Employee Motivation in an Aluminum Extrusion Operation –
A Case Study on How a Properly Designed and Managed
Incentive System Drove Outstanding Productivity and Quality

Craig Werner, Werner Extrusion Solutions LLC (WES LLC), Lake Forest, Illinois, USA;
and James Scheuing, Plymouth Tube Co., Westchester, Illinois, USA

ABSTRACT – This paper is a case study of the effective incentive system utilized in Werner
Co’s. Franklin Park, IL extrusion operation. This facility and its results were referenced in the
four WES LLC ET ’08 papers. These papers detailed some of the technical, modeling,
continuous improvement, and Six Sigma activities which helped this single 2,750 US Ton press
to achieve 34 million pounds per year; the incentive system paper details how the proper
implementation and maintenance of the incentive system also drove these results. Of particular
interest is that the co-author, Jim Scheuing, was the facility’s first press operator, and was
promoted over the years to supervision and management. In these roles, he was both personally
motivated by the system and later had control over how the system was used to motivate his team.

INTRODUCTION

The authors worked together at Werner Co.’s Franklin Park, Illinois, extrusion operation from 1985
through 2006. Craig Werner’s and Richard Kelly’s ET ’08 paper “A Two Decade Case Study – How
Modeling Drove Exceptional Results, Werner Co’s Franklin Park, IL Extrusion Operation 34 Million lbs of
Annual Production from a Single 8” Diameter, 2,750 US Ton Press” details how data analysis and
modeling systems helped to drive these exceptional results. This paper, on the incentive system used at the
Franklin Park extrusion operation, documents the details and use of the incentive system when used as a
component of the employee motivation system.

Craig Werner’s technical background includes a B.S. in Industrial and Management Systems
Engineering from Pennsylvania State University, and an M.S.I.A. in Industrial Administration from
Carnegie Mellon University. Jim’s background includes a B.S. in Psychology from Illinois State
University. The first push of production from the new extrusion press occurred on July 12, 1985; by then,
Craig had designed and implemented the employee incentive pay system (first announced on June 6, 1985).

This paper will disclose the details of the incentive system utilized in the Franklin Park extrusion
operation, and, perhaps of even greater interest, will describe how the system affected the motivation of the
employees whose pay was affected, how the extrusion supervisors were impacted by the system, and how
the management of the extrusion operation used and controlled the system. Craig Werner was the project
manager for the press installation and managed the operation upon startup. Jim Scheuing was the first
press operator, and was promoted to supervision of the extrusion department, through the lead supervisor’s
role, and on to the mill manager in charge of both extrusion and fabrication operations. He has a unique
perspective on how the system impacted all of these roles.
Werner Co. is a very large manufacturer of aluminum extrusions, fiberglass pultrusions, and climbing equipment. In 1985 there were two main facilities: Greenville, Pennsylvania, with a remelt, four extrusion presses, and extensive ladder fabrication, assembly and warehousing; and Franklin Park, Illinois, with fiberglass pultrusion equipment, the newly installed 2,750 US Ton extrusion press, and similar extensive ladder fabrication, assembly, and warehousing.

Employee incentive systems were widely used at Werner Co., in the fabrication and assembly areas of both facilities. These systems were typically based on the classical Industrial Engineering Time and Motion Study, introduced by Frederick Taylor and his contemporaries, and commonly used throughout industry.

These classical incentive systems are often strongly criticized for the dehumanizing effects of focusing only on productivity, and have been the subject of many critical reviews regarding their effect on the substandard levels of quality that could result from their misuse.

Our Franklin Park facility had an Industrial Engineering department, charged with continually monitoring and adjusting the classical incentive systems to ensure that their use motivated high levels of productivity, while also ensuring exceptional safety and quality. Because the facility was managed by the Werner family (Bob Werner and later by the author), focus never wavered from safety and quality as the primary goals, with productivity (cost) as the next focus area. Without continual oversight of the Industrial Engineering department, the systems used throughout the fabrication and assembly areas would have become dated, and the base data used to set the standards would no longer properly reflect reality. This could lead to standards that were either too hard or too easy to achieve, resulting in decreased motivation in either case.

