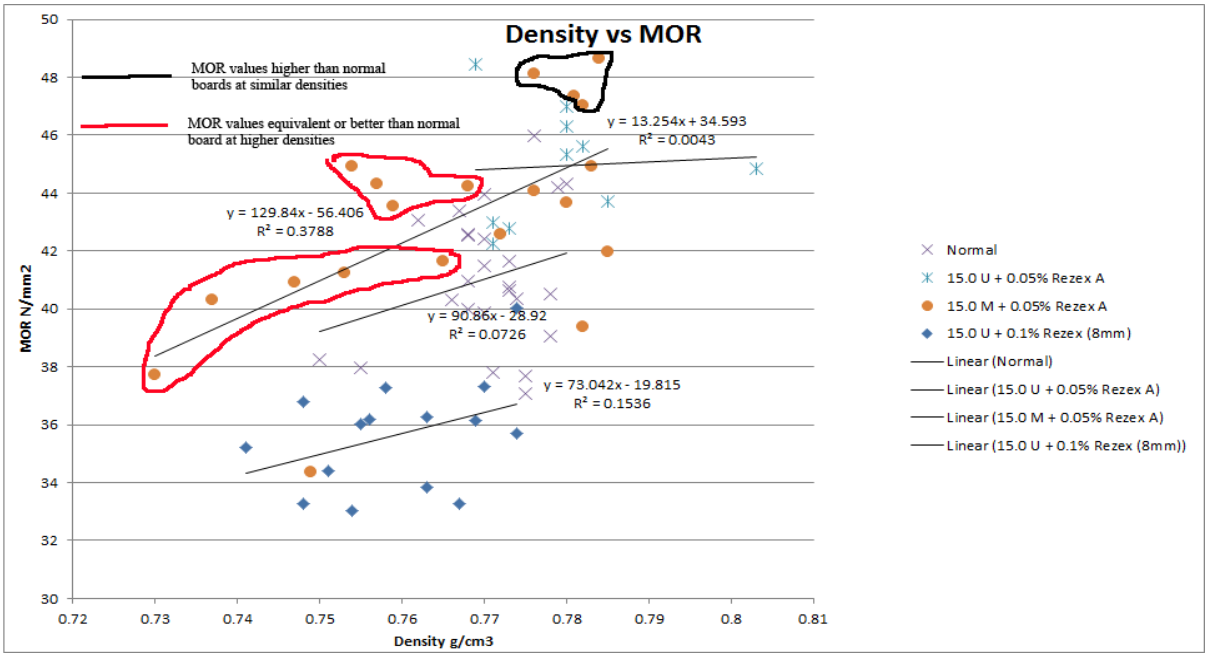
Report on Rezex A trials Daiken Miri September 2013

Abstract

The aim of the Rezex A trials was to determine whether MDF can be made at lower densities due to the expense and availability of wood supply. Trials were run with a Grundfos low dosage pump using scales to continually check the correct dosage. The dosage of Rezex A was based on dry fibre and two addition rates were used, 0.1 & 0.05%. The Rezex A was added above the resin dosing pump meaning that the pressure of the Rezex A need only be about 1 bar.

The principle behind the addition of Rezex A is to significantly reduce the surface tension of the resin mix in order to reduce the droplet size of the resin going into the blow line. The smaller the droplet size in the aerosol, the greater the cumulative surface area of the resin per unit volume enabling far greater resin spread. However to ensure the true efficacy of this the resin must be pumped at a greater pressure than that in the blow line, the greater the difference the better the aerosol effect. The addition of Rezex A will further enhance this. This will also have a concomitant effect in that there will be less build up of resin in the blow line. To increase resin pressure it is necessary to reduce the size of the injection nozzle. The nozzle size was reduced from 12 to 8mm.

