Sample SR&ED Project descriptions

#	Projects continued from 2012
1201	NW Hydraulics (1998 TCC Case) Develop diversion dam
1202	Jentel (2011 TCC Case) with "What if" analysis
1203	Airmax (2012 TCC Case) - HVAC development
	Projects started in 2013
1301	HVAC - How cost contraints affect a project

D.1 NW Hydraulics (1998 TCC Case) Develop divide wall for diversion dam

D-1′s - Project #1201:

NW Hydraulics (1998 TCC Case) Develop divide wall for diversion dam

I) OBJECTIVE: modifying & improve existing hydraulic models

DEPARTURES FROM STANDARD PRACTICE

- Reduce bedload
- Reduce downstream scouring
- Reduce cost

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D-1′s - Project #1201

II) TECHNOLOGICAL ADVANCEMENTS/UNCERTAINTY:

- Optimal method to sense & control temperature
- Variables: geometry for upstream training dikes & spurs, alignment & shape for the intake structure vs: weir, sluiceway, headgate, ejector; scour protection scheme, settling basin geometry

III) SYSTEMATIC INVESTIGATION

Activities 1-7: integrating variables / component

- 1- Baseline Testing, 2 - Upstream training works, 3 - Low Flow channel, 4 - performance of canal intake, 5 - Log Passage, 6 - stilling basin downstream of weir, 7 - settling basin

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Key Criteria Summary

R&D Base demo

1201 - NW Hydraulics (1998 TCC Case) Develop divide wall for diversion dam

Benchmarks:
Internet searches: 21 Articles
Patent searches: 5 patents
Competitive products or processes: 1 products
Similar prior in-house technologies: 3 products /

Objectives:
Decrease Bed load Deposition : 75 %
Reduce Downstream scouring : 99 %
Minimize Production cost: 25000 $per unit

Uncertainty: 1 - Geometry to address sediment & water levels

Key Variables: alignment & shape for the intake structure, geometry for upstream training dikes & spurs, scour protection scheme, settling basin geometry, weir, sluiceway, headgate, ejector

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Baseline Testing	Trials: 59 runs / samples	(none)	(none)	229.00	0.00	0.00	2013 CS
2 - Upstream training works	Analysis / simulation: 1 alternatives	(none)	(none)	689.00	9,600.00	7,100.00	2013 CS
3 - Low Flow channel	Trials: 175 runs / samples Physical prototypes: 14 samples	(none)	(none)	124.00	0.00	0.00	2013 CS
4 - performance of canal intake	Analysis / simulation: 2500 alternatives Trials: 160 runs / samples Physical prototypes: 5 samples	Decrease Bed load Deposition : 80 % (120 %)	(none)	637.00	0.00	0.00	2013 CS
5 - Log Passage	Trials: 7 runs / samples	(none)	(none)	258.00	0.00	14,100.00	2013 CS
6 - stilling basin downstream of weir	Trials: 875 runs / samples Physical prototypes: 4 samples	(none)	(none)	483.00	0.00	0.00	2013 CS
7 - settling basin	Trials: 58 runs / samples	Decrease Bed load Deposition : 75 % (100 %) Reduce Downstream scouring : 99 % (100 %) Minimize Production cost: 25000 $per unit (100 %)	(none)	280.00	0.00	3,460.00	2013 CS

Project Details:

Scientific or Technological Objectives:

Measurement	Current Performance	Objective	Has results?
Decrease Bed load Deposition (%)	50	75	Yes
Reduce Downstream scouring (%)	80	99	Yes
Minimize Production cost ($per unit)	3000	25000	Yes

[NOTE: THIS PROJECT DESCRIPTION IS REPRODUCED FROM FACTS OUTLINED IN THE TAX COURT OF CANADA Docket: 97-531-IT-G, Date: 1998/05/01]

[AUTHOR'S NOTE: IDEALLY THE TAXPAYER WOULD ATTEMPT TO QUANTIFY THE OBJECTIVES THEY ARE TRYING TO ACHIEVE. A QUANTIFIABLE OBJECTIVE HAS BEEN ADDED ABOVE, TO ILLUSTRATE.]

The problems were to maintain a low flow channel near the intake during the dry season, to exclude sediment from entering the intake and reduce downstream scouring (erosion of materials due to high velocity).

The concept of a divide wall is not new, but this is an entirely different application when the following are taken into account: it's a highly braided river, the shape of the intake works, the alignment and the length and the height of the wall in combination with the gates that were used. Also the development of methods for maintaining this low-flow channel for the intake in this highly sediment laden river is an advance.

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:

Benchmark Method/Source	Measurement	Explanatory notes
Internet searches	21 Articles	No solution found
Patent searches	5 patents	various methods did not meet the performance requirement
Competitive products or processes	1 products	the concept of a divide wall is not new , but this is an entirely different application
Similar prior in-house technologies	3 products / processes	from sediment specialists

The East Rapti river is 1,800 metres wide and carries large amounts of sediment. The channel is "braided", that is to say it consists of a number of channels. The bank of the river in subject to erosion and is highly unstable. Moreover, the slope is steep giving rise to unusually high velocity.

[NOTE: EACH CHARACTERISTIC TAKEN ALONE AND IN ISOLATION WOULD UNQUESTIONABLY HAVE PRESENTED DIFFICULTIES. CUMULATIVELY THEY MAGNIFIED EACH OTHER.]

Field of Science/Technology:

Civil Engineering (2.01.01)

Project Details:

Intended Results:	Develop new materials, devices, or products
Work locations:	Research Facility
Key Employees:	John Deer (Agriculture - Ph.D. (1981) / Researcher), Quebec Employee (Information Technology - PHD (1985) / Software Developer)
Evidence types:	Progress reports, minutes of project meetings; Test protocols, test data, analysis of test results, conclusions; Records of resources allocated to the project, time sheets; Samples, prototypes, scrap or other artefacts; Design, system architecture and source code; Project planning documents; Photographs and videos; Design of experiments

Scientific or Technological Advancement:

Uncertainty #1: Geometry to address sediment & water levels

How will the properties of the river affect the proposed dam? The unknown effect of heavy sediment movement and complicated structure combination (including weir, sluiceway, headgate, ejector, settling basin, fish ladder, log passage and river training works).

