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MANUFACTURING INSIGHTS®

Mapping Your Value Stream:

NARRATION (VO):

MANUFACTURING INSIGHTS; MANUFACTURING ENGINEERING MAGAZINE'S VIDEO SERIES FOR PROCESS IMPROVEMENT. THIS VIDEO DEMONSTRATES "MAPPING YOUR VALUE STREAM." AND SHOWS YOU HOW THE DONNELLY CORPORATION HAS USED VALUE STREAM MAPPING TO REDUCE INVENTORY AND CREATE ONE-PIECE FLOW IN THE ASSEMBLY OF AUTOMOTIVE MIRRORS.

NARRATION (VO):

WHEN WAS THE LAST TIME YOU WENT TO BUY A CAR AND FOUND EXACTLY WHAT YOU WANTED? BECAUSE OF THE VAST NUMBER OF OPTIONS, MOST CUSTOMERS END UP COMPROMISING—LIKE BUYING A COLOR THEY DON'T WANT OR PAYING FOR A PREMIUM RADIO THEY DON'T NEED. WHY DO MODERN DAY FACTORIES MANUFACTURE AN ABUNDANCE OF PRODUCT THAT SITS AS INVENTORY, YET THEY STILL DON'T HAVE EXACTLY WHAT THE CUSTOMER WANTS?

NARRATION (VO):

NOT HAVING JUST WHAT THE CUSTOMER WANTS ISN'T A NEW PROBLEM.* WHILE HENRY FORD MAY HAVE BEEN THE FIRST LEAN MANUFACTURER, HE PRODUCED VEHICLES FOR THE MASSES. * THE RULE OF BUSINESS BACK THEN DICTATED HIGH VOLUME AT LOW COST.* AS FORD SHIPPED VEHICLES OUT TO DEALERS, * HE ALSO KEPT THE PLANT PUMPING OUT MORE.* FORD ASSUMED THAT ECONOMIES OF SCALE WOULD MAKE BIGGER FACTORIES EVEN MORE COST EFFECTIVE.* THIS MEANT BUYING THE BIGGEST PRESSES AVAILABLE TO STAMP OUT HUGE VOLUMES OF PARTS.* MASS PRODUCTION LOWERED INDIVIDUAL PIECE PRICES AND THIS WAS GREAT WHEN THERE WAS UNLIMITED DEMAND, BUT NOT SO GOOD AS THE DEMAND DIPPED.

THE PROBLEM WITH MASS PRODUCTION THINKING IS THAT PEOPLE ARE FOCUSED ON

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OPTIMIZING PIECES OF THE SYSTEM, INSTEAD OF LOOKING AT THE WHOLE "VALUE STREAM." A VALUE STREAM MAP FOLLOWS THE FLOW OF RAW MATERIAL, INVENTORY AND INFORMATION WITHIN A FACTORY, OR ALL THE WAY TO THE FINAL CUSTOMER.

VALUE STREAM MAPPING, A TOOL DEVELOPED BY TOYOTA, IS NOW BEING ADOPTED THROUGHOUT THE WORLD. MIKE ROTHER AND JOHN SHOOK, TWO LEAN-ENTERPRISE EXPERTS, MADE THE MAPPING TECHNIQUE WIDELY AVAILABLE THROUGH THEIR TEACHING AND BOOKS. THIS TOOL ALLOWS YOU TO DIAGRAM YOUR CURRENT VALUE STREAM; IDENTIFY THE BOTTLENECKS THAT PREVENT YOU FROM MAKING *WHAT* YOUR CUSTOMERS WANT *WHEN* THEY WANT IT, AND THEN IT HELPS YOU DEVELOP A VISION OF WHAT YOUR FUTURE LEAN SYSTEM SHOULD LOOK LIKE.

Jim Womack on-camera:

It creates the same "aha" everywhere you go, it's a completely consistent aha. I've done a lot of these. We did an extended map in collaboration with Ford about two years ago, in which we said let's draw a macro map and go all the way from raw material onto the car at an assembly plant, and following that same product, let's go to the service parts organization. We didn't go all the way to the dealer, and we didn't go all the way to your driveway, but we did go back to raw material, and we've got a group of suppliers that shared this value stream. So you've got the fellow who gets the material out of the ground, and the fellow who formulates it, and the fellow who stamps it out or presses it or feeds it or whatever, and the fellow who assembles the parts, and the operation of putting it into the finished product. And we had a couple weeks of 'ahas', walking along, in which it becomes comically—not painfully, but comically—obvious that no one has ever looked at the whole. Everyone thought about their little piece.

NARRATION (VO): EVEN COMPANIES THAT WORK HARD AT IMPLEMENTING LEAN MANUFACTURING GET CAUGHT UP IN CREATING ISLANDS OF EXCELLENCE.* CREATING A CELL OR REDUCING CHANGEOVER TIME IS NOT THE SAME THING AS CREATING A LEAN VALUE STREAM.* BEFORE ANY IMPROVEMENT, YOU NEED TO KNOW WHY IT'S IMPORTANT TO MAKE THE CHANGE. * WHAT IF THE IMPROVEMENT JUST MAKES THE MACHINE RUN MORE, BUILDING UP EVEN MORE UNNECESSARY INVENTORY? WITH A VALUE STREAM VISION YOU KNOW WHAT TO IMPROVE, THEN YOU CAN BECOME MORE FLEXIBLE, AND REDUCE INVENTORY IN THE PROCESS.

