

LINEAR BOOK SCANNER

Gérard Tolboom Contribution
to fine tune DanyQ's 1st Prototype
Oct-Nov 2013

Summary

Reminders

Goals

Methodology

Function analysis

Saddle cycle

Book cycle

Page, capture, selection, exit

Results

Challenges

Reminder

- 1st Prototype, done by DanyQ, end of Sept 2013, as a base of work
- this equipment has a 60° apex structure, with tefloned alu sheets
- So far quality results (until shipment) were shared

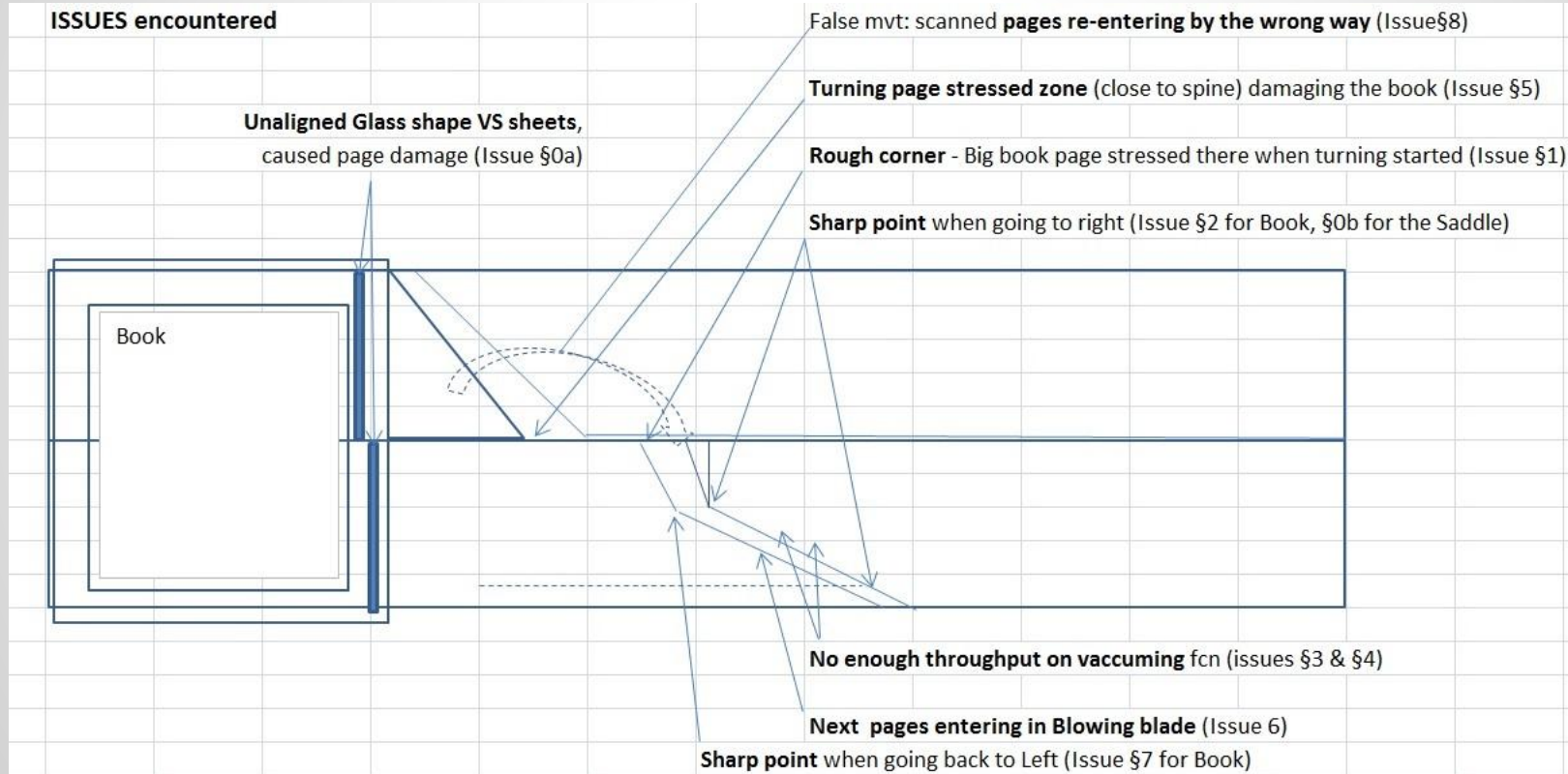
Goals

- Keep the structure as it is, and implement reversible modifications
- Focus on mechanical impacting issues
- Keep in mind, minimum costing improvements

