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**AB, INC.**

**REPORT FOR**

**LS MANUFACTURING COMPANY**

September 3, 2005

## **Executive Summary**

Consultek has been retained to review all three AB, Inc. operations namely, Daly, CA, Novato, CA, and Atlanta, GA. The following items of interest were reviewed from technical viewpoint:

- Overall manufacturing operation
- Equipment and tooling condition
- Critical needs
- Key personnel competency and expertise
- Expected changes and improvement
- Miscellaneous observations

Overall impression of AB, Inc. operations is positive. Positive in terms of key personnel competency and expertise, plant layout, room for expansion, opportunities for improvement, labor cost reduction through automation, warehouse set-up, building condition, and limited quality issues. There are two areas of concern that need immediate attention, equipment water supply situation in Novato plant and condition of coilers in Atlanta plant. By addressing these two issues, improved efficiency, higher throughput and labor cost reduction benefits can be realized in a short period.

Lack of capital investment in order to maintain condition of the existing equipment is evident in operations in Novato and Atlanta. Injection molding equipment appears to be in good condition. If properly maintained, useful service life of five to seven years can be expected. Only four of the remaining twelve molding machines located in Fresno plant are suitable for daily production. Extrusion equipment (Extruders) in Novato plant is in fair condition and useful life of approximately five years is expected without any major upgrades. Extrusion equipment in Atlanta facility is in poor shape and needs immediate attention. Downstream equipment condition such as vacuum tanks, cooling tanks, pullers, printers and coilers range from fair to terrible. Water supply issue and condition of the down stream equipment account for most of the reasons behind poor efficiency and lower throughput. Both injection molding and extrusion tooling is in good shape. No major problems are anticipated at this time. Some areas of concern and improvement suggestions are detailed in the next section of the report. Tooling maintenance is adequate but needs improvement in the area of record keeping, mold storage, traceability, and well defined preventive maintenance program. Some other areas of concern are safety, material handling system, inadequate or lack of MRP and real time monitoring system, automation and aging molding auxiliary equipment.

In summary, the basic infrastructure for manufacturing XYZ products is in place; however, opportunities exist and there is lots room for improvement via automation, equipment upgrade and modernization.

	Daly CA	Novato CA	Atlanta GA
Overall	7	6	5
Equipment: Injection Molding	7	-	-
Equipment: Extrusion	5	5	-
Tooling: Injection Molding	8	-	-
Tooling: Extrusion	7	7	6
Tool Maintenance	5	5	5
Tool Room	5	6	4
Key personnel competency and expertise	8	9	8
Auxiliary equipment: Injection Molding	6	-	-
Downstream Equipment: Extrusion	4	3	2
PM program	5	5	5
Safety	6	4	4
Automation	5	4	3
Material handling system	5	6	5
Warehouse	8	7	7
Building	9	6	6
MRP system	5	5	5
Production Monitoring system	Manual	Manual	Manual
Quality assurance	7	5	5
Technology	5	4	3

Ratings: On a scale of 1 to 10 with 10 being the best.

## **Detailed Observations**

### **Daly, California**

The physical facility is a relatively new manufacturing building located at XXX Daly, CA with good access to interstate highways. The tour and discussion of the facility and operations was directed by Mr. Sony M, V.P., and Operations. Also, involved in discussion was D A, President. His involvement was limited.

#### **General Operation:**

Daly plant is involved with injection molding with fourteen (14) presses and four (4) extrusion lines are run. Operations work on a 24/5 schedule. Currently, the extrusion lines are being run only on second and third shifts due to seasonal demand reductions.

Assembly components are also preformed at the Daly facility. These operations include manual, semi-automatic and automatic operations.

The primary Quality Assurance for the company is handled at the Daly facility. The QA operation includes product dimensional compliance as well as physical testing capabilities.

The overall facility was found to be generally clean. Some areas were congested with in process materials. Operations performed in the facility include extrusion of tubing, injection molding of components, assembly of finished product and some distribution.

#### **Systems:**

Process water system is made up of a primary water tower cooler and a back up tower. The mainline supply of water is run overhead with equal diameter (~4" diameter) lines. Drop lines to and from machines are 1.5" diameter. All water for both machines and molds are pulled from the tower system. The system is an open circuit type. Portable chillers and thermolators are available on the processing floor for specific process use.

#### **Comments:**

The water system is inadequate and poorly designed. There should be a differential diameter difference of approximately 2" between the supply and return lines; the return lines being the larger diameter. Also, I question the use of an open circuit system for process control. Additionally, I would doubt there is sufficient capacity

in this system to support additional processing equipment especially considering the available space for the addition of equipment.

Material handling is done by transfer from three external silos to gaylords which are further transferred to mixers for color blending on the extrusion lines. Color blending on the injection line is handled by tumbler mixers. All material is delivered to the injection molding machines via vacuum loaders from gaylords or barrels.

