

Minutes of the 2nd “AutoMatIC” (Automotive Materials Intelligence Consortium) Meeting

General Motors, Warren, MI, USA

23-24 April, 2015

Attending:

David Helmer	GM
Denise Massa	GM
Vesna Savic	GM
Paul Crepeau	GM
Dale Delgado	Granta Design
Dan Williams	Granta Design
Najib Baig	Granta Design
Richard Painter	Granta Design
Gerry LaRue	Honeywell Turbo Technologies
William Eddy	Honeywell Turbo Technologies
Doug Hall	Honeywell Aerospace
Mark Blagdon	Jaguar Land Rover
Peter Seggewiß	KSPG Automotive
Benoit Changeux (WebEx)	PSA Peugeot Citroën

Summary of Actions:

Minute	Action	Actioned
2.2	Add to list of requirements the idea of a role where someone can view data but not export material cards	GRANTA
2.3	Circulate access control training recording and list of previous trainings	GRANTA
3.2	Schedule session on logging at next AutoMatIC	GRANTA
3.4	Circulate 'Excel exporter matrix'	GRANTA
3.5	Schedule Webex on Excel integration	GRANTA
9.4	Review and respond to GM's feature list	GRANTA
10.4	Circulate Composites Qualification recording	GRANTA
10.5	Put welding schema online	GRANTA
10.5	Schedule welding project follow-up webex	GRANTA
10.6	Follow up with JLR before Joining Team meeting	GRANTA
13.2	Circulate State of the Industry Self-Assessment by May 8th	GRANTA
14.7	Confirm next meeting date and location	GRANTA
GENERAL	Circulate minutes, Granta and member presentations	GRANTA
GENERAL	Granta to ensure all stories/features discussed are captured in the appropriate place	GRANTA
GENERAL	Granta to consolidate user stories discussed in the meeting and provide voting lists as appropriate	GRANTA

Minutes - Thursday 23 April, 2015

1. Introductions/Welcome/Agenda Review

1.1 Richard Painter welcomed the AutoMatIC to their second meeting and thanked GM for hosting it at their Warren facility. All of the representatives introduced themselves.

1.2 Dave Helmer welcomed everyone to GM's site, and provided some background on GM's current and planned projects with Granta.

1.3 Dan Williams provided an overview of the agenda for the next two days. One of the goals of the Spring meeting is to identify 'user stories', i.e. specific requirements that the members have in particular areas of interest. The meeting would be split between *Member Updates*, and technical sessions to discuss these user stories. Dan showed the results of the April Agenda Poll, which resulted in five technical sessions being identified for this meeting: Workflow, Analysis, Simulation, Specification & Selection, and Welding & Joining.

2. "How has AutoMatIC influenced Granta Development?"

2.1 Dan Williams provided an update on Granta's plans for the remainder of the year, particularly those for GRANTA MI Version 9.

2.2 One new area of development is User Management. Dan explained that the User Manager tool, released with MI Version 8.1, makes the management of large numbers of users simpler—something that had been raised by GM at the previous AutoMatIC meeting. Further work on User Manager, particularly to support the bulk management of users, is planned in MI9. GM agreed that this is an important area for them – they have too many users to manage individually. JLR asked about the possibility of a new role for people who can see data in datasheets, but cannot export material cards. **(ACTION: GRANTA)**

2.3 Several members expressed an interest in learning more about access control and user management. It was mentioned that the April MI Training webinar had covered this topic in detail. Not everyone had been aware of this – an action was agreed to circulate the recording of this webinar and the list of previous trainings. **(ACTION: GRANTA)**

2.4 Dan provided an update on MI:Materials Gateway plans. Of particular interest was Granta's current research into the persistence of materials data from CAD to CAE. Screenshots of the new capability to export a Granta BoM from CAD and re-import it into CAE were shown.

2.5 There was a brief discussion about which members currently used a Gateway product. GM do not currently use a Gateway but intend to use the Teamcenter Gateway. JLR have a license for Abaqus/CAE Gateway but would like to use HyperMesh. KSPG use the ANSYS Gateway and would also like to use HyperMesh.