In the result three models were required:

(a) A model of the river; this required a distortion of the scale;

(b) an intake model; and

(c) a settling basin model.

For this purpose it is necessary to develop geometry for upstream training dikes and spurs, and an alignment for the intake structure.

The capacity of the sluice gate has to be increased and a flow divide wall has to be added. A downstream scour protection scheme has to be devised and a settling basin has to be modified to improve flushing.

The most significant underlying key variables are:

geometry for upstream training dikes & spurs (unresolved), alignment & shape for the intake structure (unresolved), weir, sluiceway, headgate, ejector (unresolved), scour protection scheme (unresolved), settling basin geometry (unresolved)

Activity #1-1: Baseline Testing (Fiscal Year 2013 CS)

Methods of experimentation:

Method	Experimentation Performed
Trials:	**59 runs / samples**

Baseline tests

- The baseline tests conducted before installation of the weir showed good simulation of a braided river.
- The high flow rates eroded the incised narrow channel system generated by low flows.

Results:

No results have been recorded for this Activity.

Conclusion:

[NOTE: THE CONCLUSIONS FOR THESE TESTS WOULD BE STATED HERE]

Activity #1-2: Upstream training works (Fiscal Year 2013 CS)

Methods of experimentation:

Method	Experimentation Performed
Analysis / simulation:	1 alternatives

Tests with the weir indicated that upstream left-side training works are needed to protect the guidebank immediately upstream from the weir from erosive attack, prevent erosion of the left bank (Chitwan Park), and to direct approach flow to the intake.

An upstream training scheme consisting of three open dyke elements plus T-spur dykes both upstream and downstream from the open dyke sections was developed.

Results:

No results have been recorded for this Activity.

Conclusion:

The training scheme provided the required protection, helped direct low flows to the intake, and allowed the area behind the dyke to be preserved as wetlands.

This system performed well, but the three spur configuration was also adequate. The final layout will be the decision of the project designers. A minimum of two spurs is recommended, if limited funding does not permit construction of the tested schemes.

Documentation:

- Offline Documents: Planning documents

Activity #1-3: Low Flow channel (Fiscal Year 2013 CS)

Methods of experimentation:

Method	Experimentation Performed
Trials:	175 runs / samples
Physical prototypes:	14 samples

[AUTHOR'S NOTE: THE DESCRIPTIONS BELOW WERE PROVIDED IN THE CRA'S EXAMPLE. THE DATA ABOVE (# TRIALS/ALTERNATIVES) IS PROVIDED TO ILLUSTRATE SOME OF THE ADDITIONAL DETAILS THAT WOULD IDEALLY BE INCLUDED.]

Bars built up in the 400 m wide approach channel during floods that isolated the intake during low flows. A series of tests [HOW MANY?] were conducted using submerged inner guide banks to create a low flow channel. A 1 m high guidebank forming a channel 1/4 the width of the weir achieved acceptable results [NOTE: A DEFINITION OF ACCEPTABLE RESULTS WOULD BE BENEFICIAL]. Because the inner guide bank scheme concentrates flow and causes higher upstream water levels, a scheme using floodway gates was adopted for further study.

Results:

No results have been recorded for this Activity.

Conclusion:

A modified design using two 20 m wide gated floodways and one 20 m undersluice was effective in producing a low flow channel to the intake [NOTE: CITING MAX FLOW RATES WOULD HELP]. This was accomplished primarily with open floodway gates and a closed undersluice.

A larger radius right-side guidewall [NOTE: CITING HOW MUCH LARGER WOULD BE HELPFUL IN ADDING A DEGREE OF QUANTIFICATION TO THE TESTING] improves flow conditions when flow is guided by the right guidewall.

Activity #1-4: performance of canal intake (Fiscal Year 2013 CS)

Methods of experimentation:

Method	Experimentation Performed
Analysis / simulation:	2500 alternatives
Trials:	160 runs / samples
Physical prototypes:	5 samples

Results:

- Decrease Bed load Deposition : 80 % (120% of goal)

Conclusion:

Although both orientations were studied for bedload deposition, only the results of the 90 degree intake will be discussed herein. Flow conditions with the floodway and undersluice gates open 0.5 m resulted in considerable [NOTE: "CONSIDERABLE" IS A SUBJECTIVE TERM UNLESS DEFINED BY QUANTIFIABLE/MEASURABLE PARAMETERS] bedload entering the canal headworks area. Flows with the floodway gates open 1 m and the undersluice closed also resulted in considerable deposition in the headworks area.

The addition of a 40 m long divide wall that extended above the water surface effectively prevented bedload from entering the canal headworks area when tested for the 1 m floodway gate opening with the undersluice closed. When canal flow is also eliminated, prevention of bedload entering the headworks area is further enhanced. [NOTE: BY ADDING AN ENHANCEMENT FACTOR, IT WOULD HELP PROVIDE A MEASURABLE BENCHMARK INDICATIVE OF R&D]

Flushing tests conducted with a wide open undersluice indicated that flushing with the divide wall is much more effective than without the wall. [NOTE: AGAIN, BY QUANTIFYING THE DIFFERENCE, IT PROVIDES A QUANTIFIABLE CONTEXT TO THE WORK]

Activity #1-5: Log Passage (Fiscal Year 2013 CS)

Methods of experimentation:

Method	Experimentation Performed
Trials:	7 runs / samples

Log passage tests were conducted with the premise that log accumulation in the pocket area upstream from the undersluice should be minimized.