Craig utilized his IE training to develop the incentive system for the new extrusion operation, integrating it with the philosophy of excellence which pervaded our company. The system was designed to motivate proper behaviors and reward achievements in both productivity and quality, utilizing existing corporate systems (please reference the author’s other ET ’12 paper on Certification) as the ongoing basis for the extrusion department incentive standards. Because the incentive system was integrated with the broader system ensuring data integrity, accuracy and continuous improvement, it was not necessary for the Industrial Engineering department to spend much effort monitoring the extrusion incentive system – this occurred automatically, as part of (a byproduct of) the already-established Certification system. An inspect/pack (I/P) incentive system was also used, but this will not be covered in this paper (more closely tied to classical incentive systems (time and motion-study driven).

This paper is organized as follows:

- How the incentive pay system worked (the bulk of the paper)
- How the system affected those whose pay was influenced by it
- How the system affected the supervisors in the extrusion department
- How the system was kept up-to-date by extrusion management
How the Incentive Pay System Worked

The Franklin Park extrusion press was set up in a “Z” fashion, with the log system feeding the press, which fed the handling system. The finish saw was at the far end of the department from the handling system. Staffing for each shift included supervision and die shop personnel; generally staff, but including an hourly die chaser who could also fill in for operational personnel as needed, a lead operator (press operator), a rover (delivered log and billet, removed scrap, filled in for others who were on break), a finish saw operator, and saw crew personnel (one of whom would also, depending on the profiles being run, operate the stretcher through manning the tail stock). The press operator was responsible for keeping the profiles fed into the stretcher head stock, often using masking tape to hold the cooled ends together (countering bowing from cooling effects prior to the stretcher).

The system was originally set up to motivate the lead operator, who operated the area of the department from the log rack through the extrusion press and the headstock of the stretcher. Once the system was fine-tuned for this purpose, it was expanded to include the entire hourly extrusion crew.

IMPORTANT RESULT: Because the entire hourly crew’s pay was tied to increasing the production of quality profiles, despite the presence of a union in the facility, the team was very happy to have any assistance offered from staff personnel, including supervision, quality control, die shop personnel – even the extrusion manager and maintenance. Any of these staff people could be seen pitching in and helping the department to excel on any given day. There were really never any complaints about staff taking on hourly roles – whoever could best help lend a hand to improve productivity and quality led to increasing the hourly team’s pay, and as such, their help was welcomed.

The incentive system was set up to pay:

• One lead operator
• One saw operator
• Whatever press crew the current production job called for.

Originally the incentive system was set up to be run from a PC spreadsheet program (Lotus 1-2-3), but once the “bugs” were worked out, it was incorporated into the corporate accounting and pay system.

Philosophical Overview

Please note that the system described is one method to achieve motivational incentive systems for an extrusion operation. Readers may well have different data systems or different philosophies.

IMPORTANT: The goal of this system is to encourage the crew to push more good pounds. Overpaying a bit on an incentive percentage isn’t nearly the mistake that ruining the crew’s motivation to push more good pounds would be!
The following example will be helpful in understanding the system:

- The incentive system calculates a daily incentive percentage rate for the press operator, and a separate number for the rest of the crew (sawyer, saw crew, etc.). This percentage directly impacts the dollars per day earnings of each hourly person directly.

- The incentives are paid on a daily basis. For example, the press operators for all three shifts are paid the same percentage. The intent of this is to ensure that the crews aren’t tempted to avoid, pull off of runs, etc., for more difficult profiles; in fact, by paying the same percentage for all three shifts, crew members are encouraged to be sure that they do whatever is possible for the runs to be successful from both a productivity and quality perspective, no matter which shift is running them.

- The press operators’ percent basis established daily sets the maximum level that the saw crew can achieve. If the sawyer (who effectively calls in or sends away temporary saw stacking help as needed) uses too many people at the saw, all of them suffer (in incentive earnings). If the sawyer uses too few people, there is no additional reward (Werner Co. used the industrial engineers to establish the proper number of saw crew required – working with too few crew could lead to safety or quality problems (if, for example, the stackers had to pick up too many mill lengths at once, attempting to keep up or earn more percentage, they could be subject to back injuries).