The value stream focus that we've adopted, simple observation;

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people love techniques which are easy and, in the end, not very effective. What they don't feel comfortable with is the heavier lifting, which is to look at the whole, to look at the entire flow. So I'd go around, brilliant cell. It feeds into a morass, nice little pull system, it's not pulling anything that is capable, so therefore you have to have enormous buffer. Five S looks lovely, no production control system, no flow. So it dawned on me that something was missing here, and that something is really borrowed from Toyota, but the odd thing is you never see it written down there. You go to lunch, and they start talking, and get the pen out and start drawing a map. Toyota is very visual people, they start doodling. If you look on that map on a napkin, learn from Mr. Oba at TSSC, walk through the plant on a little piece of paper, to very quickly draw current state, future state, action plan, it's just an automatic way of thinking.

NARRATION (VO): THERE ARE TWO TYPES OF KAIZEN. A ONE-WEEK KAIZEN WORKSHOP WITH FRONT-LINE EMPLOYEES HAS BECOME STANDARD PRACTICE IN MANUFACTURING COMPANIES. IMPROVEMENTS ARE FOCUSED ON A SPECIFIC GOAL, LIKE FORMING A CELL OR REDUCING THE CHANGEOVER TIME FOR ONE MACHINE. THIS IS CALLED POINT KAIZEN BECAUSE IT IMPROVES ONLY ONE POINT IN THE VALUE STREAM. * FLOW KAIZEN, OR VALUE STREAM IMPROVEMENT, LOOKS AT THE WHOLE BUSINESS . SINCE ONLY SENIOR MANAGERS HAVE RESPONSIBILITY FOR THE ENTIRE BUSINESS, THEYSHOULD GUIDE MUST LEAD VALUE STREAM MAPPING AND STEER THE IMPROVEMENT ACTION PLAN NEEDED TO REACH THE FUTURE STATE.

NARRATION (VO): MANY COMPANIES ARE FAMILIAR WITH PROCESS MAPS, BUT VALUE STREAM MAPPING IS DIFFERENT BECAUSE IT FOCUSES ON THE MATERIAL AND INFORMATION FLOWS CENTRAL TO A PRODUCTION SYSTEM.

The only thing we're doing that you didn't see in the old process maps is, we've got a closed circuit, information coming back from the customer, and product going toward the customer. That closed circuit is the real issue. So a typical process map—and by the way, Henry Ford was drawing these in 1914. ….. **(break)**….. It's drawn, the step, the amount of time, distance, and so forth between the steps, but there's no sense of why you do something. There's a list of things that have to be done, but when do you do them, how much, and so forth, so there's none of the takt time sort of presence, which is the heartbeat of the market, the voice of the customer, in operational terms, coming backward.

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NARRATION (VO): SO HOW DO YOU GET STARTED MAPPING? FIRST, YOU HAVE TO SELECT THE PRODUCT FAMILY THAT YOU ARE GOING TO MAP. THE EASIEST WAY IS TO FOCUS ON ONE OF YOUR LARGEST CUSTOMERS AND PICK A PRODUCT OR FAMILY OF PRODUCTS THAT YOU SHIP TO THE CUSTOMER.

NARRATION (VO): THE VALUE STREAM MAP ALWAYS STARTS WITH THE CUSTOMER. IN THIS CASE THE MAP IS FOR ACME STAMPING, A FICTIONAL COMPANY. THE PART IS A STEERING BRACKET PRODUCED FOR STATE STREET ASSEMBLY. ALL THE DATA IN A VALUE STREAM MAP IS BASED ON THE CUSTOMER'S "TAKT TIME." TAKT TIME EQUALS THE AVAILABLE WORK TIME DIVIDED BY CUSTOMER DEMAND. WITH AVAILABLE WORK TIME AT 27,600 SECONDS PER SHIFT, AND CUSTOMER DEMAND AT 460 PIECES PER SHIFT, TAKT TIME IS 60 SECONDS. IN THIS EXAMPLE, THE IDEAL VALUE STREAM WOULD BE FOR ALL PROCESSES TO BE PRODUCING ONE PART EVERY MINUTE.

NARRATION (VO): THIS CURRENT STATE MAP SHOWS WHERE ACME STAMPING IS TODAY, AND WILL REVEAL OBVIOUS OPPORTUNITIES FOR IMPROVEMENT.

NARRATION (VO): ONE OF THE BIGGEST "AHAS" IN "CURRENT STATE MAPPING" COMES WHEN YOU DRAW A TIME LINE AT THE BOTTOM OF A MAP TO SHOW THE AMOUNT OF VALUE ADDED WORK BEING PERFORMED ON THE PRODUCT. THE LOWER TIME LINE SHOWS THE ACTUAL "PROCESSING TIME" WHERE THE PRODUCT IS TRANSFORMED INTO WHAT THE CUSTOMER WANTS. THIS IS THE "VALUE-ADDED TIME" WHICH, IN ACME'S CASE, IS 188 SECONDS. THE UPPER TIME LINE IS THE MOST REVEALING, SHOWING THAT THE PRODUCT SPENDS *OVER 23 DAYS* WAITING FOR PROCESSING.