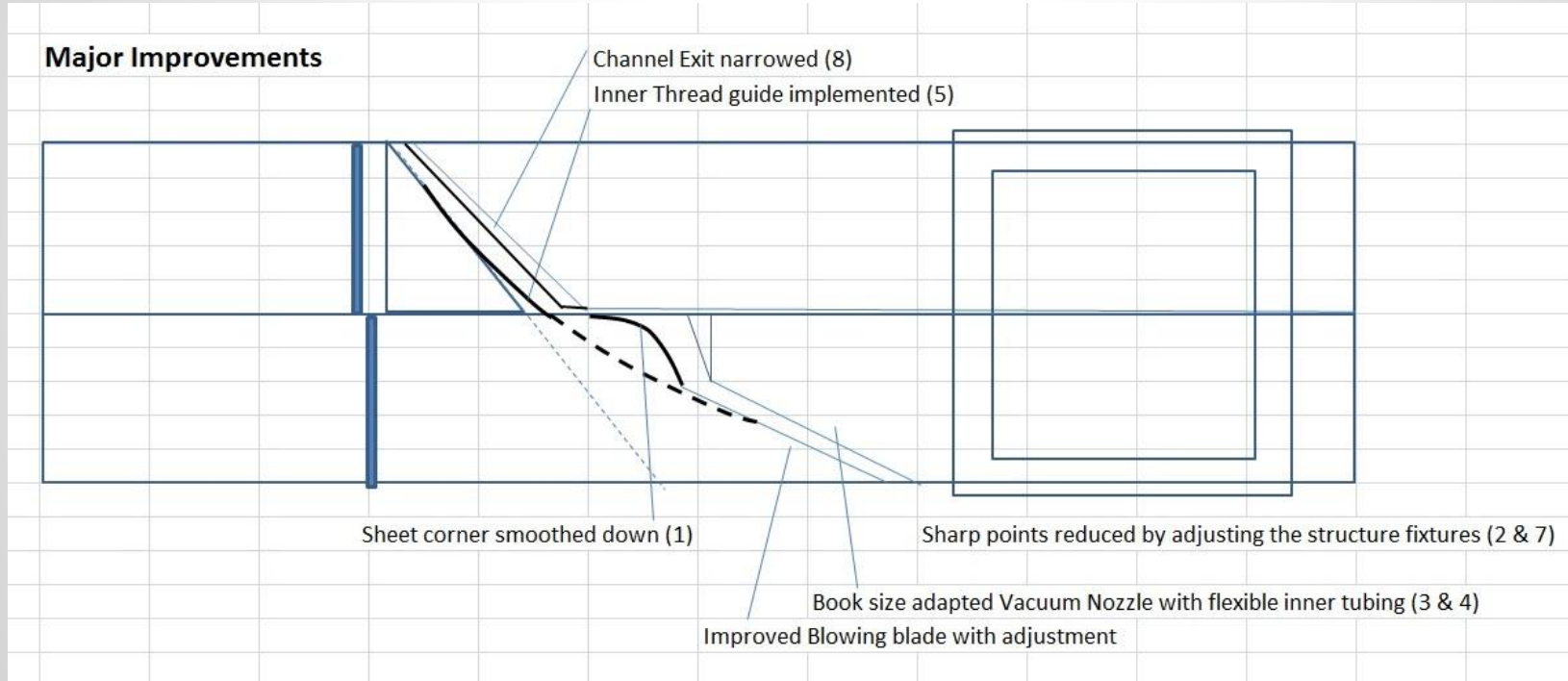
Methodology

- Reassemble the machine
- Launch mechanical testing cycles
 - Have it work, again and again, and understand root causes of book damages
 - Record them, (shared spreadsheet available)
 - Solve issues with
 - Immediate, temporal solutions
 - more long term, costless, (innovative) solutions
- Start Function analysis and step by step troubleshoot

Summary of encountered Issues



Major Improvements done



Function development

Saddle cycle

Book cycle (general)

Page turning cycle

- Page capture

- Page selection (only one at a time)

- Page exit

Calibration

Function devt > Saddle cycle

- No modification done there. all fine
- Movement accidents were minimized by
 - adjusting fasteners on the sheets onto the base (a useful tool for that is a long aluminium ruler to check what shocks might occur and reduce the height variation from one part of the shape to the next one)
 - A tip, provided by Jeff, is to let the book a bit flexible within the saddle fixtures so that the 2 “systems” self adapt with variations, without blockage and/or torn pages.
- Eventually, changed it for the white plastic -available- model : better in Calibration step (no more vertical stripes, better white/color pages)

Function devt > Saddle cycle



Function analysis > Book Cycle

Around 2000 cycles achieved, and still learning!