- The crew can make more money each day by:
  - Pushing more billets (through minimizing downtime, increasing velocity)
  - Generating less extrusion scrap for the day
  - Generating less inspect/pack scrap for the prior week
  - Not using more than the allowed number of stackers/helpers at the finish saw
  - This closely aligns with the goals of management; elements of the incentive system and its implementation touch on:
    - Safety
    - Quality
    - Productivity
    - Teamwork.

**Figure 1.** The base data in the system used to calculate the Press Operator’s incentive percentage.
Figure 2. The resulting incentive effects for the press operator and the crew.

Figure 3. The data entry and calculations for the Press Operator’s incentive percentage.
PRESS OPERATOR’S INCENTIVE EARNINGS

• The system first calculates the incentive pay for the press operator; this becomes the basis of the incentive earnings for the rest of the crew. It will be very useful to view the computer sheet printouts included as attachments.

  o The press operator’s incentive percentage is directly impacted by the number of billets run for each profile, multiplied by the allowed time for each billet

  o The actual extrusion scrap percent for the profile run is compared to the allowed (standard) scrap

    ▪ The theoretical extrusion scrap for each profile is added to a management set extrusion scrap allowance

    • The eight percent allowance above and beyond theoretical minimum scrap is meant to reflect that there can be startup billets or other issues that occur during any given run. Management expects the press operator and crew to do better than this – we set an eight percent level to give them some target to shoot for, and to avoid spending time, effort and motivation arguing about whether it should really be 3.4 percent, 4.1 percent, etc.

    • Any unusual scrap above or below what would be expected triggers a “Check Scrap” comment

    ▪ The system is set up to allow a different penalty or reward percent for the actual extrusion scrap (taking into account all scrap between the billet supplied to the press and the finished mill lengths placed onto the aging racks). For the attached documents following the paper, these were set to:

      • **Penalty**: 50 percent
        (The intent being, that rather than argue about the cause of any extra scrap between the press crew and management, let’s just assume that some of the scrap may be due to things within management’s control and some within the crew’s control)

      • **Reward**: 100 percent
        (The intent that management is willing to give all of the credit)

    ▪ A management-established incentive basis is used (128 percent for the attached example)

    ▪ Similarly, the inspect/pack department’s scrap is compared to an allowed level, four percent in the attached example with similar logic to that above, (management expects less than four percent, but doesn’t want to waste energy and motivation with the crew), with rewards/penalties utilized as for the extrusion scrap. Profiles run one day must then be processed through the aging system and removed from the aging racks, inspected, and/or packed for internal
Because it is difficult to directly tie back any extra I/P scrap to a particular day’s production for incentive purposes, the decision was made to use the average I/P scrap percent for the prior week as the actual I/P scrap, to compare to the allowed I/P scrap for each day’s incentive calculations.

- Each day, the various items run are entered into the incentive system
  - Item number includes the profile number and the dash number, which refers to the various possible mill lengths cut from the same profile
  - The billet manufacturer is included (MG in the example referred to secondary billet, which due to Werner’s scrap supply to the scrap remelter tended to have slightly higher iron percentage, and ran slightly slower at the press)
  - The number of billets listed is multiplied by the allowed time per billet (affected by the use of prime or secondary MG billet) to achieve the generated time
  - The generated time for each item number is adjusted by the actual vs. theoretical extrusion scrap per the penalty/reward percentages previously discussed; the extrusion scrap adjusted time (minutes) is the end result
  - The extrusion scrap adjusted time (minutes) is itself adjusted by the prior week’s I/P scrap actual vs. allowed
  - The resulting scrap adjustment factor sets the basis for the incentive hours
  - In the example, the number of pushes on the items generates 1,206.15 minutes, which is boosted to 1,257.59 minutes by the extrusion scrap adjustment performance and reward (20.10 hours becomes 20.95 hours). The prior weeks’ performance on I/P scrap further boosts the hours to 21.44 hours (thus, overall, the better than allowed scrap performance boosted the incentive hours by 6.67 percent for the example)
  - 21.44 hours * 128 percent incentive basis achieves 27.44 incentive hours
  - Looking back at the original 20.10 generated hours, there were thus 24.00-20.10 = 3.90 hours of non-Incentive time (downtime, slower than expected pushes, etc.)
  - 27.44 incentive hours + 3.90 non-Incentive hours = 31.34 hours
  - 31.34 hours / 24 hours/day = 130.58 percent incentive pay for the day
  - 20.10 hours generated through pushing billets using the standard allowances for each item
  - An additional 0.85 hours added for better than allowed extrusion scrap performance
• An additional 0.49 hours added for better than allowed I/P scrap performance (from the prior week)