**Comments:**

Materials for the extrusion line should be delivered to the machines either directly from the silos or color mixers. The use of manual transfers is inefficient. Color loaders should be applied in the injection molding operation as well.

**Machinery:**

Extrusion: The extruders were of older types (~20years) which were reported to have been rebuilt with updated control systems installed. As none were in operation at the time no verification of operation could be made. All units appeared clean and maintained.

**Injection Molding:**

Presses were of various manufacture including Engle, Toyo, Toshiba and Arburg. Generally, the machines appeared in good condition. One machine was noted to have a larger number of rags underneath to absorb oil from a leaking seal. The Engle press appeared to not hold cushion during processing indicating a possible need of a screw, barrel or check ring failure. This machine was reported to be the most recent arrival and had not been evaluated as yet for maintenance requirements. (I would think this would have been done before putting a machine into production operation.) I did not see set-up sheets hanging on each press, a must for any injection molding operation.

**Injection Mold Tooling:**

Tooling is generally setup for producing multiple parts styles within a family part design. This requires changing of various inserts within the mold depending on the production requirements. Molds are all numbered clearly for identification. A catalog of these numbers was reported to exist showing what parts each mold produces and what inserts are required for each.

Inspection of various inserts showed that they were in generally good condition. Storage of the inserts was on individual shelves; however, these storage areas were located along a well traveled pathway where anyone had easy access.

Mold storage appeared unorganized with no discernable order to where any given mold would be found. The larger molds were stored directly on the concrete floor. Smaller molds were located on various wooden shelving.

### **Mold Maintenance:**

The area provided for the maintenance of mold was cluttered with poor layout. Lighting was very poor for the inspection and work required in proper maintenance of molds. Available machinery was sufficient for minor repairs and the manufacture of simple components. Major repairs were reported to be handled by the Novato facility. This seemed to be an inefficient system with the availability of proper mold making facilities within the area.

Molds were provided with a three color tag indicating the condition of the tool when it was returned to the maintenance area. The tag system appears to be very good for quickly determining the status of the tool. When the mold is returned to the shop it is not accompanied by a last shot from the run. If the mold is damaged only sample parts from the damaged cavities are provided for reference to the mold maintenance group. No records of specific condition or repairs are maintained for the molds.

### **Comments:**

The mold maintenance system is in need of significant improvement. Even though the parts have limited dimensional demands the tools require better attention to ensure the overall process efficiency is maintained. I would recommend the following:

- Dedicated mold storage racks located in a reasonably secure area.
- All molds returned to the mold room from production for any reason is **accompanied by a complete last shot**. The current tag system should also be retained.
- Each mold is to have a master maintenance book containing the maintenance history of the mold. Also, the technical drawings for the mold should be included.
- A Preventative Maintenance program is needed for each mold such that a complete teardown, inspection and cleaning of the mold is made at regular intervals.
- The mold repair area to be reorganized and proper lighting provided.
- Major mold repairs handled within the local area for better control.

**Product Assembly:**

The assembly area is located in an area separate from the other manufacturing functions. Overall the area is laid out with generally acceptable spacing and lighting. The operations include semi-automatic machines which are hand loaded, manually operated machines and automated assembly machines. The manually operated machines are questionable for meeting OSHA safety requirements as operator hands are involved with holding components in position while being operated on by moving portions of the machine. All the machines appeared to be reasonable designed for the operations required with the exceptions noted.

**Quality Control:**

The QC operations as described and witnessed appear to be appropriately equipped for the measurement of the various products. They have the ability to track manufacturing lots of product through distribution. The physical testing equipment appears to be appropriate for the necessary flow and destructive tests necessary to assure product function. As reported by AIP there are no industry or ASTM standards for these products as to strength or functional requirements and all tests are based on the requirements to meet the company's warranty. No written standards were presented for any of the testing.

In process inspections are done on a loose schedule of once every two to three hours during each shift of operation. This is an acceptable level of inspection in most molding operations.

**Documentation:**

No written documentation appears to be available of any maintenance procedures on equipment for the plant. Also, historical records for the maintenance of any equipment are not maintained. There is no system for determination of real time production output. No master process sheets were seen for the set up of the injection molds or the extrusion lines.

**Comments:**

IQ Management system no longer in use in Novato facility should be revived, upgraded and installed in Daly plant. This is an excellent real time monitoring and MRP system that can immediately contribute to overall efficiency improvement.

Due to the nature of the business, namely short runs, some type of Master Unit Die system should be looked at so that the inserts can be removed from the front of the

molds without having to send the molds back to the tool room. This system should reduce change over time and improve overall efficiency.

Cycle counters should be installed on all high volume production molds.

Automation in terms of robotics, sprue pickers, and runner separators is recommended.