NARRATION (VO): EACH VALUE-ADDED STEP AT ACME IS SHOWN A AS A PROCESS BOX. TRADITIONAL MANUFACTURING IMPROVEMENT HAS FOCUSED ON SQUEEZING OUT MERE SECONDS FROM THESE PROCESSES. LEAN MANUFACTURING FOCUSES ON ELIMINATING THE NON-VALUE ADDED WASTE IN THE SYSTEM SHOWN BY THE

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INVENTORY TRIANGLES. VALUE STREAM MAPPING HELPS US IDENTIFY THIS WASTE.

NARRATION (VO): VALUE STREAM MAPPING IS DIVIDED INTO:

THE MATERIAL FLOW,

THE PHYSICAL TRANSFORMATION PROCESS,

AND THE INFORMATION FLOW.

THE INFORMATION FLOW HELPS YOU UNDERSTAND WHY INVENTORY IS BEING CREATED. IN THE CASE OF ACME STAMPING, LIKE MANY COMPANIES, INDIVIDUAL OPERATIONS ARE SCHEDULED BY PRODUCTION CONTROL BASED ON A WEEKLY-BUILD SCHEDULE. INDIVIDUAL OPERATIONS BUILD TO THE SCHEDULE REGARDLESS OF IF THE NEXT OPERATION REALLY NEEDS IT.

NARRATION (VO): DRAWING THE CURRENT STATE MAP GIVES YOU A HIGH-LEVEL VIEW OF THE WASTE IN YOUR SYSTEM. WHEN MAPPING, DO NOT GET CAUGHT UP IN UNIMPORTANT DETAILS. MAKE EACH MAP AS SIMPLE AS POSSIBLE. USE PAPER AND PENCIL AND GO TO THE FLOOR, GET ESTIMATES OF KEY DATA, AND JUST DO IT! MOST VALUE STREAM MAPS CAN BE FINISHED IN HOURS, NOT DAYS OR WEEKS.

NARRATION (VO): AFTER MEASURING AND IDENTIFYING WASTE, PUT THE CURRENT STATE MAP ASIDE. THE NEXT STEP IS THE FUN AND CREATIVE PART OF VALUE STREAM MAPPING; WHEN YOU DEVELOP A FUTURE STATE MAP FOR YOUR LEAN SYSTEM.

NARRATION (VO):

THE FINAL PHASE OF VALUE STREAM MAPPING IS DEVELOPING AND IMPLEMENTING AN ACTION PLAN TO ACHIEVE THE FUTURE STATE.

NARRATION (VO): VALUE STREAM MAPPING PROVIDES ITS OWN SET OF ICONS FOR DESIGNING THE FUTURE STATE. MOST TRADITIONAL PROCESS MAPPING LEAVES OUT SUCH CONCEPTS AS PULL SYSTEMS AND SUPERMARKET STYLE STORAGE AREAS.

NARRATION (VO): CUSTOMERS AND VENDOR FACILITIES ARE ILLUSTRATED BY FACTORY ICONS.

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VALUE ADDED STEPS ARE SHOWN AS LABELED PROCESS BOXES.

NARRATION (VO): INVENTORY IS DRAWN AS A TRIANGLE (OR IN THE ORIGINAL TOYOTA DRAWINGS, AS A TOMBSTONE FOR DEAD MATERIAL).

NARRATION (VO): TRANSPORTATION, A NECESSARY BUT NON-VALUE ADDING STEP, IS SHOWN BY A SIMPLE TRUCK.

NARRATION (VO): TRADITIONAL PRODUCT MOVEMENT IS ILLUSTRATED BY A PUSH ARROW, WHERE PRODUCT IS MADE AND PUSHED, WHETHER THE NEXT PROCESS NEEDS IT OR NOT.,…OR A FLOW ARROW FOR UNOBSTRUCTED FLOW.

A LEANER APPROACH IS A PULL SYSTEM REPRESENTED BY A CIRCULAR ARROW.

NARRATION (VO): INSTEAD OF INVENTORY STOCKROOMS, LEAN MANUFACTURING USES A SUPERMARKET CONCEPT. EACH SUPERMARKET HAS A SMALL, WELL-MANAGED, INVENTORY BUFFER, WHERE EMPLOYEES CAN PICK ONLY WHAT THEY NEED.

NARRATION (VO): OTHER ICONS LIKE "GO SEE," "KANBAN POST," AND "SIGNAL KANBAN" REPRESENT WAYS OF FLOWING AND CONTROLLING MATERIAL MOVEMENT.