• End result: the extrusion press operator’s base pay is multiplied by the 30.58 percent to calculate his incentive earnings.
  
  o If, for example, the press operator earned $14 per hour base pay, his total pay for the day (assuming eight hours worked) would be $14 per hour * eight hour per day * 1.3058 = $146.25 vs. what would have been a base pay of $112

  o The press operator earned $34.25 extra for paying attention to improving extrusion velocity, keeping downtime to a minimum (plus whatever else he could do to push more good pounds!), and because they achieved better than allowed extrusion scrap for the day, and better than allowed I/P scrap for the prior week.

SAW CREW INCENTIVE EARNINGS

• Looking back at the worksheet above for the press operator, each item number has an industrial engineer-established Allowed Incentive Crew Size

  o The engineers use a spreadsheet which takes into account the profile weight per foot, mill length, and profile configuration. They use the spreadsheet and simple logic to determine if one, two, or three stackers will be required at the finish saw, based on the configuration of the profile (which determines how many the handlers can lift at one time, taking into account the width of the part, how the parts may be interlocked, etc.), and the weight of each part (ensuring that the handlers aren’t lifting more than what OSHA and/or other internal rules limit them to)

  o This crew size is multiplied by the original generated time to achieve the generated time, times the allowed crew size

  o The accounting/payroll system supplies the clock numbers of the personnel who the sawyer affirms are part of the saw crew (saw operator, stretcher and helper(s) and rover, with a number of hours under incentive earnings for each)
    • The authors apologize, but we do NOT know why the second shift has no hours listed for the example…this production/incentive report came out 17 years ago and was all we had to use for this paper…
    • Note that not all helpers have the full shift worth of time listed for incentive earnings

  o The saw operator (sawyer) has the responsibility to operate the equipment and to manage the crew, which operates the stretcher tailstock and manually stacks extrusions into the aging rack. The sawyer can call in and send away extra stackers as needed; when these extras are stacking material they are included on the incentive system earnings, and when not, they are either doing other incentive work or earn their base pay rate
The sawyer is encouraged to make certain that the right number of stackers are utilized at all times to ensure that he and the remainder of the crew:

- Do not work harder than necessary (supports the #1 Safety Initiative) – for each order, have the correct number of people at the finish saw (there is no incentive for using fewer man-hours than allowed – if they don’t have enough stackers, the sawyer and others are either bottlenecking the extrusion press or attempting to work at a faster rate than necessary or lifting more extrusions per grab than is considered safe)

- Do not use (or report!) more hours than allowed (again, for each order have the correct number of people at the finish saw), or the whole crew’s incentive earnings will suffer (except for the press operator, who is far at the other end of the production system and physical layout)

  - The sawyer thus calls helpers to the saw area or sends them away efficiently (some of these do other work in the department which can be interrupted, in some cases Inspect/Pack personnel are called over for long runs requiring extensive extra help, etc.).

**How the System Affected Those Whose Pay was Influenced by It**

Jim Scheuing was the first press operator at Werner Co.’s Franklin Park facility. At first (before the system was expanded to the rest of the crew), only he and two other press operators (second/third shift) were affected by the system. These press operators were very well trained technically (how to operate and troubleshoot equipment, maximize the process, treat tooling, etc.) regarding safety, quality and productivity, and how the minute-to-minute decisions they made could impact upon themselves, others, and our joint success.

Management made certain that they fully understood their jobs and how the incentive system would affect their pay. We worked hard to ensure that they were kept abreast of how the certification system was gently raising productivity requirements as they reached each new level of performance (ensuring that they had daily “stretch goals”, but fair, achievable goals). The entire press production team understood the system and viewed the system, revised stretch goals, etc., as fair and achievable. Note: this isn’t management’s hope of what the team would feel, but an honest assessment based on Jim’s many years in various roles, including time where he was part of the team whose pay was directly affected by the system.