- 8 types of issues identified
- Each one, more or less influenced by book size, weight, material condition
 - Pressure (or lack of) on set of pages “in contact” with the machine, due to
 - Book number of pages > Weight (from 0,6 Kg...to 1,1, and more?)
 - Moving weight, from one side (not scanned yet) to the other one!
especially affecting outcome at start & end of cycles
 - Book prior bent blocks/pages, and page rigidity

to be confronted with designed solutions (air vacuumed and air blowed limits of effect)

Book movements

no -physical- hurting area should be met during the cycle

featuring *Torn Pages issues*

- this brought to engineer better fasteners (external fasteners for all sheets)
- book guidance was smoothed (since big books blocked on the ramp)
- internal parts adjustment was -still is- a tricky operation, and should bring to further design slight modification



Book movements



Page turning cycle > Catching function

Drawbacks: too much leaks, and losses, not enough focused on the page corner, featuring : *Duplicates issues*

- Local zone vacuuming Head/nozzle was designed sliding in rails and moved by an external handle (no set-up, nor any dismantling)
- Major gain : Efficiency improvement,
- Complementary gain : less power requested, thus less noise and temp. elevation in the closed room :)
- Quality : Each size of book properly picked up > Cycles should be finished correctly (last set of pages captured, for all book sizes)

Catching page function features (1/2)

Local Nozzle

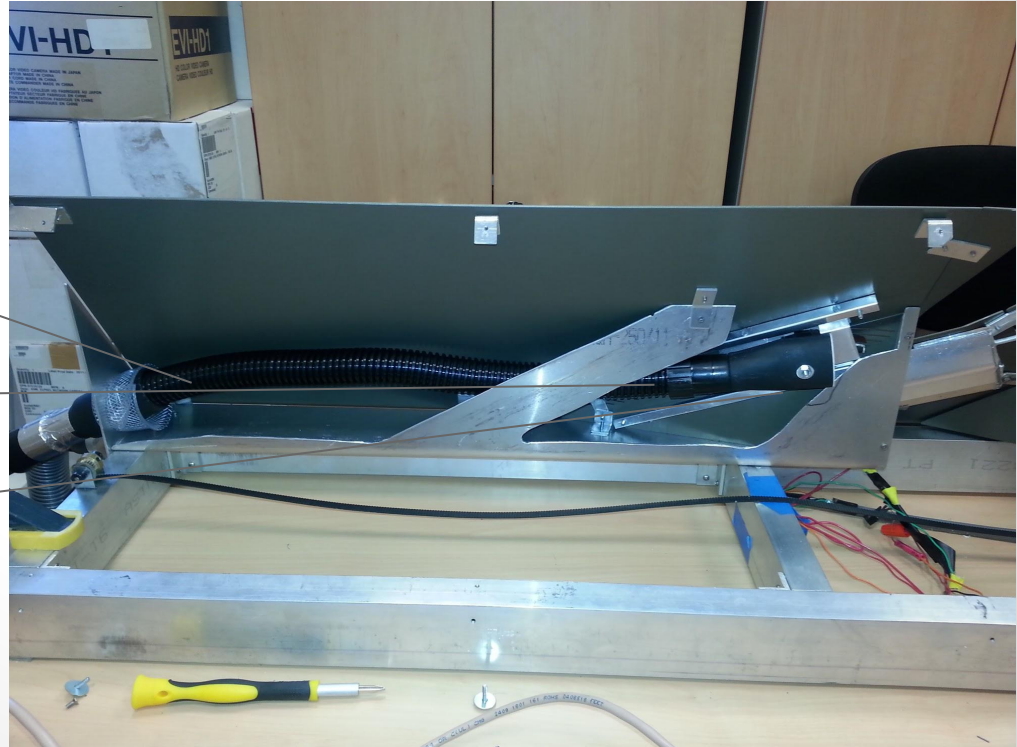
- focusing the vacuuming power to the page corner area
- feature position adjusted to book size corner area through an external handle



Catching page function features (2/2)

Rear view :

- Flexible tubing (and reduced diameter)
- Openings made in alu bent fixture
- Movable nozzle (sliding in rails)