2.6 There was a general discussion about the relative merits of using Gateway versus providing automatically generated material cards to end users. GM commented that using Gateway to make individual material assignments would be much slower than their current process to export all material cards and have them automatically picked up by the server. KSPG pointed out that for their situation, the ANSYS Gateway provided capabilities that were helpful. One key aspect of the

Gateway use case is that it could be possible to retain complete knowledge over who accesses which materials data – something that would be lost once users have access to flat material card files. However, Granta would need to improve its logging capability to allow members to make use of this advantage.

3. Member Update – JLR

3.1 Mark Blagdon presented JLR’s member update. JLR are 3 years into their project to store all relevant materials data for the company in GRANTA MI with interfaces to CAD and CAE. Mark highlighted some of the challenges in reaching this vision.

3.2 One challenge is administering users. JLR have 300 user licenses but are required to manage these users manually, which makes it difficult to show the software to potential users without putting themselves in the position of not complying with their license agreement. Something that could help them greatly in this area would be better logging – if they had a way to produce accurate data on who was using the software, they would be in a better position to know how many spare licenses they could use, and in a better position to justify license spend to management. It was agreed that we would schedule a Logging session at the next AutoMatIC meeting to go into detail on what kinds of logging would be most useful. **(ACTION: GRANTA)**

3.3 Another issue raised was documentation/training. A number of capabilities of MI, such as exporters for Excel, and text exporter writing, were felt to be not well understood at JLR. Dan Williams mentioned that Granta has recently appointed a new resource focused exclusively on developing MI training materials, the role having been taken by a previous GRANTA MI implementation consultant. This resource should allow Granta to greatly improve training materials.

3.4 Other issues were raised about the technology of CAE import and export. JLR had a number of teething problems in this area – more CAE model experience and better tools from Granta would help greatly in this area. Members expressed an interest in the idea of sharing importers or exporters that had been developed by other members. In general, it was felt that this would not involve the sharing of confidential data. It was agreed that GRANTA would send around a ‘matrix’ of exporters and members, to identify which exporters members currently had, and which they desired to have. **(ACTION: GRANTA)**

3.5 Mark expressed a desire for better tools to compare and report on data – and simpler workflows for creating/storing and releasing data that don’t require the use of multiple tools (Excel, Toolbox, Admin, Viewer). Of interest might be a way to provide ‘Excel Synchronization’ – so that data could be laid out in Excel in a way that engineers understand, quickly edited and sent back to MI. A number of existing and planned developments were mentioned, including: current capability to write Excel macros to talk to MI’s API (e.g. quick ‘import’ button, which several members use); current “Automatic Template Generator” in MI8; planned work in MI9 to improve data export, including direct export from MI:Viewer. Members expressed an interest in a Webex on Excel integration before the next meeting. **(ACTION: GRANTA)**

3.6 JLR would be interested in more embedded tools, e.g. curve fitting, data smoothing, etc. Dan Williams mentioned that Granta has plans in this area in Version 9, and that this would be discussed in the subsequent “Analysis” technical session.

3.7 Mark presented a case study with screenshots of the entire process of finding data in JLR's Virtual Engineering Hub and generating an input card, with full traceability.

3.8 Mark identified a number of small features that would make a big difference. These included improvements to MI:Admin and Toolbox, such as the ability to launch from the command line with a chosen default database; and a "URL generator" to support the creation of Viewer record URLs for embedding in, e.g. material cards.

4. Technical Session – Workflow

4.1 Dan Williams presented Granta's plans for adding a Workflow capability to GRANTA MI. The first version of this capability will be released with MI Version 9, and is likely to focus on two kinds of workflow: a materials approval/release workflow, and a materials data analysis workflow.

4.2 Members discussed which 'stories' were missing from the current list – both generic features which a workflow tool would need to have, and additional specific workflows that it should support.

4.3 Additional specific workflows suggested included: a *Revisioning* workflow, for example where a material expert modifies material properties, and people who have used that material, e.g. assigned it in CAE or PLM, get notified of the change; and the possibility of multiple *Requesting* workflows depending on who initiates the request. For example, if a new material is requested by the materials group, the sequence of tasks might be different to if it is requested by the design team or a project team.