NARRATION (VO): ARMED WITH THESE TOOLS, YOU ARE NOW READY TO CREATE YOUR FUTURE STATE VISION. THE ACME STAMPING MAP STILL STARTS WITH THE CUSTOMER AND THE TAKT TIME, BUT NOW WE SEE AN EMPHASIS ON HOW THE PRODUCT FLOWS THROUGH THE SYSTEM. WE SEE SUPERMARKETS, PULL SYSTEMS, KANBAN AND FREQUENT DELIVERIES OF PRODUCT TO THE CUSTOMER. ON PAPER, THE RESULTING PRODUCTION LEAD TIME HAS SHRUNK FROM OVER 23 DAYS TO 4.5 DAYS AND PROCESSING TIME HAS BEEN REDUCED A BY FEW SECONDS. ONCE THESE IMPROVEMENTS ARE IMPLEMENTED, ACME CAN BE MUCH MORE RESPONSIVE TO CHANGES IN CUSTOMER DEMAND; HOLD FAR LESS INVENTORY; AND FREE FLOOR SPACE FOR FUTURE BUSINESS.

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FADE TO BLACK

NARRATION (VO): TO SEE HOW VALUE STREAM MAPPING IMPROVES A REAL COMPANY, WE VISITED THE DONNELLY PLANT IN GRAND HAVEN, MICHIGAN. A LARGE COMPANY WITH $900 MILLION IN GLOBAL ANNUAL SALES, DONNELLY IS THE LARGEST PRODUCER OF AUTOMOTIVE MIRRORS AND WINDOW ENCAPSULATION IN THE WORLD. (IN THE WORLD OR US?)

NARRATION (VO): THIS PLANT WAS BUILT IN 1987 TO MAKE MIRRORS FOR HONDA, BUT HAS SINCE EXPANDED AND ADDED MANY AUTOMOTIVE CUSTOMERS.. * SALES HAVE GROWN FROM $10 MILLION IN ’87 TO A PROJECTED $100 MILLION NEXT YEAR. DONNELLY NOW EMPLOYS OVER 360 PEOPLE.

THE FIRST STEP IN MAKING EXTERIOR MIRRORS IS FORMING * THE HOUSINGS IN PLASTIC INJECTION MOLDING PRESSES. FROM THERE MOST ARE PAINTED, AND ASSEMBLED WITH PURCHASED PARTS TO MAKE MANUAL OR POWER MIRRORS.

NARRATION (VO): PAINTED MIRRORS WERE NEW FOR DONNELLY WHEN THEY FIRST STARTED WORKING WITH HONDA. IN THE BEGINNING, PAINT QUALITY PROBLEMS PLAGUED THE PLANT.* HONDA SENT QUALITY SPECIALISTS TO HELP AND WAITED PATIENTLY FOR RESULTS. BY 1995, HONDA TOLD DONNELLY TO IMPROVE THEIR RECORD FOR QUALITY AND ON-TIME DELIVERY OR THEY WOULD FIND A NEW SUPPLIER. * DONNELLY WAS RATED AS ONE OF THE “DIRTY DOZEN” OF HONDA’S WORST SUPPLIERS. * DONNELLY TRIED A NUMBER OF UNSUCCESSFUL APPROACHES TO MANUFACTURING IMPROVEMENT BEFORE THEY BEGAN USING VALUE STREAM MAPPING AND OTHER LEAN CONCEPTS.BROUGHT IN HIRED A FORMER V.P. OF MANUFACTURING FROM TOYOTA GEORGETOWN TO LEAD A SYNCHRONIZED APPROACH TO LEANAND HE SAID WE MUST APPROACH LEAN AS A SYSTEM.

We got involved with Honda at the start of this plant. About the same point in time we got involved with GM Synchronous, with Picos, with Honda’s Best Practices. We created our own team, which we called Delta, which is our continuous improvement process.

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BREAK

But we didn't really embrace lean as a total operating system until about 1995, when Russ Scaffade started. And he brought in a vision of lean, which is an overall series of philosophies that, when put together with the corresponding tools, enable us to attack all the various activities in more of a synchronized approach.

I think the biggest driver behind that was, as an organization I don't believe we were meeting our corporate objectives. I think we had seen improvements in some areas, but overall we weren't meeting objectives that the corporation had set out for us. I think we spent some time scratching our heads and trying to understand why that was. We thought we were doing a lot of things that were defined by lean, so it seemed like we were doing the right things, and I really don't think we had the good understanding until we got some different management in the organization that did have some Toyota experience and background, who really adjusted the way we thought about what lean was, came in and really defined for us a production system. We now operate under the Donnelly Production System, which very clearly outlines the philosophies of lean.

NARRATION (VO): THE ORIGINAL VALUE STREAM MAP OF GRAND HAVEN, EVEN WITH THE QUALITY ENGINEERING HELP OF HONDA, LOOKED DISMAL. WITH ONLY 2.1 HOURS OF VALUE ADDED TIME, IT TOOK ALMOST 30 DAYS TO MAKE A MIRROR.* IN THE EARLY 1990S THE PLANT MADE NO PROFIT FOR 2 ½ YEARS, HAD OVER 27000 PARTS PER MILLION DEFECTS,* SCRAPPED MORE THAN ONE THIRD OF PAINTED MIRRORS, AND SPENT A SMALL FORTUNE ON PREMIUM TRANSPORTATION.