## **Novato California**

We met with Jay M, Operation Manager of the Novato, CA plant on August 31<sup>st</sup> to tour this facility. Ken provided a complete tour and review of the operation for the facility.

### **Operations:**

The plant is dedicated to the extrusion of tubing, both plain and with in-line emitters. The plant also serves as a warehouse and distribution center for the western states.

### **Extrusion:**

The plant runs eight (8) extrusion lines with positions for 2 additional lines. Currently, lines No.1 and No.2 are the primary producers and the best machinery. Line No.1 is a co-extrusion system. This capability is not currently utilized. Lines No.4, No.5, No.6, No.8 and No.9 are generally considered by Ken to be marginal in capability due to the condition of the extruders or down stream equipment. The major complaint falls on the vacuum boxes on most of the machines. These are generally "home made" units which do not hold consistent vacuum or water levels.

Supply systems for the water are also a major concern. Lines 1 and 2 are supplied water via dedicated pumps. All other lines are supplied by a single pump from the primary chiller. This system results in pressure and supply variation depending on the number of lines running.

Other equipment required to improve the operations are pullers, cutters, printers and coilers. Also, none of the lines is equipped with automatic screen changers on the extruders.

The plant is equipped with an IQ Management system for production monitoring. This system was shut down when ABC took over.

There are 14 injection molding machines remaining at the facility. Of these presses two are setup for silicone molding, two are considered to be of not functional value and the remaining ten are functional.

The water system is a closed loop system with an 80 ton tower; a 75 ton air cooled chiller supplies the extrusion lines with a 30 ton backup unit. A 20-ton chiller was available to the injection molding operation. Also, a Novatec drier is not currently in use.

Material handling for the extrusion lines is direct from a railcar to a wave blender where regrind and color are mixed with the virgin. The material is direct vacuum

transferred to the extruder from the blender. Generally, all lines run black. Line 2 can be used for color with the use of a color loader on the extruder.

There are a number of old and generally unused injection molds remaining in the plant. The plant also has a machine shop with equipment sufficient to maintain and build molds. Most of the equipment is sitting idle. This shop is separate from the plant maintenance shop.

Plant maintenance and efficiency has suffered from a lack of capital expenditures for sometime. Quality control is very limited as the major testing is done in Ontario. In process tests are made for dimensions and flow rates. These are done by the online personnel.

Documentation of maintenance procedures does not exist as with the Ontario facility. There is an informal procedure for each production system that is reported to be adhered to. There is nothing documented to confirm this, however.

**Comments:**

Too much pressure fluctuations seriously affect the quality issues which appear to result in higher scrap and regrind. This in turn creates more processing issues in terms of increased pressure build up due to clogging of the screen. All screen changing except on line 1 and 2 is done manually almost once a shift which results in excessive down time.

Automatic or semi automatic screen changers are highly recommended.

Downstream equipment must be upgraded.

## **Atlanta, GA**

Atlanta plant was toured on September, 2<sup>nd</sup>. Operation manager Ned R, provided a complete tour and review of the operation for the facility.

### **Operations:**

This plant is dedicated to making both PVC and LLDPE tubing of various sizes. The plant serves as warehouse and distribution for southern states.

### **Extrusion:**

There are four extrusion lines in operation with 3.5' screw diameter. Line 1 is a very old merit extruder producing PE tubing at 600 ponds per hour. Line two is an older Prodex extruder running at a rate of 400 pounds per hour. Line 3 is an older sterling extruder producing ¾ IPS tubing at approximately 500 pounds per hour. Line 4 is 1960 Bandera extruder running at about 65 percent of the maximum throughput.

All the extruders are old and are in need for upgrade. The controllers are in bad shape and need calibration and/or replacement. The downstream equipment is very old and also in need for upgrades. The coiler does not traverse and does not have tensioner. The tubing has to be manually coiled and requires two operators to carry out this operation. None of the equipment has name plates to indicate age and other related information necessary for replacement parts and maintenance. Limited maintenance is done on tooling and extruders. Screw and barrels have not been measures for excessive wear. Water supply is in fair shape. Material is purchased in bulk, however there is only one 44,000 pounds capacity silo requiring frequent loading. Material loaders are new and in excellent shape but are not utilized due to material feeding (bridging) issues. There are no screen changers on the machines and requires frequent tear downs to replace clogged screens.

Color mixing is done by adding color in gaylords and mixing it with shovel! No color blender or a tumbler is available for adequate mixing. Except for the operation manager technical skills of the operators is less than adequate and lots of formal training is needed. There are no head pressure gages to indicate pressure build up and time for screen change.

Safety is a real concern due to the pipe lay out which runs on the floor between the machines creating trip hazard along with open wires and other items of concern.

**Comments:**

Packaging equipment (coilers) is the first priority to improve efficiency and reduce labor. Not much capital has been expended for the up keep or upgrading of the aging equipment.

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