This was accomplished to a large extent by closing the undersluice but operating the floodway. This operation resulted in log accumulation upstream from the floodway, but minimal accumulation in the pocket. Logs of 20 m size were capable of being flushed by completely opening the gates (floodway or undersluice). Larger logs of 30 m size frequently became jammed.

Several log diversion walls were tested to explore the potential for improving the effectiveness of diverting logs into the floodway. The best scheme involved a solid skimmer wall that allowed flow to pass underneath the wall and the logs were re-directed away from the pocket area. [NOTE: IDEALLY, THESE DIFFERENT LOG DIVERSION WALLS THAT WERE TESTED WOULD BE QUANTIFIED AND EXPLAINED]

Results:

No results have been recorded for this Activity.

Conclusion:

The elimination of all canal flow combined with no undersluice flow resulted in more favourable conditions for diverting logs from the pocket.

Activity #1-6: stilling basin downstream of weir (Fiscal Year 2013 CS)

Methods of experimentation:

Method	Experimentation Performed
Trials:	875 runs / samples
Physical prototypes:	4 samples

Four stilling basin designs were tested downstream of the weir: Types 3 and 4 at basin elevations of 224.7 and 226.7 m. The two higher basins produced downstream water levels that were much higher [NOTE: QUANTIFY "HIGHER"] than the tailwater level. This caused scouring conditions downstream as high velocities were generated by the drop in water level. The Type 3 basin at 224.7 m elevation was adopted for final design.

Results:

No results have been recorded for this Activity.

Conclusion:

The adopted basin was tested with and without stone accumulation in the stilling basin. The presence of stones caused some additional mounding of the water above the floor blocks for the higher flows and an exaggerated vertical eddy that tended to rotate stones back to the face of the spillway, where they may accelerate erosion of the concrete. Many of these stones, however, will wash out at the higher flows.

Activity #1-7: settling basin (Fiscal Year 2013 CS)

Methods of experimentation:

Method	Experimentation Performed
Trials:	58 runs / samples

Flushing with the four-channel scheme was unsuccessful because insufficient downstream channel capacity resulted in subcritical flow through much of the downstream section of the basin. This scheme would function adequately if more downstream capacity were provided.

Flushing with the single-channel scheme with the slope through the flushing ports continuing at the 1:100 basin slope was not satisfactory as a hydraulic jump formed in the basin. Elevation drops of 20, 30 and 45 cm through the ports were then tested. Supercritical flow through the ports, and thus effective flushing, was maintained for flow rates from 2 to 6 m3/s for the three tested drops.

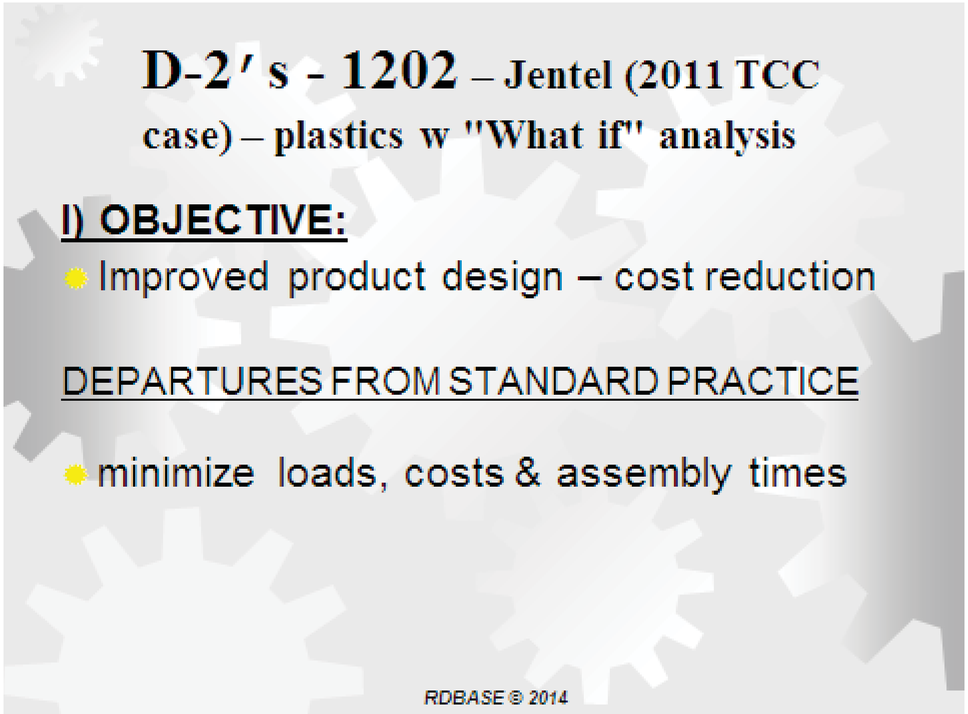
Results:

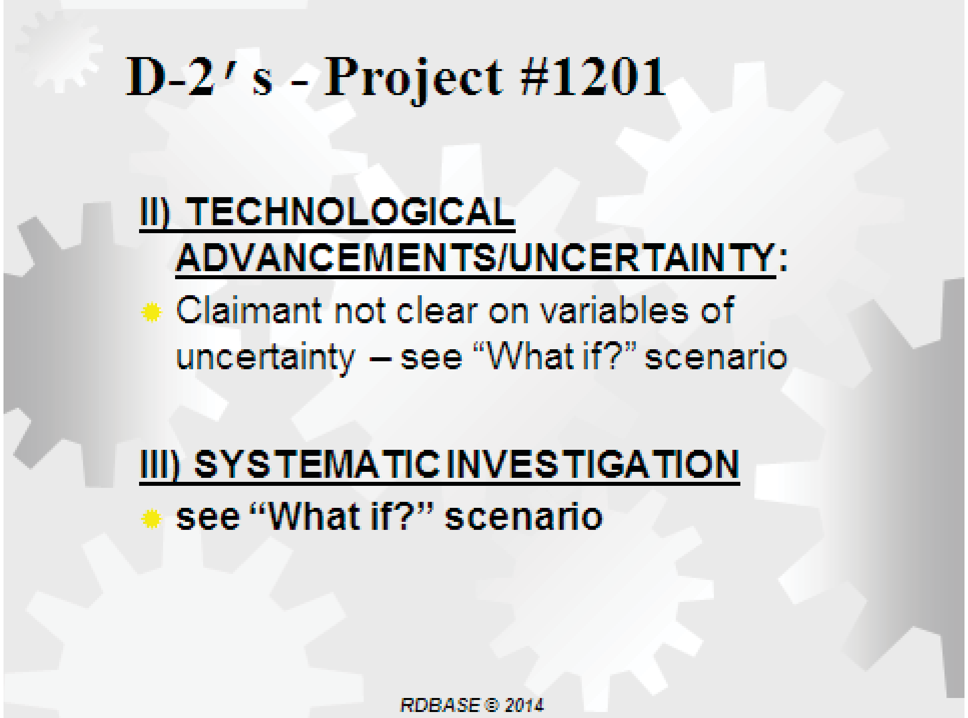
- Decrease Bed load Deposition : 75 % (100% of goal)
- Reduce Downstream scouring : 99 % (100% of goal)
- Minimize Production cost: 25000 $per unit (100% of goal)

Conclusion:

Approach flow patterns to the settling basin appear satisfactory as the upstream transition adequately spreads the flow so that all basin segments are used effectively. There is slower moving flow along the diverging sidewall that would be improved by rounding the upstream corner of the transition. Deposition in the basin was fairly well distributed among the basin segments.

D.2 Jentel (2011 TCC case) – plastics "What if" analysis





1202 - Jentel (2011 TCC case) - with "What if" analysis

Benchmarks: Internet searches: 17 Articles
Competitive products or processes: 4 products
Similar prior in-house technologies: 2 products /
Potential components: 7 products

Objectives: Max. Load : 120 kg
Manufacturing cost: 145 $ Cdn.
Assembly time: 10 minutes

Uncertainty: 1 - optimal combination of materials & forming processes

Key Variables: cooling rates, fastening optimization for load, melt temperature (ranges and times), mix time, types & order of reagent additions

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Design and Integrate stands	Trials: 1 runs / samples Physical prototypes: 1 samples	(none)	cooling rates	0.00	0.00	0.00	2012 CS
2 - Design & Form Bin	Analysis / simulation: 18 alternatives Trials: 180 runs / samples Physical prototypes: 2 samples Lines of code: 14 Lines of prototype code	(none)	(none)	1,000.00	14,500.00	0.00	2013 CS

Project Details:

Scientific or Technological Objectives:

Measurement	Current Performance	Objective	Has results?
Max. Load (kg)	80	120	No
Manufacturing cost ($ Cdn.)	156	145	No
Assembly time (minutes)	25	10	No

NOTE: THIS PROJECT IS BASED ON THE 2011 TAX COURT CASE OF JENTEL MANUFACTURING LTD., V. THE QUEEN, (2011 TCC 261)

THOUGH THE TAXPAYER LSOT THIS CASE WE HAVE;
- USED THE FACTS PROVIDED IN THE CASE &
- RECAST THEM TO "POTENTIAL ELIGIBILITY" BY ILLUSTRATING,
- “TECHNOLOGICAL ADVANCEMENT” INCLUDING,
- POTENTIAL “HYPOTHESES AND CONCLUSIONS” (AS REQUIRED BY THE COURTS).

A FULL DESCRIPTION OF THIS CASE IS PROVIDED IN OUR NEWSLETTER 2011-2 AT:
HTTP://WWW.MEUK.NET/NEWSLETTERS_AND_PUBLICATIONS.ASPX]

A FULL COPY OF THIS CASE HAS BEEN UPLOADED TO THE "DOCUMENTS" SECTION OF THIS PROJECT.

Ideally we would provide quantified objectives such as cost, strength, weight, tolerances, failure rates,... which "stack up" to require "experimentation" in areas beyond "standard practice" (such as);
1) different configurations on measured structural integrity,
2) effects of plastic melting process conditions,
3) additive reagents &/or
4) modifying extrusion/forming techniques on produced plastic physico-chemical characteristics

These in turn would allow us to identify other (binary - i.e. yes or no) objectives including replacing non-recyclable structural plastics, such as ABS, with recyclable ones, such as polypropylene.

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:

Benchmark Method/Source	Measurement	Explanatory notes
Internet searches	17 Articles	Found 7 articles on plastics forming issues + 10 articles on alternate fastening concepts relevant to this design
Competitive products or processes	4 products	Examined geometries and materials used on 4 competitive products. None provided over 100kg load performance.
Similar prior in-house technologies	2 products / processes	re-examined the causes of failure on 2 or our prior "shelf" product we are improving.
Potential components	7 products	Discussed fastening designs and alternatives with 7 plastic fastener designers & manufacturers. Contacted 3 plastic suppliers to get addtional performance details on their products and recommendations for processing.

AN ideal submission would provide specific evidence of known technology limits via: articles, competitive products, expert opinions, patent searches, prior in house failures, blogs, etc.

Field of Science/Technology:

Composites (including laminates, reinforced plastics, cermets, combined natural and synthetic fibre fabrics) (2.05.04)

Project Details:

Intended Results:	Improve existing processes, Improve existing materials, devices, or products
Work locations:	Commercial Facility
Key Employees:	Al Nobel (Chemical Engineering - P.Eng. (1989) / Research Associate), Nick Tesla (Electrical technology - CET (2002) / Research Associate)
Evidence types:	Design of experiments

Scientific or Technological Advancement:

Uncertainty #1: optimal combination of materials & forming processes

A "matrix" of variables (parameters) were identified for testing under different described conditions. HYPOTHESES = can we improve the existing predictive model for effects re: altered temperature of melt, mix time, order of reagent addition, type of reagents, rate of cooling, etc. influence on measured final plastic characteristics/parameters.