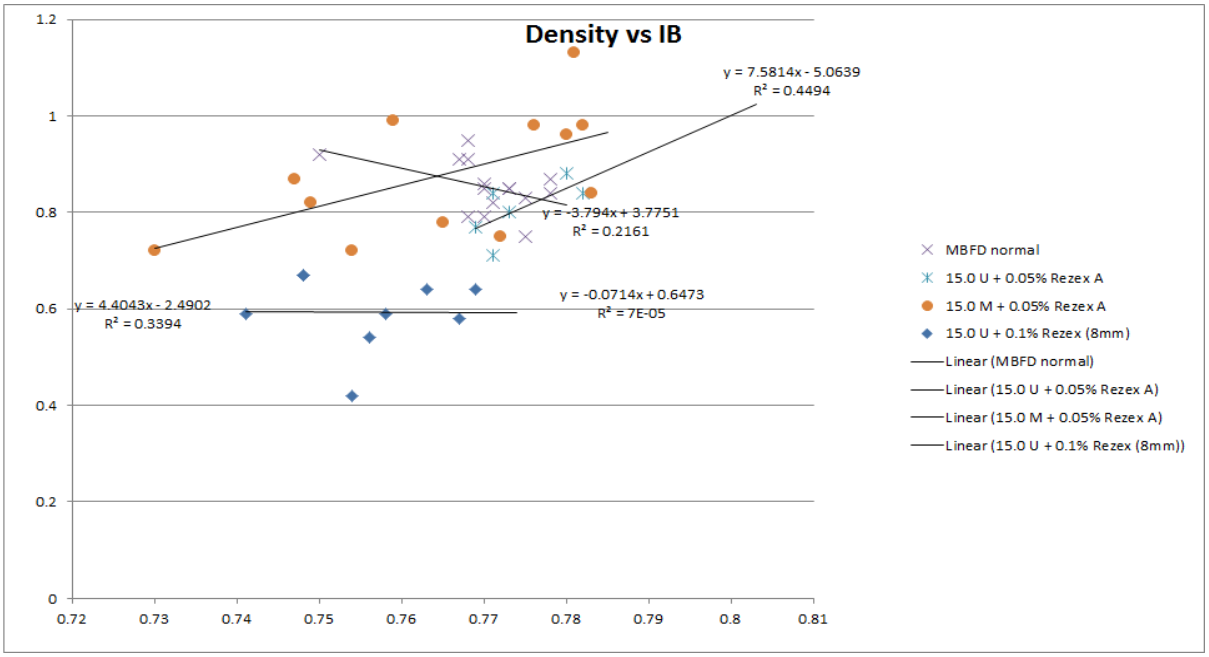
It has been shown using the well prepared data by Ms Eileen Wong (and I acknowledge her excellent efforts), at the dosage of 0.05% that addition of Rezex A enabled significant reductions in board density while maintaining or even improving both MOR and IB values thus achieving the aim of potentially reducing wood use.



The above graph for 15mm Density vs MOR clearly shows three significant factors:

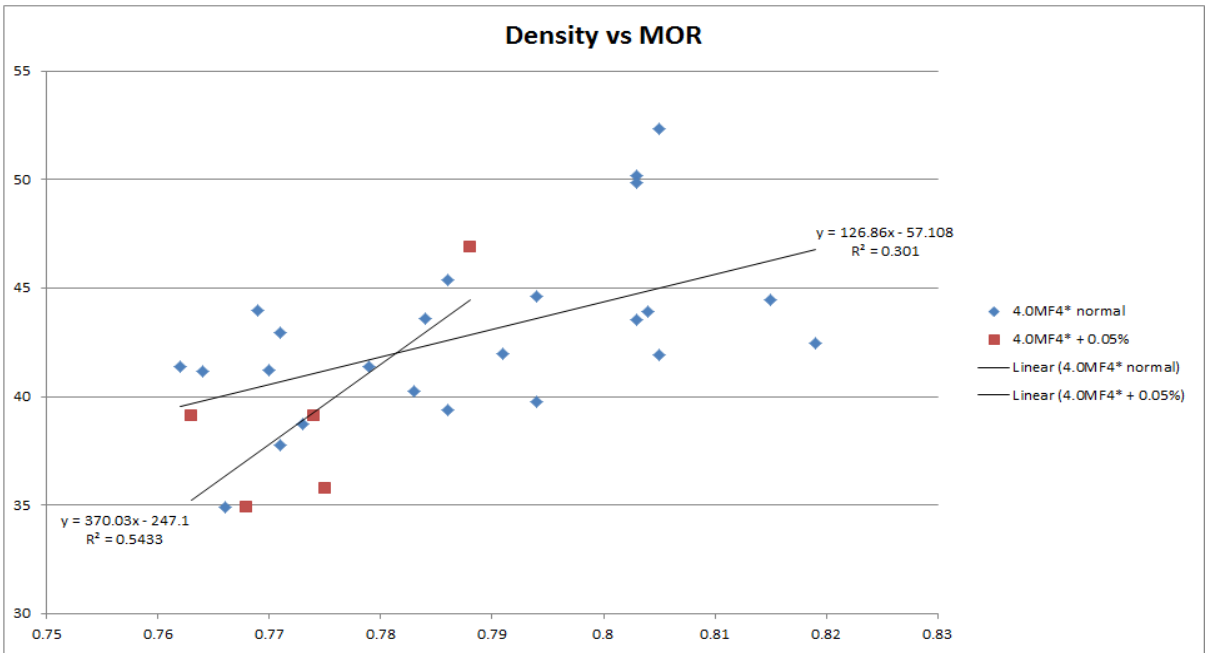
1. At similar densities, board made with 0.05% Rezex A have higher MOR values to boards made without Rezex A
2. Boards made at lower density with Rezex A added at 0.05% have similar or better MOR values to boards made without Rezex A

