SUBJECT: Overdue E-3 Cage Orders

Schenectady, January 26, 1950

Mr. W. Pruessman
Building #273

On October 28, 1949, we were asked to find out why there were so many diaphragm orders overdue and to suggest means for eliminating the backlog.

We have sent many reports to you on this subject, but we should like to take this opportunity to summarize the situation.

On October 28, 1949 there were 1161 orders on hand, and 687 of those were overdue. On January 23, 1950 there were 900 orders on hand and 588 of those were overdue. This would indicate only a 15% reduction in the overdues, but we feel that the results are much more significant. There has been a new manufacturing schedule devised which has rearranged many shop orders. This change in dates has not been entered yet on the dispatch cards. As soon as this is done (which should be before January 30, 1950) the overdues should drop about 250 orders. This anticipates correcting the dates on both dispatch boards. This would bring the overdue backlog to the lowest point in eight months.

We have another check on the position of the diaphragm section. This is the weekly report issued by Production on the number of Overdue Diaphragms. On January 16, 1950, there were only 67 diaphragms overdue; in October there were 250.

A great many of the difficulties arose from the failure of Production and Manufacturing to speak the same language. The confusion arose from the usage of both manufacturing and steam schedules and from finish date as opposed to delivery date on finished diaphragms. We feel that this problem has been thoroughly ironed out, at least, the floor knows why it is being criticized.

It was discovered early that the cause for the late finishing of the diaphragms did not lie so much with the Manufacturing Group as with the auxiliary functions: Engineering, Planning, Voucher Typing, Cage Dispatchings and Production. Each of these groups has been pushed in an attempt to get everyone to pull his own weight. At the same time pressure was

exerted on each foreman toward the same end. None of these groups are out of the woods yet, but on the whole there has been an improvement in the outlook, if nothing else. Two manufacturing sections deserve a special pat on the back - Mr. Smith's and Mr. Endries' - each of these sections has cut its on hand and overdues more than 50%. The other sections have been dogged by special difficulties which are gradually being ironed out.

However, there should be no let-up now; the weekly cage reports should serve to keep the interested parties on the ball in the manufacturing groups, and calculated prodding of the auxiliary functions should keep them stepping also.

I would like to thank everyone here for the aid and assistance which you have given me. If you had not willingly given me all the information I needed, I would have accomplished nothing. As it is I have had a very interesting and educational assignment and I hope that I've helped in improving a difficult situation.

TURBINE MANUFACTURING DIVISION

Burton Grad

Burton Grad

BG:aso

CC: W. Klinkow
N. Coutant
W. Nelson
D. Eagen
W. Lawless
H. Schryver
P. Finley
D. Broderick
R. Egan
J. Brown
E. Keefer
L. Borst
G. Endries
J. Larkins
V. Post
J. Smith

B. Grad
#273
E 105

SUBJECT: DIAPHRAGM DISPATCHING

1-27-50

Mr. J. Brown:

In order to facilitate the placing of the section under Mr. Endries on a dispatching basis the following suggestions are made:

A. For the parallel movement of move cards, dispatch cards, diaphragms and component parts--

1. This situation, which was extremely erratic, has improved of late. Move men and crane followers have received definite instructions but should be briefed occasionally in the future to this end:

a. Whenever a diaphragm cannot be left at its usual designated place because of lack of storage space or for any other reason the crane follower must hand the move card to the move man as an indication. The move man should mark the actual station on the move card following his signiture before the card is returned to the dispatcher.

b. Parts must not be moved without a move card.

c. The halves of a diaphragm must not move independently. Since only one move card exists for both halves and since several jobs require the presence of both halves they must move simultaneously.

2. The mechanical setup of the cage control board is satisfactory. The number and order of compartments are sufficient. Since dispatching will be on a "late" basis until a manufacturing schedule is attained, matters may be simplified for the dispatcher by a 3-section compartment, the middle section containing priority jobs. However, if it is found that jobs in the bottom section are being neglected a 2-section compartment should be maintained.

3. A 3-section compartment has been setup for accumulations and assembly in Mr. Endries' section. The bottom section is for orders waiting accumulations. When the accumulation voucher is received the dispatch card is moved to the middle section to signify an order ready for assembly. The top section is for orders in process of assembly.