THE ORIGINAL PRODUCTION SCHEDULE PERMITTED DONNELLY TO MAKE A 5-DAY INVENTORY OF MOLDED HOUSINGS.* THE PAINT DEPARTMENT ALSO KEPT A 5-DAY INVENTORY.* AN ADDITIONAL DAYS WORTH OF INVENTORY WAS A BUFFER BETWEEN ASSEMBLY AND FINAL INSPECTION, * AND AN 8-DAY FINISHED GOODS INVENTORY STORE WAS MAINTAINED. THE ORIGINAL TOTAL LEAD TIME ON THIS MIRROR WAS JUST UNDER 30 DAYS.

Many plants kind of have a catch-all area that whatever you have that you don't need at the assembly area, you just kind of stick it back in that corner. And they literally had so many things stuck back in that corner, inventory and jigs and fixtures, etc., that at one point they were back there digging around and looking for something, and literally, underneath and behind this pile of

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material they found a **car, a car** that had been brought into the plant some time before for some fitting of some parts, and they literally had just misplaced it, forgot it was back there.

NARRATION (VO): THE ORIGINAL, RATHER UNORGANIZED, LAYOUT OF THE PLANT PLACED LITTLE IMPORTANCE ON OVERALL FLOW. * ASSEMBLY CELLS, SHOWN HERE IN BROWN, WERE SCATTERED ALL OVER THE PLANT. THE CELLS' ASSOCIATED INVENTORY, COLORED BLUE, WAS STORED IN ANY AVAILABLE FLOOR SPACE.

You would have seen a facility that was organized very differently than it is today. ~~You would have seen a facility that had its assembly area scattered through many parts of the plant. There really wasn't a distinct area, there were assembly cells through the entire plant. The inventory that supported those cells was right at the cells.~~ You would have seen inventory scattered in many locations across the plant, and you would have seen lots of inventory. 10.08.25

10.08.35 In comparison, what you'll see today are the assembly cells gathered together in a distinct part of the plant. You'll see our inventory gathered together, our work in process inventory, in a distinct part of the plant, which we call a central market or store, and you'll see much less inventory than you would have seen six years ago. 10.08.53.

NARRATION (VO): DONNELLY'S GRAND HAVEN PLANT HAS MADE GREAT STRIDES SINCE THE EARLY DAYS. THE CURRENT STATE MAP SHOWS THAT MANY LEAN CONCEPTS HAVE BEEN IMPLEMENTED, RESULTING IN A REDUCTION IN OVERALL LEAD TIME FROM 30 TO 8.5 DAYS.

12.05.10 I think some of the key measures within our organization, again going back to our management by planning, is within this facility over the past four years, we have doubled our production volume in this facility over the past four years. We've done that with adding less floor space than we would have otherwise had to. 12.05.31 ~~… We've reduced our defects, our quality PPM. Four years ago from roughly 1200 down to, we're in the range of approximately 60 today PPM.~~ Our delivery rating, we four years ago, in an average month, would have 50 to 100 late deliveries to our customer. 12.06.08 12.06.09 Today we're averaging roughly two missed deliveries per month to a customer.

NARRATION (VO): A MAJOR LAYOUT CHANGE IN THE LATE 1990S IMPROVED THE VALUE STREAM FLOW. NOW THERE IS A CLEAR FLOW FROM MOLDING TO MOLDING STORES, TO PAINT TO THE PAINTED PARTS SUPERMARKET, THEN ASSEMBLY, AND

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FINALLY SHIPPING.

NARRATION (VO): THIS VALUE STREAM MAP FOCUSES ON THE CURRENT STATE OF PAINTED-SIDE VIEW MIRRORS.

NARRATION (VO): THE PROCESS STARTS WITH PLASTIC RESINS, WHICH DIFFER, DEPENDING ON WHAT THE CUSTOMER HAS SPECIFIED.

NARRATION (VO): THESE RESINS ARE VACUUMED UP FROM GAYLORDS INTO DRYERS WHICH PREPARE THE MATERIAL AND MOVE IT THROUGH PIPES TO THE INJECTION MOLDING PRESSES.

DELETED

NARRATION (VO): WHEN THE NUMBER OF GAYLORDS ON THE SHELF REACHES A MINIMUM LEVEL, AN ORDER GOES TO THE RESINS SUPPLIER.

NARRATION (VO): THE RESINS ARE STORED JUST ACROSS THE AISLE FROM THE DRYERS. A KANBAN SYSTEM TRIGGERS THE MATERIAL HANDLER TO MOVE THE RESINS WHEN NEEDED.* WHEN THE RESIN CONTAINER IS ALMOST EMPTY, THE KANBAN CARD FOR THAT TYPE OF RESIN IS SELECTED * AND PLACED BEHIND A SWITCH. THIS SWITCH TURNS ON AN OVERHEAD LIGHT * VISIBLE TO THE MATERIAL HANDLER,* WHO COMES OVER, MOVES THE RESINS FROM STORAGE INTO USE, AND TURNS OFF THE LIGHT.

NARRATION (VO): FOLLOWING THE VALUE STREAM MAP, THE NEXT STEP IS THE MOLDING PROCESS AND ITS SCHEDULING.