3. Rezex A addition of 0.1% is not an effective option as it would appear that resin may be penetrating into the fibre too much. This of course means that less money is spent on Rezex A making it more cost effective

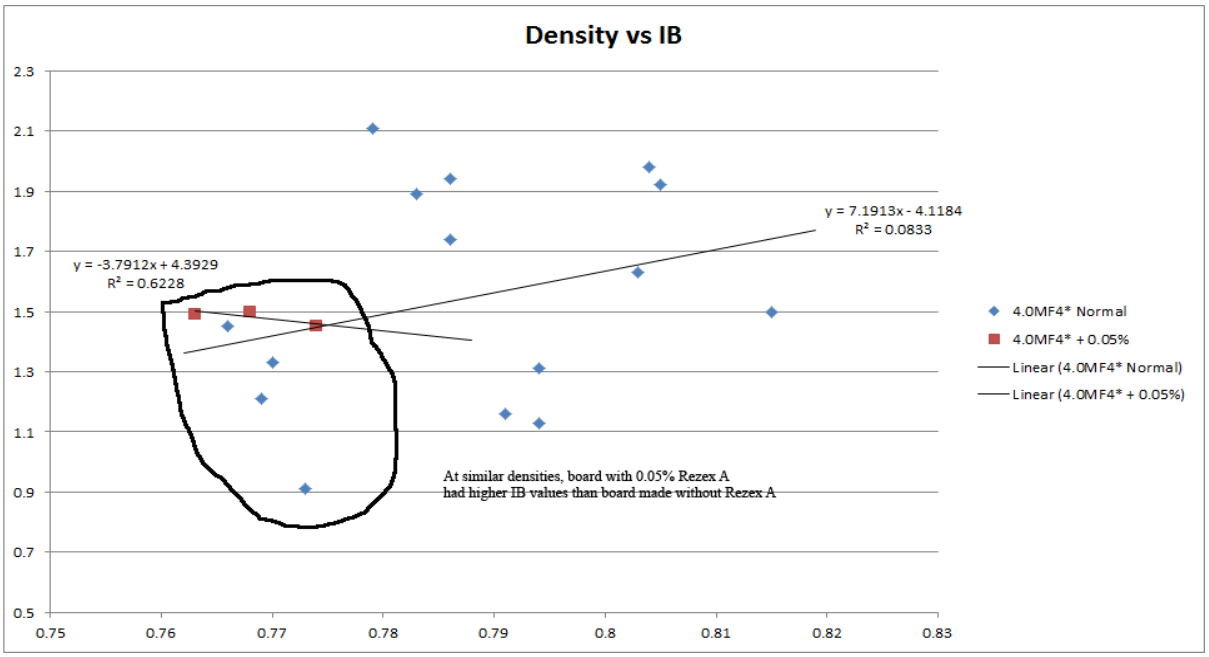


The 15mm Density vs IB graph shows the following:

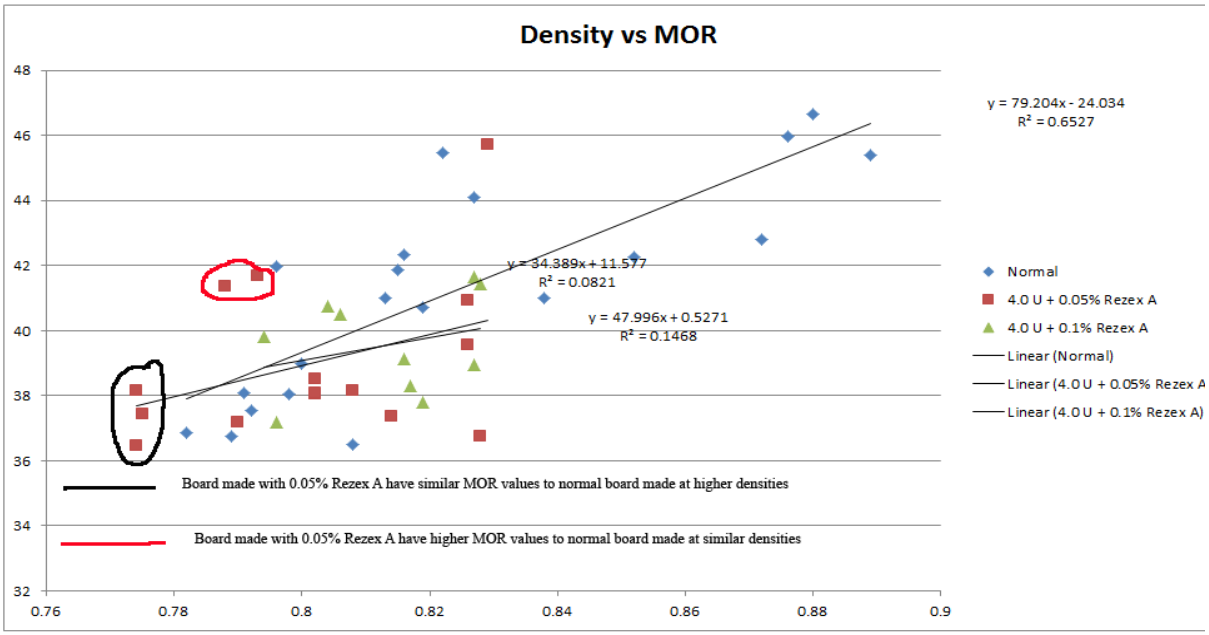
1. The addition of Rezex A at 0.05% at lower density gave at least equivalent properties to normal board at higher densities
2. The addition of Rezex A at 0.05% gave better IB values than normal board at similar density.
3. The addition of 0.1% of Rezex A let to poorer IB properties due to I believe excessive resin penetration of the fibres.



The chart 4.0MF4 Density vs MOR in my opinion does not show a clear trend and further trials are required.



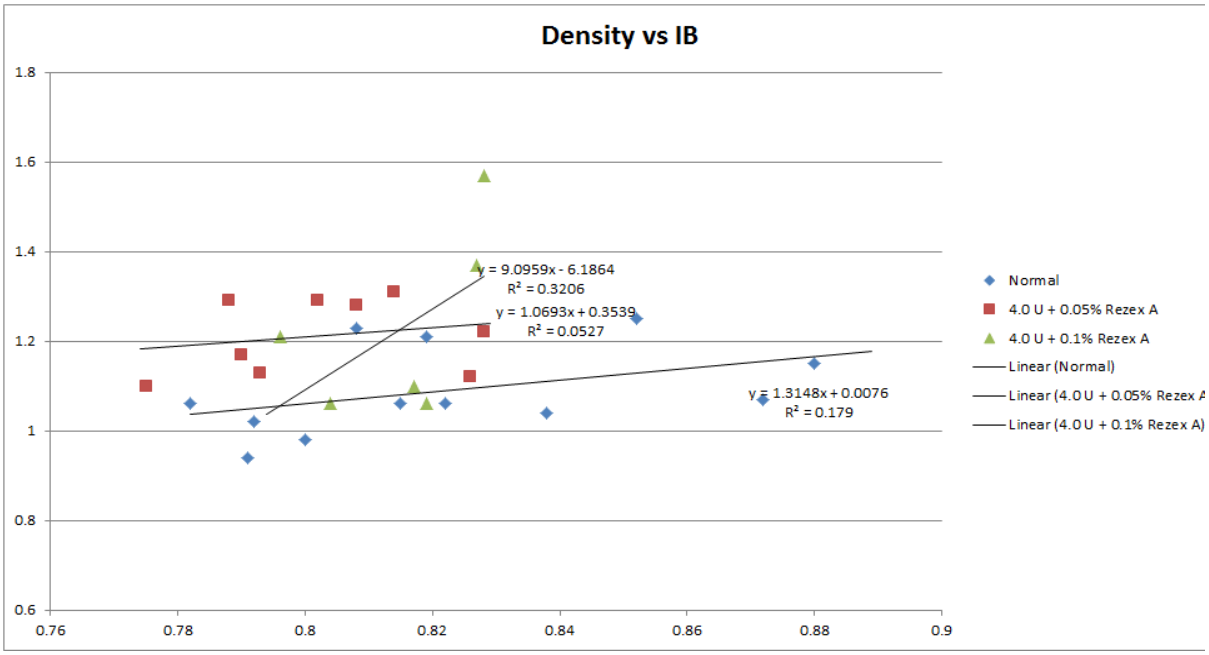
The chart 4.0MF4 Density vs IB clearly shows that at similar densities, board made with Rezex A added at 0.05% had higher IB values to normal board made without Rezex A.