4. The dispatcher must, by all means, continually match all move cards and dispatch cards as soon as the former come in. He must know when his jobs are available.

5. It may occur that an operator is absent, a machine is under repair, etc., and a minor rerouting is necessary to maintain earnings and flow at a following operation. Providing that the following operation is not dependent upon the first, such being the case in "Drill for Crush Pins" and "Mill for Support Pins" in Mr. Endries' section, the dispatcher may reroute the diaphragm with appropriate directions on his move and dispatch cards.

B. Section 17 of "A" Bay is being used as a storage area, mainly for completed diaphragms. All means should be excercised to store them elsewhere. Their presence at A-17 is a hindrance to the temporary storage of in-process diaphragms in an already crowded bay and is also a psychological detriment to the workers in the attempt to attain and maintain a manufacturing schedule.

C. Finish dates on dispatch cards for diaphragms and component parts are now being revised continually according to the current steam schedule. These dates should not be used. Original manufacturing dates should be kept on the dispatch cards to maintain pressure on overdue jobs.

Turbine Production

Stan Beran

Stanley J. Beran

cc: N. Coutant #273 E-203
W. Pruessman #273 Rm. 126
W. Klinkow #273 E-105
D. Broderick #273 A-5
G. Endries #273
H. Rosse #273
V. Strock #273
J. Smith #273
B. Grad #273
R. Egan #273 A-5
Cage Dispatchers - 5, File-2

GENERAL OUTLINE

THE TURBINE DIVISION PURCHASING AND REPLACEMENT POLICY FOR MACHINE TOOLS

I Why this meeting?

- A. Wish to explain our Policy.
- B. Wish to show you our present situation.
- C. Wish to show you how to obtain a new machine tool.
- D. Wish to show you the steps Management is taking to aid you in modernizing your Section.

II Our Present Equipment.

- A. What we have
  1. How many machines.
  2. Initial Cost.
  3. Replacement Cost.
  4. Book Value.
  5. Age Range.
  6. Sizes.
  7. Floor space occupied.
- B. What we have ordered or will order soon.

III The economic basis for machine tool replacement and purchase.

- A. Basically a cost problem.
- B. Contrast the two opposite attacks.
- C. Competitive economies.
- D. The GE Answer - Replace for Cause. Consider Risk & Potential Return.

IV What are causes for replacement.

- A. Need increased capacity.
- B. Non-repairable machine.
- C. Cost savings.
- D. Combinations.

V Our Present Position - Policy.

- A. How depreciation works to aid modernization.
- B. What we have available for machine tool purchasing.
- C. How we intend to divide it - to achieve maximum profits for least risk.

VI How you can get a new machine tool.

A. Examine your machines for shortcomings.

B. Investigate what new type equipment is available.

C. Prepare a detailed summary showing why you believe it would be good business to purchase the new machine for your area. This is a Factual analysis - Proving your point by figures.

D. Follow through. Actually realizing anticipated cost savings.

VII How special studies aid you in keeping your equipment modern.

A. Regular investigations of new equipment.

B. Getting special purpose machines designed.

C. Aiding you in justifying replacements.

D. Special research room.

E. Special tabulating and analyzing projects.

VIII General conclusions.

PICTURES AND CHARTS NEEDED
to fit in with Outline.

Portion of outline:

Exhibit 1.	II A, 1, 2, 3, 4	Chart
2.	II A, 5	"
3.	II A, 5	Pictures
4.	II A, 6	"
5.	II B	"
6.	III, A	Chart
7.	III B	"
8.	IV A	Pictures & charts
9.	IV B	" "
10.	IV C	" "
11.	IV D	" "
12.	V A	Chart
13.	V B	"
14.	VI C	" (check list)
15.	VII B	Pictures
16.	VII D	"
17.	VIII	Chart

Possible machines for examples:

Bucket Miller
J. & L.
DeVlieg
8' Mill
25' Boring Mill
Nichols Hand Miller
Hydrotel
Threader
Small Miller
Coil Slotter

THE TURBINE DIVISION PURCHASING AND REPLACEMENT POLICY FOR MACHINE TOOLS

The reasons for holding this meeting are fourfold:

First, we would like to explain our present replacement policy and elaborate on it to show how it effects you.

Second, we wish to discuss our present situation as regards the amount invested in machine tools.