4.4 Additional generic features suggested included: ability to log workflow history so we can ask "How many of these tasks did we action last month?", or "how long did this task take to run?"; the ability to prioritize tasks generated by a workflow, e.g. "Show me all the tasks I have to do in priority order"; the ability to include AND/OR logic, e.g. "To get to the next step, ALL of these tasks must be done, but only ONE of these tasks must be done"; and the ability to trigger an export of data to CAD/CAE from within a workflow.

4.5. The licensing model for workflow was discussed briefly – e.g. what happens if a workflow is triggered by the user of a non-Granta tool. Would users of those tools need a Granta license? Granta will clarify this before the MI9 release.

4.6 It was mentioned that a workflow to support new Granta users requesting access to the system would be useful. While this might not be something directly relevant to the MI:Workflow plans, it was agreed that Granta could provide more helpful messaging to users who access the system but are denied access – such as a message to guide them to the correct person who can give them access.

5. Member Update – Honeywell

5.1 Gerry LaRue gave a member update for Honeywell. The implementation from an automotive perspective is very early stage; but Doug Hall was also present to represent Honeywell Aerospace who have been using GRANTA MI for much longer. The goal is to have Honeywell Turbo Technologies users accessing the system for a consistent source of all approved materials data and

models, although there is some way to go – in particular most HTT users are currently unaware of what Granta can do for them.

5.2 Logging is a key requirement – so that administrators can find out who isn't using the system and ask: "how can we help you?"

5.3 A question was raised as to how members enforce the use of Granta in their organizations. Doug Hall mentioned that at Honeywell Aerospace, they use a Peer Review process to ask people where they got their data – the answer must either be "from Granta" – or that the engineer will request that the data be put into Granta.

5.4 Other key issues included the storage of large amounts of data – particularly removing any limitations of file size or number of data points. Gerry mentioned dynamic stress/strain data sampled at high rates – potentially tens of thousands of data points.

5.5 A new role was proposed – administrators who could modify the database schema but not actually see the data itself.

6. Technical Session – Analysis

6.1 Dan Williams presented Granta's plans for incorporating more data analysis tools within GRANTA MI. There is a balance that needs to be struck between providing complete flexibility to manipulate curves and data (i.e. replicating MATLAB, Excel, etc.) and having all analysis done outside MI.

6.2 Members identified User Stories for data analysis that would be useful to their organization. The full list is captured in Granta's AutoMatIC user story list, but examples included:

- Fitting of curves, e.g. polynomials, to data
- Extrapolation
- Smoothing
- User interaction with charts (e.g. removing outliers, picking points of interest)
- Capturing the traceability/metadata of what analysis has been done and why

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The first day of AutoMatIC was concluded with a tour of GM's Material Testing Laboratory, and a Consortium Dinner.

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7. Member Update - PSA

7.1 Benoit Changeux presented PSA's member update. PSA have deployed their database for simulation data, "BASMAT+", which contains areas for raw test data, processed test data and computational (simulation) data – as well as tables to support the mapping of materials to component/part families.

7.2 PSA are very interested in the welding/joining schema – and expressed a concern that in their scenario they foresee many tens of thousands of records in such a database.

7.3 Benoit asked the group how they currently managed the problem of data validation workflow. KSPG explained how they carefully define the material managers who are able to release data – they manage the process by having a relatively small number of authorized 'approvers'. Doug Hall presented a slide on Honeywell's process, originally shown at MDMC. Honeywell have defined the process of data validation in distinct (but often parallel) steps – and clearly mark out the team responsible for each step in the process.

7.4 Benoit also asked the group what their use and philosophy towards Gateway was. There was discussion about the change of culture required for users to be accessing data without screening it first—potentially better visualization/'print preview' tools in Gateway would be helpful here.

7.5 Benoit was asked what exporters PSA have built. He cited RADIOSS, Abaqus, NASTRAN, PAM-STAMP and Autoform. Members again expressed interest in sharing a 'matrix' of exporters to facilitate consortium sharing of exporters. (See action 3.4)

7.6 PSA also have an interest in better tools for managing users, improved training/documentation for text/Excel exporters, and simplification of options for linking.

8. Technical session: Simulation

8.1 Najib Baig presented an introduction to the various options for managing data for simulation. Three high level options were discussed: (1) Managing material cards purely as text files, (2) Storing material models in the database as structured numeric data, and using MI's capability to format that data in card format on request without manipulating any numbers, and (3) Allowing Granta to manipulate data before producing a final card, i.e. using data transform algorithms on-the-fly to generate data for simulation.