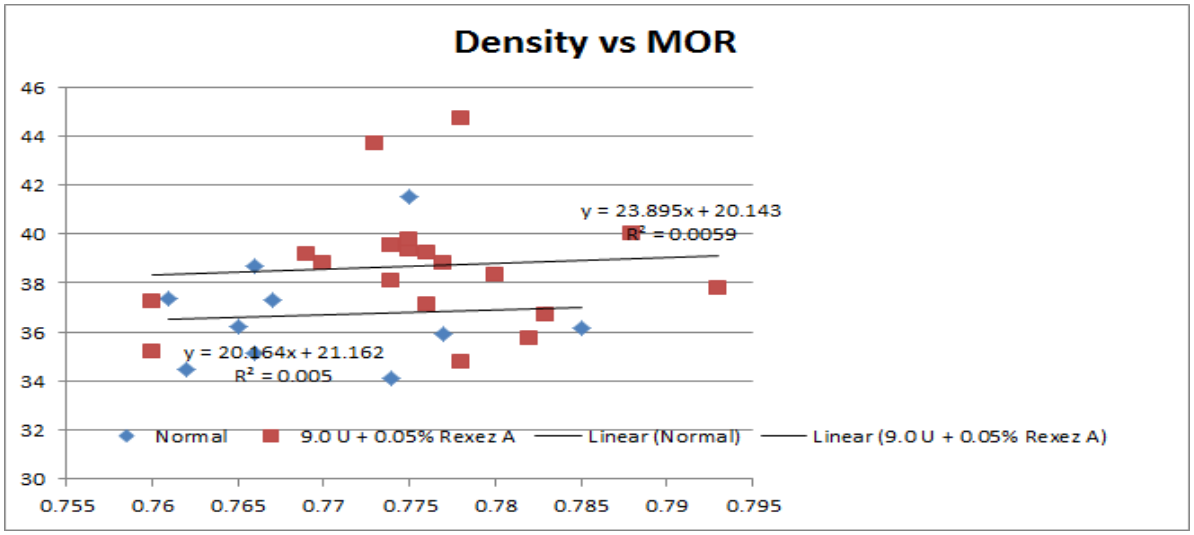
The chart 4.0 U Density vs MOR shows the following:

1. At similar densities, board made with 0.05% Rezex A have higher MOR values to boards made without Rezex A
2. Boards made at lower density with Rezex A added at 0.05% have similar or better MOR values to boards made without Rezex A

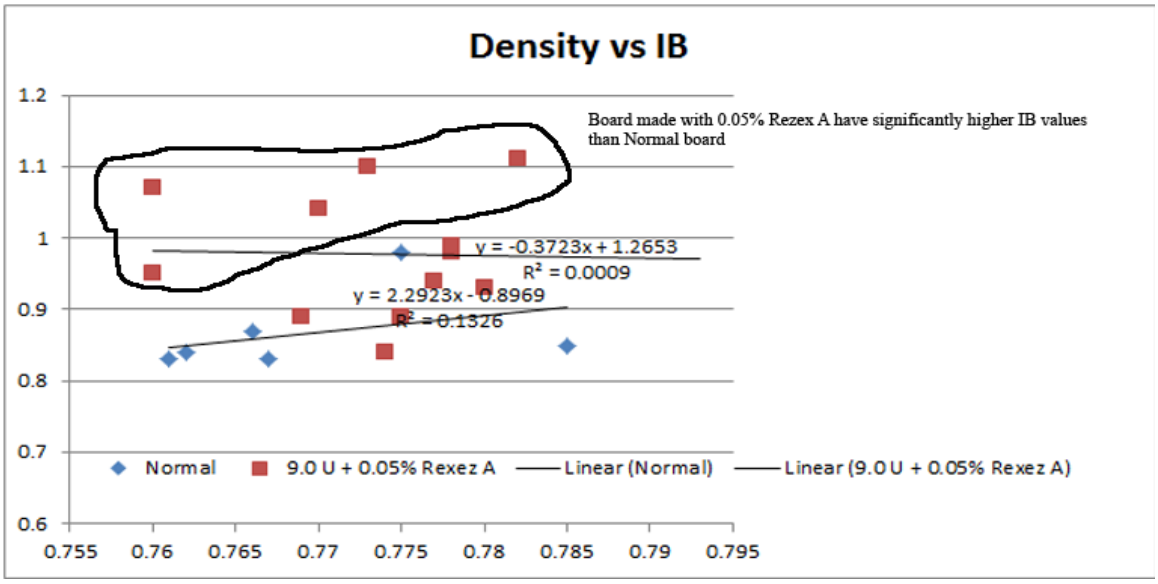
3. Rezex A addition of 0.1% is not an effective option as it would appear that resin may be penetrating into the fibre too much.