Third, we would like to show you how you can go about obtaining new machine tools and

Fourth, we wish to show you the steps that management is taking to aid you in modernizing your section.

First of all, we would like to take up what we actually have on hand, what are we talking about, how many machines, how much do they cost, what would be the expense of replacing them, what is their book value. Chart 1 gives these figures (discussion of chart 1 here). Next, you may be interested in the age range and the size variation (chart 2 will give those figures). Pictures for size - variation.

We have ordered within the last year the following machines:

(to be listed by Mr. Sherman)

Name Price

) some pictures of a few of these machines.

and we will soon get deliveries on the following:

(to be listed by Mr. Sherman)

Name Price

Now, we should like to discuss the economic basis for machine tool replacement and purchase. Primarily, we have a cost problem. We are investing money in equipment which should enable us to gain increased profits. Since this mode of investment must compete against all other possible ways of investing the money, the rate of return must be great enough to justify the risk that you are taking; and there is a very large risk involved in purchasing machine tools. Many things could occur to make a machine virtually valueless: business conditions may change; designs of the Turbines may change so radically that the machine tools are useless or inefficient, or there may be a revolutionary change in the design of the machine tool itself, making your present equipment obsolete. In addition, our Division must compete cost-wise against the other divisions of the Company for every replacement dollar available.

There are two diametrically opposed methods of attack to the replacement problem. The first way is not to replace a tool; buy a new machine, use it until it is ready to be scrapped and then discard it. This has the defect of not allowing you to keep up with improvements in design and gradually your cost per piece made will increase due to the deterioration of the machine tools. The other extreme is to replace every year or similar extremely short period without cost justification. The reasoning behind this is that your plant is always the most modern in the industry. The defect, of course, is obvious. So much money is being spent on purchase and installation that cost savings cannot possibly be sufficient. You can see naturally that neither one of these attacks is good. The logical thing to do is to find some sort of happy medium.

A third mode of attack often mentioned is to replace on a competitive basis. That is, when your competitor buys a new tool, you should do the same.

This would be all very well if your competitors followed sound replacement practices, however, you have no guarantee of this. Therefore, your replacement policy must stand on its own feet. You must feel that yours is the best possible replacement method.

The G. E. answer has been to replace for cause. Consideration must be given to the risk involved as compared with the potential return. This means that top management decides what is a reasonable return for a given risk; then the Division involved must show good cause for taking this risk.

The next question that arises is what are good causes for replacement; what reasons will justify this increased investment; why should you take additional risks? One of the main reasons for investing the money is to take care of an expanding business. In other words, increased capacity is necessary if we are to take our share of the business; therefore, if it is felt that the business potential is great enough, the need for increased capacity is a good cause for additional machine tool investment. (Pictures for example and case history).

A second cause is non-repairability. This refers to a condition where a machine tool has been used so long that it cannot adequately produce the parts required. To bring it back to efficient production would necessitate a very large or prohibitive repair bill. In these cases, it is often cheaper to buy a new machine than to repair the old one. (Pictures & case histories).

The third and probably most important reason for replacing a machine tool is on a cost savings basis. This is the reason that you will be interested in most. It refers to purchasing a new tool which can make the part required either more accurately, faster, with less spoilage, with less operator attention, or any of the other various cost savings. (Pictures & case histories). This reason is probably the easiest to visualize. You are going to pay back the investor extra

dollars profit for each dollar he gives you. You must therefore show a sufficient return to justify the risk.

As in all practical matters, we usually find ourselves replacing machine tools for combinations of the above reasons rather than for one reason alone. This is, of course, logical and it makes it easier to justify replacements. (Pictures & case histories).

A point that has very often been raised is, what is our present policy? How do we stand right now? In discussing this, one of our first problems is depreciation. The purpose of having a depreciation reserve is to enable you to maintain a modern plant. The original idea was to actually have a depreciation fund with the money set aside in a bank account or trust fund to be used only for machine tool replacement. However, this would be illogical in a Company of our size. We reinvest our money in the place where we can obtain the best return. If replacement will give us the greatest returns then we will use some of our profits to buy new machine tools, however, if we can gain a greater return by constructing a new building, we will do that instead. Our present depreciation policy is that a machine tool shall be completely amortized in 12 years, which leads to a yearly depreciation rate of 8 1/3%. The reason for using a 12 year basis is past experience; we have been buying and using machine tools for a good many years and the Company-wide experience has shown us that we can expect the average machine tool to last 12 years. The Company as a whole sets up a machine tool replacement budget, and this year the Turbine Division has been authorized to spend $1,000,000. However, we will only spend this money if we can find good cause for spending it. We intend to divide it up among the various sections on the basis of which Foreman presents the best story. We will spend this money in such a manner as to provide maximum profits for the least risk, so it is directly

up to you; if you want the money for your section, you have to go out and get it.