The most significant underlying key variables are:

melt temperature (ranges and times) (unresolved), mix time (unresolved), cooling rates, types & order of reagent additions (unresolved), fastening optimization for load (unresolved)

Activity #1-1: Design and Integrate stands (Fiscal Year 2012 CS)

This Activity is addressed in Fiscal Year 2012 CS.

Activity #1-2: Design & Form Bin (Fiscal Year 2013 CS)

Methods of experimentation:

Method	Experimentation Performed
Analysis / simulation:	18 alternatives
Trials:	180 runs / samples
Physical prototypes:	2 samples
Lines of code:	14 Lines of prototype code

Analysis/Simulations:examined how solid flow models to evaluate alternate methods under which plastic fluxing & molding processes could be optimized

Trials:tested 8 different plastics: PETG, PVC, acrylic, ABS, styrene, Lexan, HDPE & polyethylene.

Physical prototypes:Developed 2 prototypes using (ABS and HDPE), further testing was carried out using varying thicknesses of material to determine strength
characteristics.

NOTE: SEE THE WHAT IF MATRIX TO COMPARE ELIGIBLE S. INELIGIBLE ACTIVITIES:

Results:

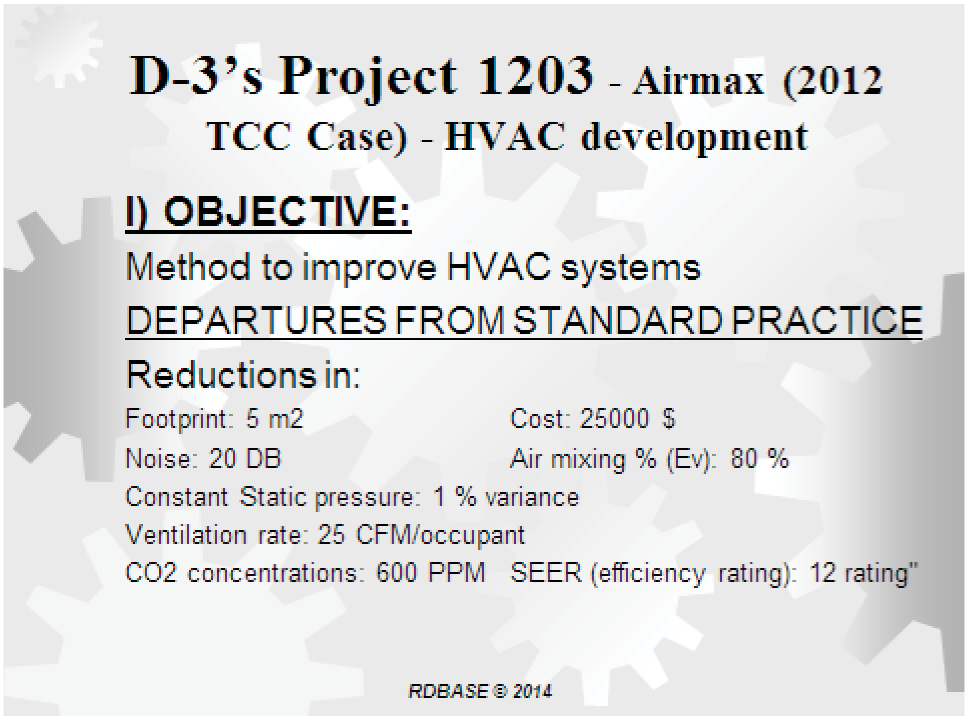
No results have been recorded for this Activity.

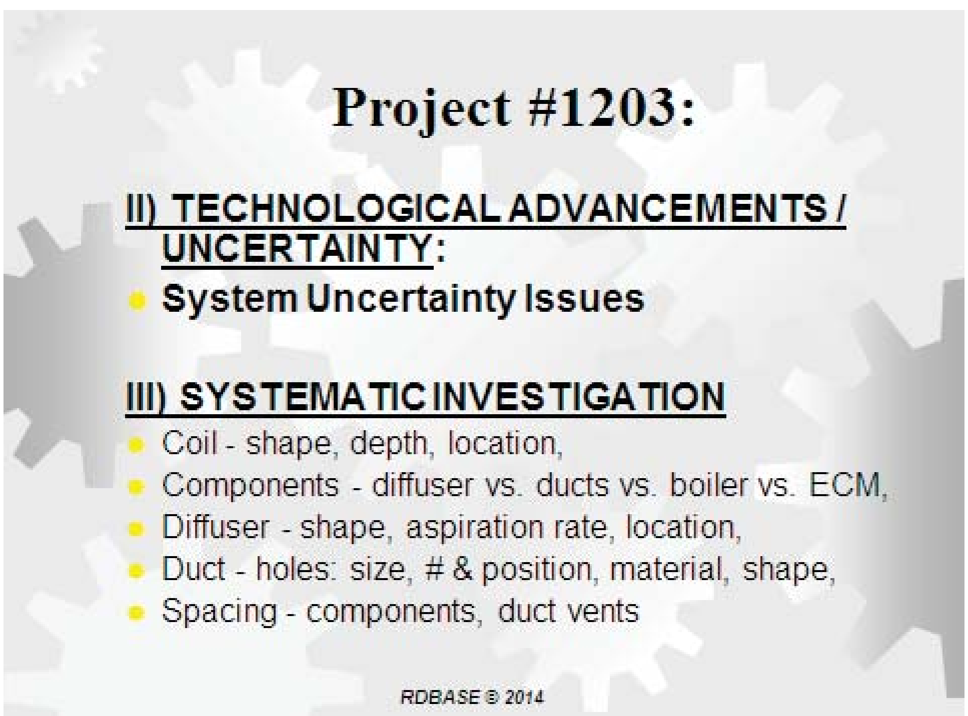
Conclusion:

Documentation:

- Uploaded to RDBASE.NET: Jentel project breakdown WHAT IF.xls (27KB)

D.3 Airmax (2012 TCC Case) – HVAC development





1203 - Airmax (2012 TCC Case) - HVAC development

Benchmarks:

Internet searches: 8 Articles
Patent searches: 14 patents
Competitive products or processes: 12 products
Similar prior in-house technologies: 3 products /
Potential components: 55 products
Queries to experts: 4 responses

Objectives:

Footprint: 5 m2
Cost: 25000 $
Noise: 20 DB
Constant Static pressure: 1 % variance
Ventilation rate: 25 CFM/occupant
Air mixing % (Ev): 80 %
CO2 concentrations: 600 PPM
SEER (efficiency rating): 12 rating

Uncertainty: 1 - component design & integration

Key Variables: Coil - shape, depth, location, Components - diffuser vs. ducts vs. boiler vs. ECM, Diffuser - shape, aspiration rate, location, Duct - holes:size, # & position, material, shape, Spacing - components, duct vents

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Diffuser (accepted by CRA)	Analysis / simulation: 100 alternatives Trials: 10 runs / samples Physical prototypes: 10 samples Lines of code: 50 Lines of prototype code	Noise: 40 DB (50 %) Air mixing % (Ev): 75 % (75 %)	Diffuser - shape, aspiration rate, location	1,250.00	0.00	0.00	2012 CS
2 - Duct (Challenged by CRA)	Analysis / simulation: 100 alternatives Trials: 12 runs / samples	Ventilation rate: 23 CFM/occupant (60 %) Noise: 32 DB (70 %) Air mixing % (Ev): 77 % (85 %)	Components - diffuser vs. ducts vs. boiler vs. ECM Duct - holes:size, # & position, material, shape Spacing - components, duct vents	1,000.00	0.00	0.00	2012 CS
3 - Furnace ECM x-n (challenged)	Analysis / simulation: 100 alternatives Trials: 50 runs / samples	Footprint: 7 m2 (86 %) Cost: 30000 $ (85 %) Noise: 25 DB (87 %) Constant Static pressure: 0.5 % variance (105 %) Ventilation rate: 28 CFM/occupant (160 %) Air mixing % (Ev): 86 % (130 %) CO2 concentrations: 800 PPM (0 %) SEER (efficiency rating): 12 rating (100 %)	Coil - shape, depth, location Components - diffuser vs. ducts vs. boiler vs. ECM Spacing - components, duct vents	1,408.00	37,000.00	20,000.00	2013 CS

Project Details:

Scientific or Technological Objectives:

Measurement	Current Performance	Objective	Has results?
Footprint (m2)	20	5	Yes
Cost ($)	60000	25000	Yes
Noise (DB)	60	20	Yes
Constant Static pressure (% variance)	10	1	Yes
Ventilation rate (CFM/occupant)	20	25	Yes
Air mixing % (Ev) (%)	60	80	Yes
CO2 concentrations (PPM)	800	600	Yes
SEER (efficiency rating) (rating)	10	12	Yes

[NOTE: THIS PROJECT EXAMPLE IS REPRODUCED FROM DETAILS PROVIDED IN THE TAX COURT OF CANADA RULING ON AIRMAX TECHNOLOGIES, 2012 (TCC) 376. Copies of the judgment are available from the Tax Court of Canada website [www.tcc-cci.gc.ca].

SINCE THE MOTION WAS AN INFORMAL APPEAL THERE WAS ONLY SUMMARY EVIDENCE PROVIDED AT THE TRIAL.

AS A RESULT WE HAVE ADDED ADDITIONAL GUIDANCE & EXAMPLES OF POTENTIALLY ELIGIBLE WORK IN THE AIR DISTIBUTION INDUSTRY.

In addition to the claimants own cost & performance goals there may be additional objectives created by;

- ASHRAE or other industry standards eg. for air quality / ventilation rates

As illustrated in this example it is important to list all significant & QUANTIFIABLE objectives since they tend to "stack up" or combine to create the technological uncertainties.

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:

Benchmark Method/Source	Measurement	Explanatory notes
Internet searches	8 Articles	8 articles outlining design methods of similar systems were discovered but none met the stated objectives.
Patent searches	14 patents	14 different patents were examined regarding both component design & concepts to integrate entire systems.
Competitive products or processes	12 products	Concepts from 12 competitive systems were examined.
Similar prior in-house technologies	3 products / processes	
Potential components	55 products	
Queries to experts	4 responses	received 4 responses via HVAC industry blogs re. alternate part designs

DEPARTURES FROM STANDARD PRACTICE:

The design of this system was unique in the market insofar as it utilized higher than usual pressure in response to the problem of the narrower duct work used in narrow multi-storey townhouses.

It also contemplated using an unconventional heat source that also provided domestic hot water, unlike those more commonly used indirect-fired furnaces.

AUTHOR'S NOTE: IDEALLY THE CLAIMANT WOULD ATTEMPT TO OUTLINE ALL:

- "DUE DILIGENCE" PERFORMED IN ORDER TO

- BENCHMARK THE LEVEL OF TECHNOLOGY WHICH WOULD BE
- "READILY AVAILABLE TO SOMEONE SKILLED IN THE ART."

THE CRA AND COURTS REFER TO THIS AS "STANDARD PRACTICE" FOR THE INDUSTRY.

THERE IS NO MINIMUM REQUIRED LEVEL OTHER THAN IT IS "REASONABLE WITHIN THE BUSINESS CONTEXT OF THE FIRM."

