLISTER-STIER LABS Lyophilization Room

HOLLISTER-STIER, Spokane, Washington



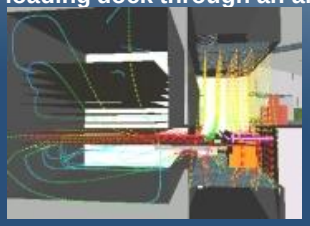
Hollister-Stier, the oldest and most respected name in allergy science, contracted TDMG to analyze one of their clean rooms. A detailed understanding of humidity ratios and air flow was needed for the new pharmaceutical lyophilization (or freeze drying) process area. The analysis provided essential information for the successful construction of this laboratory.



This new aseptic processing area houses a complex vial loading and handling area. The vials enter the room on a conveyor belt system from an adjacent room which is held at a different pressure, and exit the room on a conveyor system to another room which is, again, at a different pressure level.

Proper design of the actual lyophilization chamber and its loading area is of the greatest importance.

Though the chamber itself is sealed, its airflow is circulated from the loading dock through an air conditioning system which must ensure proper temperature and humidity to prevent frost from forming on the equipment. The air within the loading zone must also be laminar to prevent contamination.



TDMG's thorough analysis enabled Hollister-Stier to develop the proper layout and design. Without this type of analysis, contamination could have cost the pharmaceutical firm thousands of dollars in lost product and crucial renovations.

"TDMG's experience and attention to detail provided critical information, which played a vital role minimizing project costs and ultimate project success".

Keith Bear
Senior Engineer
Hollister-Stier