Page turning cycle > channelling function

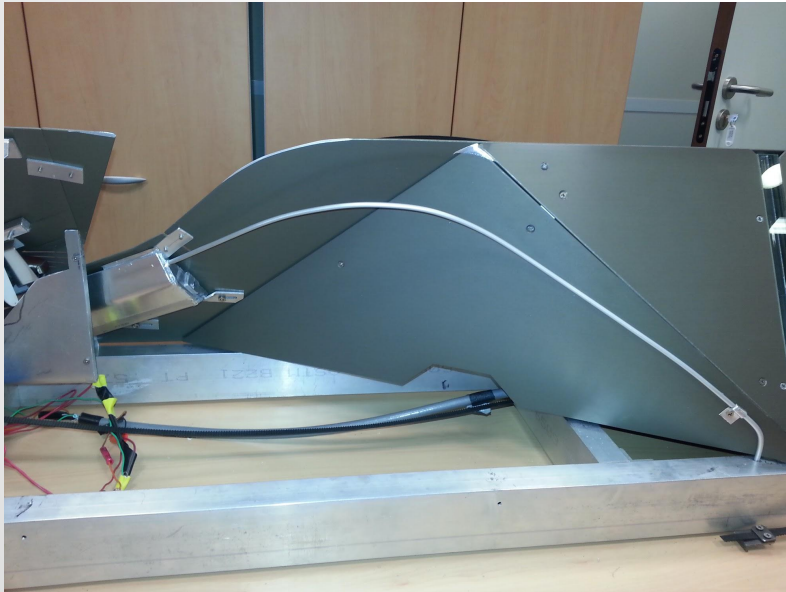
Issue : Turning page reaches this “corner” (since area close to spine often blocks there and let the book damaged)

Solution for the page is to follow the new rail, and to get the spine of the book less stressed



Channelling function

alu rail



Page selection function (Goal : only one at a time)

featuring *Missing Pages issue*

- Leaks reduced or cancelled
- Flow directed to a narrow blade, only 3 mm width, and adjusted outside of any hazardous page cycle (2nd, 3rd one could enter there)
- fixed solution



Page exit channel

Space had to be reduced since book pages re-entered by this way.

- 1st trial was not enough with big book scanned part weighting down the sliding pages
- 2nd add was done on last runs. seems to work.

(modification of the machine 'll consist in let the sheet slide on same distance to come closer)



Outcome : quick cycle video

2 little videos there :

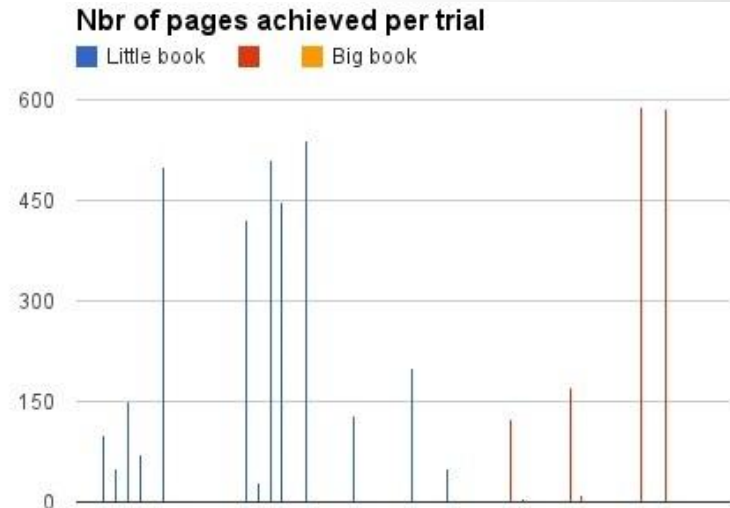
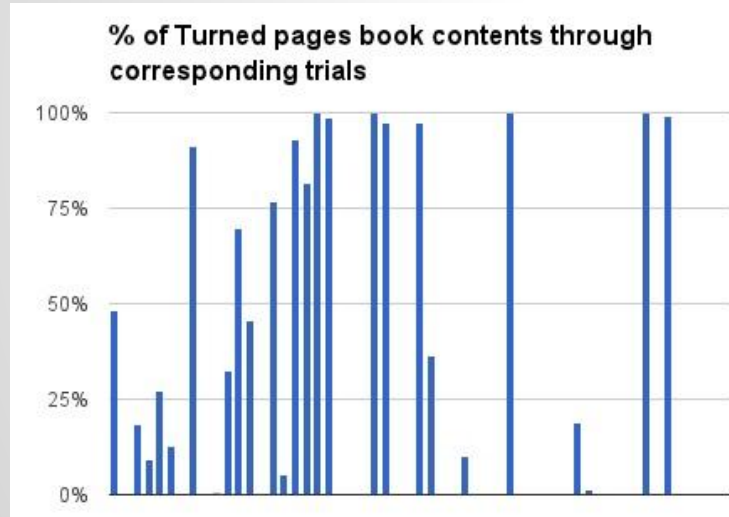
https://www.youtube.com/watch?v=ZS_6nYnXWvs