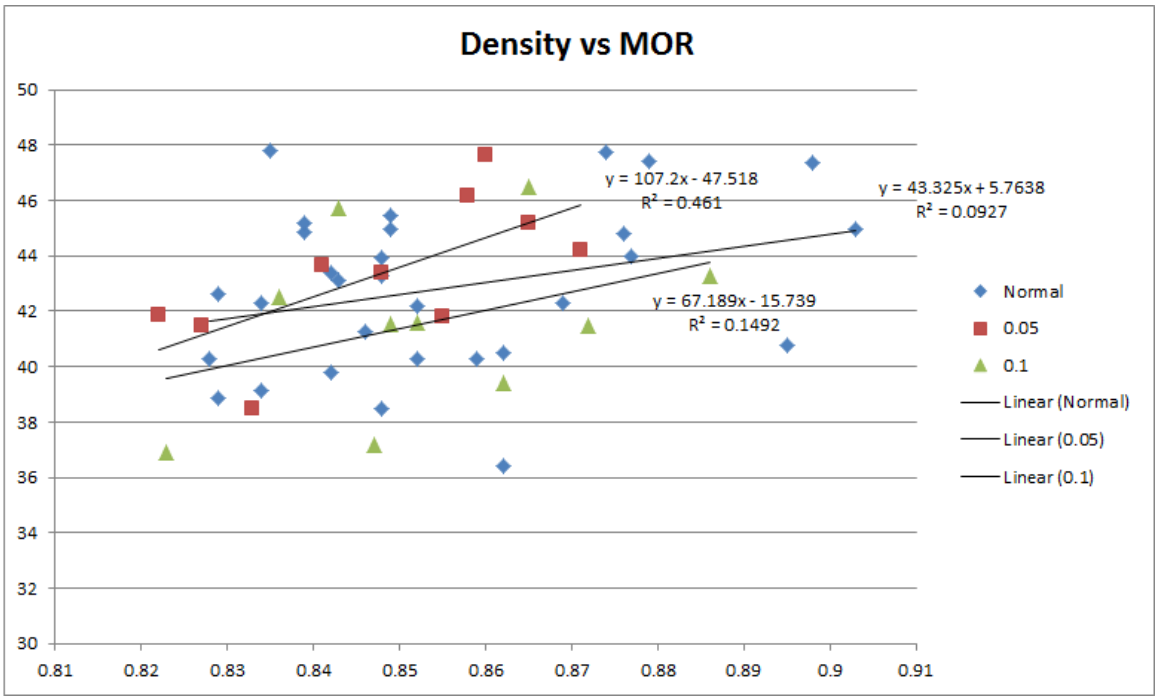
The chart 4.0 U Density vs IB clearly shows the improvement of IB properties with the addition of Rezex A at 0.05% at similar densities. The addition of Rezex A at 0.1% does not show any clear trend and I would recommend that it not be pursued.