We have had numerous questions from you on how to actually go about getting a new machine tool; how you can individually get your share of this $1,000,000. First of all, you have to examine your entire stock of machine tools in order to discover their shortcomings. You are in the best position to know this since you will see the troubles often enough. Any machines which seem to you inefficient in the performance of their tasks, should receive special attention. By asking the Methods Group, you will be able to find out whether there is any new type of equipment available. If there is, you should investigate the advantages. We have a check list available (exhibit it ((Mr. Schaeppi))) to aid you in analyzing the advantages of a new machine tool. After using this check list, you should prepare a detailed and complete summary showing why you believe it would be good business for us to purchase the new machine in question for your area. (Exhibit) This should be a factual analysis. You should prove your point by figures wherever possible. We know that there are certain intangible savings, but you should, to the best of your ability, attempt to evaluate these. The Methods Group would be very glad to aid you in preparing this summary; however, they are not going to do your work for you. The reason why we wish you to prepare this summary yourself is that no matter how large the anticipated savings are, it is not worth anything to us unless they are realized. We have had numerous cases where anticipated savings were quite large, but, because the individual Foreman has not been sufficiently concerned, no real cost saving has materialized. We had a good idea; it seemed that it would save us money and yet we have gained no additional profits. For this reason, primarily, we want you to know what you are getting and why you are getting it. The easiest way to do this is to ask you to justify the replacement.

When you obtain any replacements on machine tools, you should, of course, follow through very thoroughly to make sure that you get your moneys' worth; that

you are actually saving the money you claim in your summary.

But, don't get us wrong, we are not leaving you out on a limb, and asking you to do it all yourself. We are spending quite a bit of money on special ideas to aid you in keeping your equipment modern. We are conducting regular investigations of new equipment. This involves various men in Methods and other groups visiting machine tool factories and customer factories in order to find out if they are using any new or better equipment. This is done quite frequently and you may have occasionally been in on these trips. Through these trips, we often learn of ways that we can improve our own manufacturing setup.

When you have special problems which cannot be solved by standard line equipment, the Methods Group will investigate the feasibility and expense of purchasing special purpose machines.

The Methods Group will also, as mentioned above, aid you in justifying replacements. They may know of special ways or means of establishing cost savings in a particular case. As an example of this, they may often know of a spot where your old machine can be used thereby making it easier to justify a new one.

We have also started something just recently which may prove of interest and assistance to you. On the second floor in the Service Bay, we have a special research room for machine tools. We have purchased certain machines which we feel will make revolutionary changes in the mode of operation on the floor. The Methods Group has been experimenting with these machine tools in an effort to discover their capabilities or limitations. This also enables us to give certain Methods men an opportunity to actually run machine tools so that they may more easily discover better ways of making various parts. As soon as we feel that we can demonstrate the usefulness of cost savings of these new machine tools, we will introduce them in various sections. (The case history of the J. & L. Turret Lathe--

In the winter of 1949, Mr. MacNary was in Springfield and happened to see a new Jones and Lamson Turret Lathe in operation. It was doing work similar to some of our body bound bolts. On a chance he asked them to try to make one part for us, Drawing #807081, This part normally cost us about 26¢ using high speed steels. They found that they could make the part in 1 min. 7 secs. by use of the new Turret Lathe with carboloys. On this information, we decided to purchase the machine for testing, to find out tool life, what type carboloys were better, as to the range of operation and other items of interest. We have been testing this machine now for about 2 or 3 months and we have used it on body bound bolts and certain other parts. It runs at 1,000 RPM, 15 hp motor.) This is an example of information we are obtaining from this special research room. (Pictures and more thorough case history).