Jim found that the system was fair and helped to keep him on his game regarding operations. He was very concerned with any equipment downtime, as it eliminated his ability to push any billets and thus earn generated time during the period of downtime. As such, he worked hard to let the technical staff know of any problems as soon as possible (odd sounds, oil leaks, unusual equipment reactions, etc.). He was equally concerned with any things which would create either:

- Any single noticeable amount of downtime
- A situation where he couldn’t push as quickly as desired
- Situations where smaller issues added up to the loss of generated time misses (this could include slow dead cycles, tooling setup problems, log furnace or other problems leading to tearing, scrap, etc.).
If Jim couldn’t push as many billets as he thought he should be able to, due to whatever cause, or if there was anything driving extra scrap, he acted quickly and continuously, communicating to whomever he needed to (maintenance, engineering, extrusion management, plant management, or general management) to get the problem noticed, prioritized and fixed, so that he could earn more money! He worked very closely with maintenance to help them to troubleshoot and solve the problem ASAP!

Jim’s understanding of how all of the pieces (technical, tooling, personnel, etc.) affected his ability to earn incentive dollars ensured that he never grew complacent, but expected excellence from those supporting his efforts to improve production and reduce scrap. He was equally comfortable pressuring management, die correctors, plant engineers, maintenance personnel, supervisors, or the rest of the crew if they were doing, or not doing anything that impacted upon his and the rest of the team’s incentive earnings. In short, Jim was motivated to push more billets and to minimize any scrap.

How the System Affected the Supervisors in the Extrusion Department

As a supervisor, Jim found that the system provided internal motivation to do the right things for the press operator, and the sawyer and saw crew. No one wanted to lose any possible incentive earning dollars, and the whole crew worked together with each other, management, and the technical/maintenance staff to keep the equipment and process running at peak performance. They were all motivated to continuously improve productivity and scrap, trying to keep edging ahead of the continually reset extrusion velocities, pounds per hour and extrusion and I/P scrap percentages set by management through the certification process.

From Jim’s view as a supervisor and lead supervisor, the crew’s motivation to work together as a team and with others throughout the division to continuously improve and to perform well on a daily basis freed him up to focus on what he could do to help with this, and to ensure that the division’s goals of safety, quality, productivity, teamwork, and housekeeping were advanced.

The incentive system was a tremendous assistance to the supervisors, ensuring that they didn’t have to focus on details of the operation best handled by others in the crew. While they, of course, ensured that productivity and quality were achieved, they could rely on the press operator and the rest of the team to keep these objectives in mind, without continually requiring supervisory attention.

How the System was Kept Up-to-Date by Extrusion Management

The KEY was that management set up and used the certification process in a manner to gently encourage continual improvements. When promoted to mill manager, Jim, like his predecessors, was pleased when the press operator and crew earned nice incentive pay. Their goal was not to drive rates up to eliminate these earnings, but rather to use the certification system to gently nudge the expectations higher on an achievable basis, working with the crews, technical personnel, metallurgist, etc., to provide the leadership and technical advancements to assist the crews in continually improving all aspects of the department. Similarly, when extended periods of equipment, aluminum alloy, dies, etc., were present and clearly identified as known issues, temporary adjustments to the system were made to be fair to the entire team with the incentive system. This helped the team to understand that the system was fair, properly maintained, and was utilized to achieve the common objectives of the entire extrusion department – staff and hourly.

Jim used the certification system (see the ET ’12 companion paper: “How Extrusion Operational Data Integrity can be Used as a Simple, Effective Means to Continuously Improve Extrusion Operations,” and...
ensured that his supervisors and operators were part of the decision process to revise the profile data toward more accurate and higher levels of achievement.

CONCLUSION

The end result of this extrusion incentive system was that it aligned the goals of the organization with the shorter-term incentive goals of the team of people who, together, ensured that the equipment, tooling, processes, technology, and personnel motivation built on each other to drive the repetitive levels of excellence and performance that were achieved at Werner Co.’s Franklin Park extrusion operation for decades. Key to these achievements was the focus on fairness and motivation, vs. what would have been a mistaken focus on setting certification levels too difficult to achieve, or establishing a system that would require an undue effort to maintain or, worse yet, would become a bone of contention between management and the team of people operating the extrusion department.