Field of Science/Technology:

Thermodynamics (2.03.03)

Project Details:

Intended Results:	Improve existing processes
Work locations:	Commercial Facility
Key Employees:	Al Nobel (Chemical Engineering - P.Eng. (1989) / Research Associate), Nick Tesla (Electrical technology - CET (2002) / Research Associate)
Evidence types:	Project records, laboratory notebooks

Scientific or Technological Advancement:

Uncertainty #1: component design & integration

We have attempted to list examples of

- the top 5 variables of experimentation along with
- an outline of potential issues (or subvariables) to be investigated

In addition to those listed experimental development in this and similar HVAC areas may include contemplation of:

- manifold pressures vs. BTU inputs
- warm vs. cold air systems
- constant vs. variable air volumes

The most significant underlying key variables are:

Coil - shape, depth, location, Components - diffuser vs. ducts vs. boiler vs. ECM, Spacing - components, duct vents, Diffuser - shape, aspiration rate, location, Duct - holes:size, # & position, material, shape

Activity #1-1: Diffuser (accepted by CRA) (Fiscal Year 2012 CS)

This Activity is addressed in Fiscal Year 2012 CS.

Activity #1-2: Duct (Challenged by CRA) (Fiscal Year 2012 CS)

This Activity is addressed in Fiscal Year 2012 CS.

Activity #1-3: Furnace ECM x-n (challenged) (Fiscal Year 2013 CS)

Methods of experimentation:

Method	Experimentation Performed
Analysis / simulation:	100 alternatives
Trials:	50 runs / samples

In 2008, the appellant incurred expenses to bring a European-sourced boiler into conformity with North American standards.

The appellant also undertook testing of ECMs to ensure that they could be programmed at the speeds necessary to meet the design requirements set for the appellant's HVAC system while still meeting the manufacturer's safety specifications, which were required to be adhered to in order to ensure coverage under the manufacturer's warranty.

The ECMs used in the test were purchased from a Korean manufacturer, Essen Tech. The appellant worked with a consultant to develop new program settings for the control board. The evidence shows that the appellant had the right to use the intellectual property generated from the testing, along with Essen Tech.

NOTE: THE ABOVE DETAILS WERE PROVIDED TO THE TAX COURT. IDEALLY A CLAIMANT WOULD ILLUSTRATE ADDITIONAL DETAILS RELATED TO ANY INVESTIGATIONS OF THE VARIABLES OF UNCERTAINTY.

Results:

- Footprint: 7 m2 (86% of goal)
- Cost: 30000 $ (85% of goal)
- Noise: 25 DB (87% of goal)
- Constant Static pressure: 0.5 % variance (105% of goal)
- Ventilation rate: 28 CFM/occupant (160% of goal)
- Air mixing % (Ev): 86 % (130% of goal)
- CO2 concentrations: 800 PPM (no improvement)
- SEER (efficiency rating): 12 rating (100% of goal)

Conclusion:

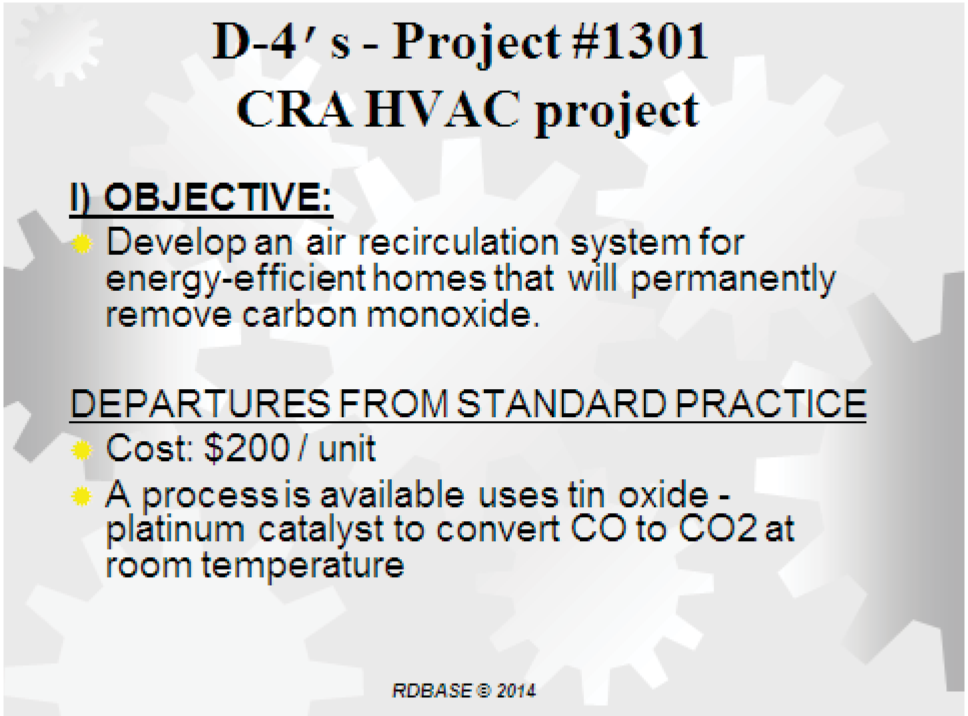
According to the judge,

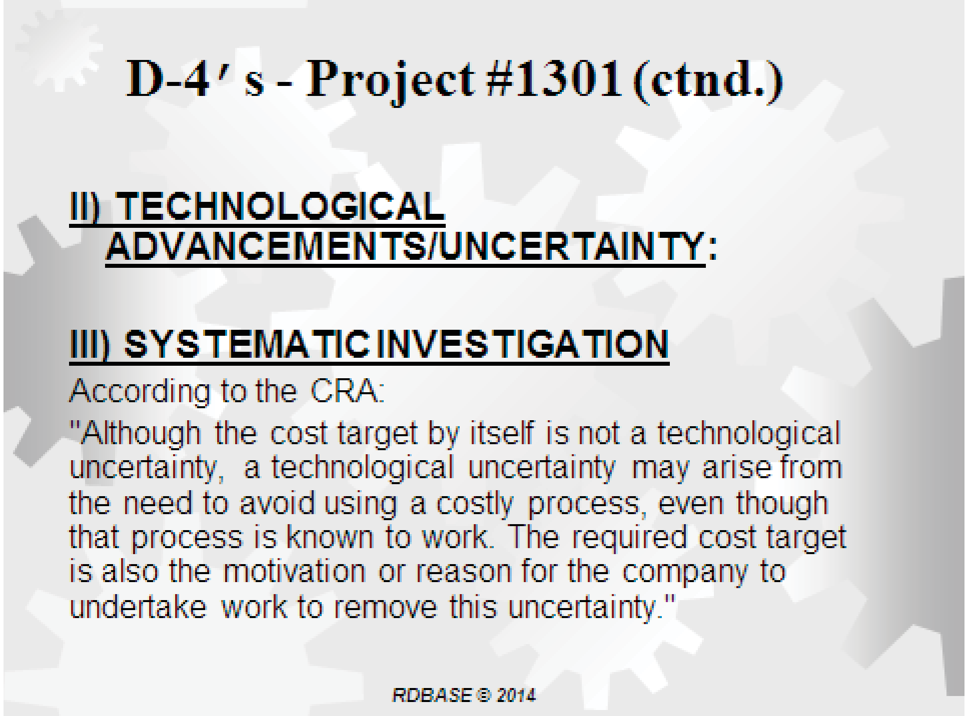
"The evidence demonstrates that the appellant identified the problems with, and deficiencies of, existing HVAC systems.

In response, the appellant developed a testing site to conduct testing with respect to its diffusers, the integration of the boiler into its system, the programming of the ECM, and the relevant safety and operational standards. Experiments were run, the results were collected and modifications were made."

Significant variables addressed: Coil - shape, depth, location, Components - diffuser vs. ducts vs. boiler vs. ECM, Spacing - components, duct vents

D.4 CRA HVAC project





1301 - HVAC - How cost contraints affect a project

Benchmarks: Internet searches: 44

Objectives: Cost: 200 $ / unit
Minimum conversion temperature: 20 Deg C

Uncertainty: 1 - Convert CO to CO2 at room temp

Key Variables: how to convert CO to CO2 at room temp

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Development	Analysis / simulation: 25 alternatives Trials: 7 runs / samples	Cost: 180 $ / unit (120 %) Minimum conversion temperature: 23 Deg C (80 %)	how to convert CO to CO2 at room temp	640.00	2,300.00	48,000.00	2013 CS

Project Details:

Scientific or Technological Objectives:

Measurement	Current Performance	Objective	Has results?
Cost ($ / unit)	300	200	Yes
Minimum conversion temperature (Deg C)	35	20	Yes

Example 3 – Illustrating concepts from paragraph 5, section 2.1.1 Eligibility of Work for SR&ED Investment Tax Credits Policy

According to the CRA, This example shows that cost targets are not technological uncertainties, but a technological uncertainty may arise by trying technologically uncertain paths to solve a problem to meet the cost targets.

A company wants to develop an air recirculation system for energy-efficient homes that will permanently remove carbon monoxide. A key component of this system is a module in which carbon monoxide (CO) is converted to relatively harmless carbon dioxide (CO_2) at room temperature.

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:

Benchmark Method/Source	Measurement	Explanatory notes
Internet searches	44	Could not determine optimal matrix .

A process is available that uses a tin oxide and platinum catalyst to convert CO to CO_2 at room temperature, and the company could develop a product based on this process. However, the high cost of using this process will make the selling price of the product out of reach for consumers.

There are other methods to convert carbon monoxide, but they are not effective at room temperature. A key requirement is that the module must operate at room temperature.

Field of Science/Technology:

Mechanical engineering (2.03.01)

Project Details:

Intended Results:	Improve existing processes
Work locations:	Research Facility
Key Employees:	Nick Tesla (Electrical technology - CET (2002) / Research Associate)
Evidence types:	Project records, laboratory notebooks; Design, system architecture and source code

Scientific or Technological Advancement:

Uncertainty #1: Convert CO to CO2 at room temp

To achieve the project objective (a room-temperature carbon monoxide remover), the company has to develop an inexpensive process that operates effectively at room temperature.

The technological uncertainty relates to how to convert CO to CO_2 at room temperature that does not use the costly process with tin oxide and platinum.

The most significant underlying key variables are:

Activity #1-2: Development (Fiscal Year 2013 CS)

Methods of experimentation:

Method	Experimentation Performed
Analysis / simulation:	25 alternatives
Trials:	7 runs / samples

Results:

- Cost: 180 $ / unit (120% of goal)
- Minimum conversion temperature: 23 Deg C (80% of goal)

Conclusion:

According to the CRA:

"Although the cost target by itself is not a technological uncertainty, a technological uncertainty may arise from the need to avoid using a costly process, even though that process is known to work. The required cost target is also the motivation or reason for the company to undertake work to remove this uncertainty."

IN THE AUTHORS OPINION THIS ILLUSTRATES HOW

- THE QUANTIFIABLE BUSINESS OBJECTIVES (IN THIS CASE TO REDUCE COST WHILE MAINTING OTHER PERFORMANCE PARAMETERS)
- "STACK UP" TO CREATE "TECHNOLOGICAL UNCERTAINTY."

Significant variables addressed: how to convert CO to CO_2 at room temp

Documentation:

- Uploaded to RDBASE.NET: RD Base license agreement 2014.pdf (16.4KB), Compounding test matrix example-2.pdf (260KB)