NARRATION (VO): CHANGEOVER TIMES FOR THE MOLD ONCE TOOK ANYWHERE FROM 2 TO 8 HOURS, SO DONNELLY RAN THE SAME PART FOR ONE WEEK OR MORE. THE MOLDED HOUSINGS WERE STORED EVERYWHERE, RESULTING IN MASSES OF INVENTORY. * TODAY, MOLD CHANGEOVERS TAKE ABOUT 20 MINUTES AND EACH RUN LASTS ONLY 1 OR 2 SHIFTS. EVEN TWO SHIFTS PRODUCES A LOT OF INVENTORY, SO A

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TRIANGLE KANBAN, SOMETIMES CALLED A SIGNAL KANBAN, TRIGGERS THE PULL SYSTEM.

NARRATION (VO): NOW ALL INVENTORY IS STORED IN AN ORGANIZED SUPERMARKET-STYLE AREA AND EACH PART HAS ITS OWN LABELED RACK.

NARRATION (VO): THE MATERIAL HANDLER WILL COME FROM THE INTERNAL CUSTOMER, IN THIS CASE THE PAINT AREA, AND "GO SHOPPING," TAKING ONLY THE MIRROR HOUSINGS NEEDED.

NARRATION (VO): WHEN A PREDEFINED TRIGGER POINT IS REACHED, WELL-LABELED ON THE SIGNPOST AND SHOWN WITH YELLOW TAPE ON THE CONVEYOR ROLLER,* THE MATERIAL HANDLER WILL TAKE THE TRIANGLE FOR THAT PART.* THE TRIANGLE KANBAN CONTAINS KEY INFORMATION LIKE THE PART NUMBER, THE PRESS NUMBER IT WILL BE PRODUCED ON, AND ITS LOCATION IN THE SUPERMARKET. THIS SERVES AS A "LICENSE" TO MAKE MORE MOLDED PARTS WHEN BROUGHT BACK TO THE MOLDING PRESS AREA.

NARRATION (VO): THE TRIANGLE IS HUNG ON A VISUAL SCHEDULING BOARD ON THE PRESS THAT MAKES THE PART AND THIS BECOMES THE MOLDING SCHEDULE. * ANYONE CAN WALK BY, LOOK AT THIS BOARD, AND KNOW THE STATUS OF ALL OF THE PRESSES IN THE SHOP.

NARRATION (VO): WHEN A TRIANGLE GETS TO THE LAST POSITION ON ITS TRACK, THAT SIGNALS THE OPERATOR THE NEXT PRODUCT TO BE RUN. THE TRIANGLE IN THIS POSITION SHOWS THE PARTS THAT ARE CURRENTLY RUNNING ON THE PRESS.

NARRATION (VO): WHEN THE TRIANGLE FOR A PRESS IS ABOUT TO BE TRIGGERED, THE MATERIAL HANDLER GETS ONE LABEL FOR EACH TOTE OF PARTS TO BE RUN, AS SHOWN ON THE TRIANGLE KANBAN, AND BRINGS THEM TO THE PRESS OPERATOR.* THE PRESS OPERATOR WILL MAKE AS MANY BINS OF MATERIAL AS THERE ARE LABELS AND THEN APPLY ONE LABEL TO EACH TOTE.

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NARRATION (VO): TO KEEP MACHINES RUNNING, THE SET- UP CREW MUST ACT QUICKLY TO CHANGE THE PRESS OVER IN TIME TO RUN THE NEXT PART.* TO ALERT THE CREW, A YELLOW CARD IS INSERTED WITHIN THE LABELS SO IT IS VISIBLE ABOUT ONE HOUR BEFORE THE JOB IS COMPLETED.* WHEN THE YELLOW CARD IS EXPOSED, THE OPERATOR TURNS ON A LIGHT * TO ALERT THE SET-UP TEAM OF AN UPCOMING CHANGEOVER.

NARRATION (VO): WHILE THE DETAILS OF THE TRIANGLE PULL SYSTEM ARE NOT ON THE VALUE STREAM MAP, THE CONCEPT OF THE PULL SYSTEM, THE AVERAGE AMOUNT OF INVENTORY, AND CHARACTERISTICS OF THE MOLDING PRESS ARE ALL CLEARLY SPELLED OUT. * AFTER MOLDING, THE MIRROR HOUSINGS ARE READY TO BE PAINTED.

NARRATION (VO): SINCE THE PAINT PROCESS IS MORE OF A BATCH PROCESS THAN INJECTION MOLDING, DONNELLY USES SEVERAL SCHEDULING SYSTEMS TO CONTROL THIS INVENTORY.

NARRATION (VO): THESE PAINTING SCHEDULES ARE FLEXIBLE ENOUGH TO COMPENSATE FOR OCCASIONAL DEFECTS, SINCE THE CUSTOMER REQUIRES EACH MIRROR TO PERFECTLY MATCH THE VEHICLE COLOR. * IN THE PAINT AREA, EVEN THOUGH MUCH ENERGY IS SPENT PRODUCING A HIGH PAINT YIELD,, EXCEPT THE SMALLEST BLEMISH IS STILL REJECTED.* PAINTED HOUSINGS MOVE ON AN OVERHEAD CONVEYOR THROUGH PAINT AND CLEAR-COAT STAGES AT THE RATE OF 5.5-FEET PER MINUTE. ON AVERAGE, ABOUT 20,000 MIRRORS ARE PAINTED PER DAY.