8.2 Option (1) is the method currently employed by GM. It has advantages of simplicity and is the fastest method to get up and running. Downsides were discussed, such as: the difficulty to visualize, compare or modify data when it is stored in text files; the inability to log who uses a material card once it has left the Granta system. User stories were proposed, such as an in-built text editor within Granta to make tweaks to cards and read them back in with full traceability.

8.3 Option (2) is seen as a desirable state in many ways, as the downsides above are not present. However, it takes time to reach this state. JLR has made progress – although still has work to do. User stories here include: more robust methods to import and digitize legacy material cards and cards sent by suppliers; ability to compare and visualize the material model data, and perhaps

compare it to a card that the user has received from another source; the ability to use Excel (or similar) as a means to view and edit model data by laying it out in a format that resembles the actual material card.

8.4 In general, Option (3) was not favoured by members. Material models tend to be the results of lots of expert processing and iteration – and not something that members feel comfortable being generated automatically. Some exceptions were noted: (a) the pre-processing necessary to generate the first pass material card for a calibration – which could be done by analysis tools such as those presented in Technical Session 2, and (b) certain kinds of fatigue data processing, where it would be useful to generate coefficients directly from curves, rather than going via Excel.

8.5 A number of generic user stories were also added:

- Tools to guide users towards recommended exporters for a material: GM currently have an attribute which lists the preferred exporters; they have an automated batch script which then exports the correct card
- Workflows that support the editing of model data and controlling the process of validation before a new card is released
- A ‘Time Machine’ capability, proposed by PSA, which would allow you to dial back the system to a particular date and generate the cards that would have been available at that time. In general, it is important to be able to capture the version history of material cards, regardless of which option (1), (2) or (3) is chosen.

9. Member Update – GM

9.1 Denise Massa and Vesna Savic presented GM’s member update. GM have recently begun their MI implementation, beginning with a replacement of their CAE database. They have an ambitious goal of 15,000 GM users and another ~4,000 supplier users – so ease of user management will be a crucial requirement.

9.2 Denise explained their long term vision, including GRANTA MI as the “Authoring Gold Source”, Teamcenter as the “Consumption Gold Source” and ultimately the goal of separating Part and Design, with material callouts appearing in the correct place (“EDGE”).

9.3 Vesna provided a live demonstration of GM’s CAE data within GRANTA MI.

9.4 Vesna discussed some smaller features that would make a big difference; she has sent a list to Granta. Granta to respond offline to GM on these. At least one of the requirements (freeze top pane of record) is a bug that has been fixed. **(ACTION: GRANTA)**

Before the lunch break, GM also treated members to an impressive 3D visualization demo in their Global Visualization Center.

10. Project Session: Welding & Joining Schema

10.1 Dan Williams provided an update on the Welding & Joining Schema project. A number of members had commented that this kind of project could be an important way for members to show ROI on attending AutoMatIC meetings – to show short term deliverables as well as longer-term strategic plans.

10.2 Members have already contributed useful information on the scope of the schema, and Granta has put together a prototype database for further feedback. Dan demonstrated this database, including:

- Use of 'Pedigree' tables to capture information about the joined materials and also the 'joint pedigree', which includes welding parameters and the sequence of materials in the joined stack
- Use of 'Selection' tables to help users find the appropriate joining process for a given set of requirements, and identify 'tribal knowledge' about particular welding and joining processes
- Use of Test Data and Simulation Data tables to store properties used in engineering
- Use of MI:Explore to provide an alternative means of searching and viewing data to MI:Viewer

10.3 The members provided some initial early-stage feedback on the prototype:

- It may be necessary to have different tables for each test type; this will depend on the complexity and number of test types – if possible it would be desirable to keep things simple and have a single test table.
- It may be necessary to add a Statistical Table to capture the roll-up of test data into simulation data, with traceability
- It would be good to have various reports that can be generated, such as a report on what testing has been completed for a particular joint or combination of materials. Different reports may be necessary for different consumers, e.g. a report for the Manufacturing Engineering department might be different to a report for a CAE group.

