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Thermal Feasibility and Scenario Study

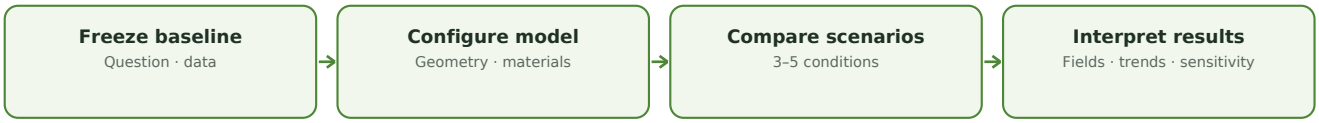
ENGINEERING SERVICE | BC-THERM-02 | S04-F | v1.1 | 12 November 2026

Document type: Service brief and computational study outline.
Purpose: Adapt a bounded thermal model to a defined HPDC question and compare selected operating scenarios.
Typical engagement: 12–25 working days; fixed-scope computational engineering study.

1 Executive summary

BC-THERM-02 adapts the HPDC-Twin workflow to a defined customer question and a representative process dataset. The study establishes a documented baseline, maps modeled outputs to available measurement locations, and compares selected operating or thermal-boundary conditions. It combines reproducible simulation runs with sensitivity analysis and an explicit plan for independent evaluation in a subsequent pilot.

BC-THERM-02: from customer data to scenario comparison



2 Engineering decision and customer value

The study helps engineering teams compare how selected initial conditions, effective cooling parameters, interface representations, or cycle settings influence the modeled thermal response. It can inform which conditions merit closer investigation, what additional measurements would be useful, and whether a more formal calibration and independent evaluation pilot is justified.

3 Work packages

Work package	Activities	Output
Study definition	Agree intended use, geometry abstraction, reference cycle, model variables, and scenario matrix.	Study protocol and configuration plan.
Data/model preparation	Organize representative measurements, material properties, process timing, and sensor coordinates; configure the model.	Versioned model configuration and data mapping.
Scenario execution	Run a documented baseline and approximately 3–5 selected conditions where supported by the data and configuration.	Reproducible run set and thermal outputs.
Comparison and interpretation	Compare fields and histories, examine selected parameter sensitivities, and document data gaps.	Scenario comparison, interpretation, and next-stage recommendation.

4 Deliverables

- Agreed study question, intended use, model boundary, and scenario matrix.
- Versioned JSON configuration and reproducible run manifest.
- Baseline and selected scenario runs with thermal summaries and available spatial fields.
- Temperature-history comparisons at agreed observation locations and phase-fraction outputs where relevant.
- Sensitivity summary for selected uncertain or controllable parameters.
- Engineering report explaining the comparison, assumptions, interpretation, and recommended next action.
- Documented calibration/holdout plan for BC-THERM-03 when independent evaluation is the next step.

5 Information used in the engagement

BC-THERM-02 uses representative measured process information. A prior BC-THERM-01 assessment is recommended where the data package or model fit is uncertain. The final scenario set is agreed against the actual configuration and customer records.

Information	Examples	Study requirement
Geometry	Simplified die/cavity cross-section, insert dimensions, casting thickness, sensor locations.	A bounded domain appropriate to the agreed two-dimensional study.
Materials	Alloy and die grades; relevant density, heat capacity, conductivity, latent heat, and phase range.	Traceable properties or documented candidate values.
Process data	Cycle phases, initial temperatures, timing, operating-condition identifiers.	Representative conditions for baseline and comparisons.
Measurements	Temperature histories with sensor IDs, coordinates, units, calibration, sampling and uncertainty.	Development/calibration subset for preliminary comparison.
Cooling context	Available cooling temperatures, flow/pressure records, insert/channel description.	Information sufficient to define the agreed effective cooling representation.

6 Delivery approach and responsibilities

Bamboos Consulting	Customer	Optional specialist partner
Configures the C++ solver and Python/Jupyter workflow; maps outputs to sensor coordinates and timestamps; runs the baseline and selected scenarios; reviews sensitivity and numerical diagnostics; documents assumptions, provenance, and interpretation.	Provides authorized representative records and geometry/material context; explains process changes across cycles; nominates an engineering reviewer; agrees scenario conditions and the separation of development data from any future holdout set.	Where required, supports geometry preparation, sensor-data review, instrumentation planning, or complementary analysis under a separately agreed work package.

7 Engagement scope and commercial format

Planning element	Indicative definition
Service mapping	S04-F · Thermal Feasibility Study
Indicative effort	12–25 working days (16-day planning baseline). Actual effort depends on geometry preparation, data quality, number of scenarios, and review requirements.
Commercial mechanism	Fixed-scope computational engineering study or time-and-materials development where the model adaptation requires a broader work package.
Acceptance and review	Completion of the agreed baseline and scenario runs, reproducible configurations, output comparisons, sensitivity review, and engineering report. The report states what the available data and model support for the intended question.

> Next step. Share the engineering question, representative cycle records, and available geometry/material information. A short scoping discussion can establish whether the data are ready for a feasibility study or should first pass through BC-THERM-01.

The final statement of work defines the specific engineering question, data package, model configuration, scenario count, review points, and deliverables. The engagement is tailored to the customer’s process and intended decision.