NARRATION (VO): A MINI-"SUPERMARKET" STORES TWO HOURS OF PRODUCT RIGHT OUTSIDE OF THE PAINT BOOTH, AND A VISUAL MIN-MAX SYSTEM TRIGGERS REPLENISHMENT.* THIS METHOD OF REPLENISHING THE PAINT SUPERMARKET IS SHOWN ON THE MAP BY THE EYEGLASS ICON THAT REPRESENTS "LOOKING AND SEEING" THE LEVELS IN INVENTORY.

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THE NEXT IMPROVEMENT WILL BE SWITCHING TO A TRUE KANBAN SYSTEM USING CARDS.

NARRATION (VO): PART OF THE MIRROR HOUSINGS SUPERMARKET STORES A SUBSTANTIAL QUANTITY OF PAINTED MIRRORS.* DONNELLEY'S ABILITY TO REDUCE THE INVENTORY OF PAINTED MIRRORS WILL DEPEND ON FURTHER IMPROVING FIRST-TIME PAINT YIELD,* AS WELL AS REDUCING THE CHANGEOVER TIME IN THE PAINT BOOTH. *IDEALLY, NEW AND SMALLER PAINT BOOTHS WILL BE DEDICATED TO PRODUCT FAMILIES AND THE "MONUMENT" WILL BE DISMANTLED.

NARRATION (VO): NEXT ON THE MAP IS ASSEMBLY THAT USES A TRUE KANBAN CARD SYSTEM FOR "SUPERMARKET SHOPPING."

NARRATION (VO): A KANBAN LOOP IS SET UP TO DELIVER MATERIALS TO ASSEMBLY. THE LOOP COVERS THE PAINTED PRODUCT SUPERMARKET AND THE PURCHASED PARTS SUPERMARKET. IN BOTH, A PULL SYSTEM, USING WITHDRAWAL KANBAN CARDS, IS USED.

NARRATION (VO): TO KEEP THE ASSEMBLY CELLS STOCKED, THE MATERIAL HANDLER COMES TO THE SUPERMARKET WITH A CART AND WITH KANBAN CARDS PICKED UP FROM THE CELLS. USING THE CARDS, THE MATERIAL HANDLER PICKS THE RIGHT COLORS FROM THE PAINTED-HOUSINGS SUPERMARKET.* THEN THE MATERIAL HANDLER PICKS WHAT IS NEEDED FROM THE PURCHASED PARTS SUPERMARKET.* WHEN THESE COMPONENTS ARE DELIVERED TO THE ASSEMBLY CELLS, THE MATERIAL HANDLER PICKS UP MORE CARDS FROM THE CELLS' MAILBOXES FOR THE NEXT CYCLE.* THERE IS ONE TIMED ROUTE THAT ALL MATERIAL HANDLERS GO THROUGH. ONE ROUTE SIMPLIFIES STAFFING REQUIREMENTS, SOMETHING THAT CAN CHANGE QUICKLY AS VOLUME FLUCTUATES.

NARRATION (VO): THE ASSEMBLY CELL SCHEDULE IS BASED ON ACTUAL CUSTOMER-ORDER QUANTITIES.

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NARRATION (VO): THE ASSEMBLY CELLS ARE DESIGNED FOR ONE-PIECE FLOW. THE MIRRORS MOVE FROM STATION-TO STATION, ONE AT A TIME, AND ALL WORK IS CAREFULLY BALANCED AMONG OPERATORS USING STANDARDIZED WORK METHODS. THE OPERATORS WORK IN TEAMS AND CONTINUOUSLY IMPROVES THE CELLS' OPERATION. A TEAM MEMBER ACTS AS A FACILITATOR, KEEPING TRACK OF PERFORMANCE, RESPONDING TO TEAM-MEMBER NEEDS, AND COLLECTING KANBAN CARDS FOR PICK UP. MANY MISTAKE-PROOFING DEVICES ARE BUILT INTO THE CELLS, INCLUDING SMART NESTS THAT CHECK THE PRODUCT AT EACH STAGE TO BE SURE PARTS HAVE BEEN PROPERLY ASSEMBLED.

NARRATION (VO): FROM THIS POINT ON, THE SYSTEM IS TRADITIONAL. FINISHED MATERIAL IS MOVED TO AN INVENTORY HOLDING AREA.* THE INVENTORY IS WELL ORGANIZED, BUT THERE ARE STILL MORE FINISHED GOODS IN STORAGE THAN DONNELLY WOULD LIKE. IN PART, THIS IS BECAUSE THE CUSTOMERS DO NOT ORDER THE SAME AMOUNT EVERY DAY AND MAY ASK FOR A LARGE SHIPMENT OF ONE TYPE OF MIRROR ONE DAY, AND THEN A LARGE SHIPMENT OF A DIFFERENT MIRROR ANOTHER DAY. THUS, DONNELLY MUST KEEP SAFETY STOCK TO PROTECT THEMSELVES FROM SUCH ORDER FLUCTUATIONS. DONNELLY CALLS THIS SAFETY STOCK THE "WALL OF SHAME".