<https://www.youtube.com/watch?v=ZnKRGJRGqZs>

- Focused Vacuuming zone sub system
- Guiding page alu thread until channel exit
- Enhanced effect blowing blade
- New structure fasteners (more freeness in positioning)
- Avoiding re-entering solution through exit channel
- New (white) saddle adoption

Results (1 / 2)

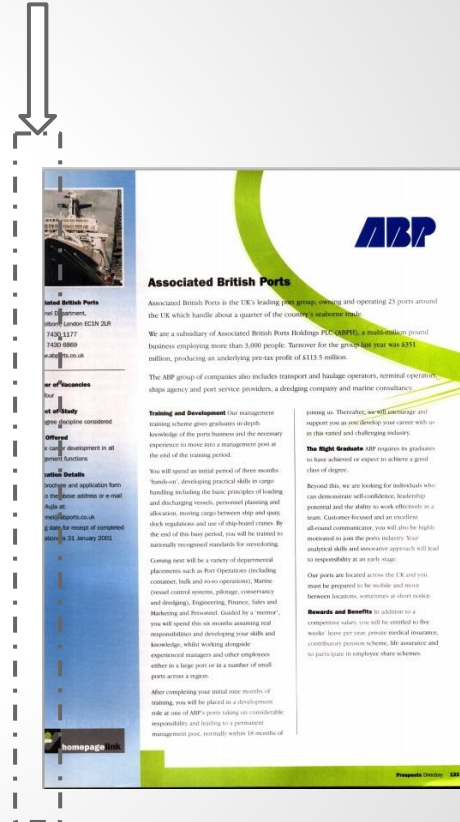
Until Nov 20th : only mech tests were conducted



Results (2 / 2)

As of Nov 20th :

- 1st books scanned !
- Calibration seems ok
- Gutter / central crop won't be addressed with this prototype configuration :)



The screenshot shows the ABP website with a dashed box highlighting a section. A white arrow points to the top of this section. The highlighted section contains the following text:

Associated British Ports

Associated British Ports is the UK's leading port group, owning and operating 21 ports around the UK which handle about a quarter of the country's seaborne trade.

We are a subsidiary of Associated British Holdings PLC (ABH), a multi-sector round business employing more than 3,000 people. Turnover for the group last year was £311 million, producing an underlying pre-tax profit of £113.5 million.

The ABP group of companies also includes transport and haulage operators, terminal operation, ship agency and port service providers, a dredging company and marine consultancy.

Training and Development Our management training scheme gives graduates in-depth knowledge of the port business and the necessary experience to move into a management post at the end of the training period.

You will spend an initial period of three months 'shadowing' developing practical skills in cargo handling including the basic principles of loading and discharging vessels, personnel planning and allocation, moving cargo between ship and quay, dock regulations and use of ship-board cranes. By the end of this three month period, you will be trained to nationally recognised standards for stacking.

Following this will be a variety of departmental placements such as Port Operations (including customer, bulk and reefer operations), Marine Control control systems, piloting, conservation and dredging), Engineering, Finance, Sales and Marketing and Procurement. Guided by a 'mentor', you will spend this six months assuming real responsibilities and developing your skills and knowledge, whilst meeting alongside experienced managers and other employees either in a large port or in a number of small ports across a region.

After completing your initial nine months of training, you will be placed in a development role at one of ABP's ports taking on considerable responsibilities and leading to a permanent management post, normally within 18 months of joining us. Therefore, we will encourage and support you to start developing your career with us in the initial and challenging industry.

The Right Graduate ABP requires its graduates to have achieved or expect to achieve a good class of degree.

Beyond this, we are looking for individuals who can demonstrate self-confidence, leadership potential and the ability to work effectively in a team. Customer focused and an excellent attitude to customer care, you will also be highly motivated to join the ports industry. Your analysis of skills and assessment approach will lead to responsibility at an early stage.

Our ports are located across the UK and you must be prepared to be mobile and move between locations, convenience of short notice.

Benefits and Benefits In addition to a competitive salary, you will be entitled to: free meals; leave per year; private medical insurance; contributory pension scheme; life assurance and no participation in employee share schemes.

homepage link

Prospects Directory 2007

Challenges

- Next step : scan in mass prod conditions,
- Through continuous improvement, troubleshoot relevant issues
- Suggest “serial” design and assembly instructions,



Q&A

Questions welcomed !