10.4 It was mentioned that Granta has developed some similar tools in the area of composites. Members noted that they weren't aware of the recent Composites Qualification webinar at which these tools were shown. Granta will circulate details of a recording of this webinar. **(ACTION: GRANTA)**

10.5 Dan proposed to put the prototype database online so that members could log in and use it; a project webinar could then be used to collect feedback. **(ACTION: GRANTA)**

10.6 Mark Blagdon has an upcoming meeting with JLR's joining team – it would be great if a prototype database were available online before then. If not, some screenshots/video would be helpful. **(ACTION: GRANTA)**

11. Member Update: KSPG

11.1 Peter Seggewiss presented KSPG's member update. KSPG have one of the most mature implementations of the group, having begun their project in 2011 with a goal of KSPG-wide availability of material knowledge. The tools for CAE engineers and material experts are almost complete; more work needs to be done to involve key designers and product managers.

11.2 KSPG experienced challenges with exporter development – particularly in managing their modified exporters between GRANTA MI versions. Peter proposed an alternative model for MI's data structure, where Exporters and Unit Systems could be managed independently of databases. This could greatly reduce maintenance and development efforts.

11.3 Peter presented some information on how KSPG demonstrated Return on Investment from Granta. Arguments based on data from Granta's 2012 "Business Case for Materials Information Management" were employed—such as: time spent searching for materials data and percentage of duplicate testing—to generate some quantitative figures. A projection for management of the ROI by 2016 was produced which was successful in justifying additional license purchases. This presentation was well received by AutoMatIC members – members were urged to identify and share additional ROI arguments at future meetings.

11.4 Small feature improvements identified by KSPG included improved chart editing, and more consistent search behaviour, such as more consistent behaviour when searching with wildcards and quotation marks. Paul Crepeau from GM mentioned he had also observed unexpected behaviour when searching with and without quotation marks and using other special symbols such as parentheses. Another KSPG request was the ability to generate a filled Excel template with data from a particular record; Dan Williams mentioned that this was a feature shortlisted for development in the MI 9 timeframe.

12. Technical Session: Selection & Specification

12.1 Denise Massa gave a presentation on GM's method for material naming, selection and specification. GM has made significant progress in defining a naming convention for a large proportion of their materials – this naming convention is reflected in their GRANTA MI CAE database.

12.2 Other members agreed that this was one of their bigger challenges. Dan Williams asked how Granta could help: in general it was agreed that this was not something that could be solved with software features, but that the networking and best practices promoted by AutoMatIC would make a big difference.

13. Industry Report

13.1 Dan Williams presented an update on the State of the Industry Report. The goal of the report is to capture the drivers for materials data management and the current 'snapshot' of where the industry is with respect to its goals. To do this, a 'self assessment' spreadsheet is proposed, which members will complete each year.

13.2 Dan showed the current draft of the spreadsheet and explained how it works. Members were enthusiastic about using this tool to better understand the overall picture of where the industry is. A timeline was agreed to circulate the spreadsheet by 8 May; to have member self-assessment done by 30 June, and to circulate the 2015 Report in September 2015. **(Action: GRANTA)**

14. Wrap-Up

14.1 Richard Painter thanked members for their contributions and attendance, and thanked GM for the great job they had done in hosting the April meeting.

14.2 There was a discussion about the meeting format and things members would like to keep or do differently. The agenda poll was agreed to be a good thing, to provide transparency in what topics

get discussed. In general, the discussions relating to Member Updates were seen to be the most valuable part of the meeting.

14.3 To allow more time for member updates, it was proposed to increase the meeting duration to 2 days – this would also make it easier to justify attendance to management. One suggestion was to have all the member updates on the first day, rather than spread them out over the two days.

14.4 It was suggested that it would be useful to circulate member presentations before the meeting, so other members would have time to think of questions they would want to ask.

14.5 Doug Hall suggested it would be useful to spend 30 minutes reporting on the other Granta consortia – for example to see whether all the consortia were aligned in priorities or had diverging requirements.

14.6 Richard Painter proposed holding the next meeting in Europe, the week of October 19th. Mark Blagdon volunteered to host the meeting at JLR; Peter Seggewiss also offered KSPG as an alternative location.

14.7 Granta will discuss offline with JLR and KSPG and circulate an agreed meeting date and time.
(Action: GRANTA)