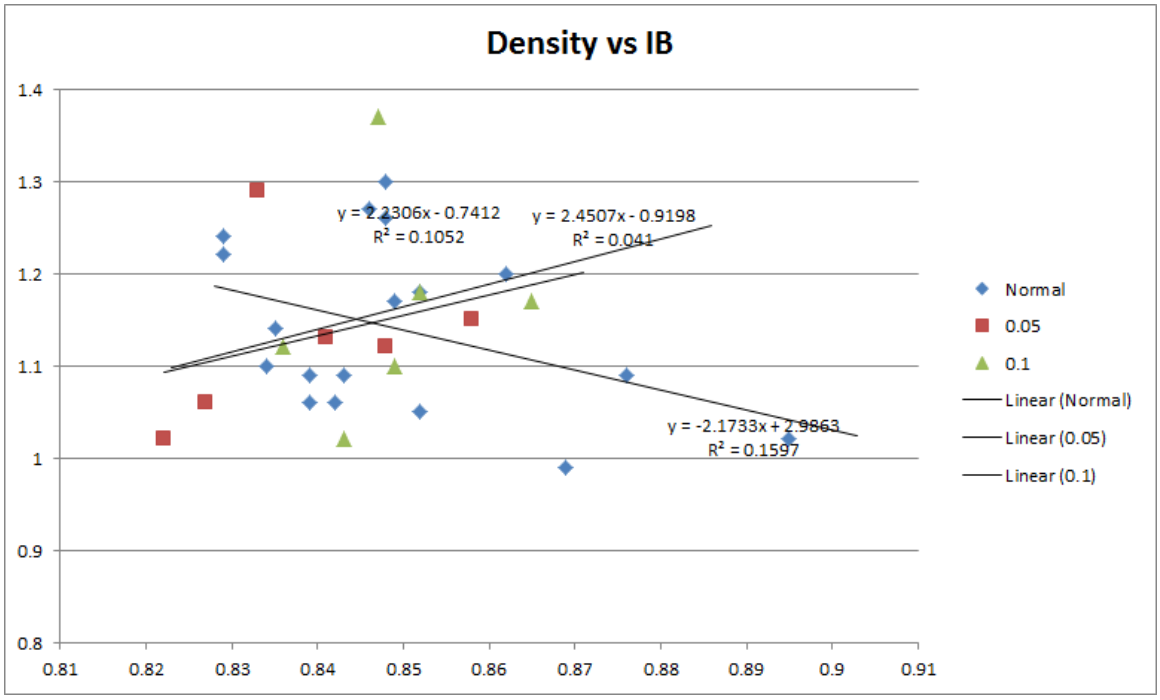
The chart 9.0 U Density vs MOR clearly shows that the addition of Rezex A 0.05% to board improves MOR values over normal board.



The chart 9.0 U Density vs IB clearly shows the improvement in IB property values compared with Normal board made without Rezex A.



The chart 2.5 U Density vs MOR again shows that boards with Rezex A added at 0.05% have better MOR values than Normal boards of equivalent density. It also shows that the addition of Rezex A at the higher concentration of 0.1% shows no clear trend. Note the higher R squared value for the regression for the 0.05% addition of Rezex A 0.461 which shows greater predictability



The chart 2.5U Density vs IB shows that at the lowest densities board will still produced with perfectly acceptable IB values.

Conclusions

Given that board was made over all the thicknessed trialed using both UF and MUF resins, at lower densities with equivalent of superior IB and MOR values it is recommended that Daiken Miri implement the usage of Rezex A. As such it is recommended install a permanent dosing system for Rezex A as was recommended using a Grundfos DDA 30-4 low dose pump associated with a Siemens magnetic flow meter. (Ray Roberts to get the full details of this). It is further recommended that the initial dosage of Rezex A be 0.05% on dry fibre.

In the meanwhile it is recommended that further trials be run using the existing pump however it is *essential* that the existing pump be recalibrated in the laboratory because I felt on the last day it was giving fluctuating dose rates. It is essential that the dose rate of Rezex A be accurate and consistent as it was also shown that the higher dose rate did not necessarily give promising results due to the probable penetration of resin from the fibre surface into the fibre lumens.

It is recommended that Daiken DMR ensure maximum resin pressure in the resin line to optimise the effect of Rezex A reducing the droplet size and so improving resin spread. It is therefore suggested that the nozzle size be kept at a minimum to ensure maximum pressure. Improved aerosol efficiency should also result in reduced resin buildup in the blow line after the injection nozzle.

It is also recommended that Daiken Miri give Oxford Technologies Pty Ltd a demand forecast for Rezex A so that the necessary raw materials can be procured as this requires relatively long lead times.

It is also recommended that the press cycle for 15mm board be modified so that time to full pressure by slightly delayed to increase the core density of the product and so improve IB values.

Dr Ray Roberts 2nd October 2013