NARRATION (VO): ONCE A DAY, FINISHED PRODUCT IS BROUGHT FROM STORAGE TO BE STAGED AND SCHEDULED FOR SHIPPING TO THE CUSTOMER.* WHILE THE FREQUENCY OF DELIVERY DEPENDS ON THE CUSTOMER, DONNELLY IDEALLY WANTS TO SHIP MORE OFTEN AND REDUCE THE AMOUNT OF INVENTORY IN THEIR PLANT.

DONNELLY KNOWS THEY MUST BE A BETTER SUPPLIER TOMORROW THAN THEY ARE TODAY.* THEY KNOW CUSTOMERS ARE DEMANDING LEVELS OF PERFORMANCE THAT WOULD HAVE SEEMED IMPOSSIBLE A FEW YEARS AGO.

ONE EXAMPLE OF ESCALATING EXPECTATIONS IS A NEW AUTOMATED-ASSEMBLY CELL

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THAT BUILDS DIFFERENT STYLES AND COLORS OF MIRRORS "IN SEQUENCE" FOR FORD MOTOR COMPANY.* EACH MIRROR IS ASSEMBLED, THEN PACKAGED IN THE SAME SEQUENCE AS THE VEHICLES ON FORD'S ASSEMBLY LINE.

15.11.18 Today, depending on our customer, our target PPM that is expected is anywhere from 30 to maybe 70 PPM. So over the years it's decreased by ten- or 20-fold, the expectation of the customer relative to quality. 15.11.38

15.12.39 The improvement requirements from our customer for improved quality, improved delivery, and reduced costs, has driven us to constantly seek out improvements. What we've been able to use value stream mapping for is to help us look t the entire stream, the entire value stream, and identify where are our weakest links. 15.12.59 It has been a very important tool for us to identify where do we think we can go in and implement improvements, as opposed to kaizaning or having continuous improvement activities in a certain area based upon our opinions at the time, we now use value stream mapping to help us understand where is the weakest link in the value stream. Based upon that analysis, we're able to pinpoint our kaizan activities very distinctly. 15.13.25.

NARRATION (VO): GRAND HAVEN CONTINUES TO USE VALUE STREAM MAPPING TO IMPROVE PROCESSES AND TO DEFINE THE NEXT FUTURE STATE AS THEY LEARN WHAT IS POSSIBLE.

NARRATION (VO): ULTIMATELY THE NEW FUTURE STATE MAP MUST BE RAPIDLY CONVERTED TO ACTION ON THEN SHOP FLOOR.* CONTINUOUS IMPROVEMENT TEAMS, WHICH INCLUDE FULL-TIME HOURLY ASSOCIATES, IMPLEMENT THE CHANGES.* DONNELLY CAREFULLY SETS OBJECTIVES FOR EACH LEVEL OF THE ORGANIZATION AND EVERYONE KNOWS THEIR GOALS FOR THE QUARTER.* ACCOMPLISHMENT OF THESE GOALS IS CAREFULLY TRACKED AND DISPLAYED USING STANDARDIZED VISUAL CONTROLS.

16.06.36 Being a participative organization, management needs to provide to the workforce the direction, the what. They need to be able to explain the why. And then they ask the workers to help us figure out the how. What value stream mapping does is allows our management to really get a clear picture of what they want to do,

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and be able to answer why the various tools that are being implemented are being implemented and the fact that they are being implemented. 16.06.59

NARRATION (VO): AT DONNELLY, VALUE STREAM MAPPING IS CLEARLY AN IMPORTANT MANAGEMENT TOOL GUIDING THEIR TRANSFORMATION TO A LEAN ENTERPRISE. WHILE THEY HAVE FOCUSED MOSTLY ON THE INSIDE OF THE PLANT, VALUE STREAM MAPPING MAY ALSO BE USED TO LOOK AT THE ENTIRE VALUE STREAM OF CUSTOMERS AND SUPPLIERS.

We consciously, for the Learning to See book, decided to bound it at the plant walls. We do show the customer, the next downstream customer and the next upstream supplier. We don't say anything about them other than this is what the customer wants, and here's how we communicate with that supplier.

.. However, as you start doing that conceptually, this is arithmetic, it's not calculus; you just start to add. That's all you have to be able to do is add. And you start to expand your scope. As you do that, well wait a minute, now you have to have the purchasing people involved, and you have to have the suppliers' sales people plus their operations people plus their purchasing people, so that the number of organizations, departments, and firms that have to be at the party gets bigger

…I had a great story just recently of a company that went to its customer and said let's draw a combined map of what you do and what we do. They drew the map—just two operations, here's your operation, here's our operation. Great big 'aha'. Look at all the duplication. Why don't we just do all of it right here, and by the way why don't we move what we do next to you. Then all of these handoffs and all this management complexity disappears.

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