In addition to these investigations of particular cases, the Methods Group has been spending quite a bit of time doing special tabulating and analyzing of our present equipment. This has been done in order to discover average machine life, usage, and repair history. The results of these inquiries should enable us to give you a better idea of just how the Turbine Division stands.

General Conculsions:

We hope that we have aided you in understanding our logic, our policy, our present situation, and our thoughts concerning machine tools. Let us briefly re-examine some of these ideas. We buy machines in order to make more money, therefore, when you wish a new machine you must prove to us that you will make more money for the Division because of its purchase. We are putting this problem squarely up to you. We are going to spend $1,000,000 this year; if you want your share, go out and get it. We will help you all that we can but we cannot do it all. The thought

we would like to leave you with is that by your personal efforts you can get new machines and thereby improve your own and the Division's condition. Thank you.

(20 mins. speaking time; 30-40 mins. exhibit time.)

Burton Grad

SUBJECT: Voucher Typing

Schenectady, January 20, 1950

Mr. W. Pruessman
Building #273

The following are our recommendations for extricating Voucher Typing from their backlog and enabling them to reduce manpower:

A. Instruct each typist as to just what must be typed on each voucher and where it is to appear. The details of some of these ideas have been given to Mr. Lawless. Some of them are:

1. No capitals.
2. No punctuations after abbreviations.
3. Use all abbreviations.
4. No "Pt." before part number.
5. Cage and station on line below last line of operation description.
6. Class of price (std., spc., tmp.) and price on same line as last line of operation 'description.'
7. Do not type in description of part.
8. Omit the serial number from all vouchers.

B. Instruct each typist as to just what must be typed on each Cost Card.

1. Leave off all operation descriptions except on supply jobs.
2. On second copies the only information that must be typed at the top is: Start Date, Shop Order, and Drawing Number.

C. Design a new voucher to suit the Turbine Division's needs. It could be used for extra cost as well as regular labor vouchers. This should be a carbon backed, side-hinged voucher in strips of six. Some of them should be singles, numbered from one to six.

D. All planning cards, with six or less operations which will be used five or more times, should have a special cost card master typed up and filed with the Planning Card. When an order comes through the master would be attached and then instruction sheets and a cost card run off. These sheets would be attached to numbered vouchers on which only a price and hectographed heading (from order master) appears.

E. The order master should be redesigned in order to fit in with the new voucher.

F. All headings for orders should be duplicated after the rest of the voucher is typed.

G. All planning cards to which four or more orders are attached should have masters duplicated for the operation descriptions and then all of the vouchers could be duplicated.

H. All orders which have standard planning should have the entire voucher book hectographed before planning, and the book attached in Planning.

I. A code system should be devised to represent the various instructions which appear on the vouchers.

J. All Extra Cost vouchers which occur frequently should be duplicated so that merely the price and identification need be typed on later.

TURBINE MANUFACTURING DIVISION

Burton Grad

Burton Grad

BG:aso

CC: W. G. Lawless
L. C. Warner
N. W. Coutant
D. Fagan
G. O. Truex
W. H. Schryver
A. Sturges
P. P. Finley
J. Brown
W. A. Nelson

Schenectady, January 16, 1950

Mr. H. E. Sherman
Building #273

Can you aid me in getting the following material:

CHART

How many machines

Total Initial Cost

Approximate replacement cost

"Book Value"

BAR CHARTS

How many in each year up to present.

Also how many more than 5, 10, 15, 20,

etc. years old.

Three to Six pictures illustrating size - large, medium and small.

TURBINE MANUFACTURING DIVISION

B. Grad

BG:aso

January 6, 1950

ROUTING OF COMPONENT PARTS AND DISPATCHING B. Grad

OF DIAPHRAGM ASSEMBLIES #273-E-105

In order to facilitate the dispatching of diaphragm assemblies and to relieve an accumulation and storage problem the following procedure will go into effect on February 10, 1950.

Diaphragm assembly paper work will be released by the Production Office on Distr. #5 according to due date as is the practice at present. This paper work will be filed in a "Dead Load" file in the dispatch cage.

As each component part needed for assembly—webs, rings, spacers, partitions, backing rings, and in the case of first stage nozzles, end pieces—are completed, the Finish Stock Delivery paper work will be brought by the move man to the dispatcher. It will not go to the stockroom as in the past. The component parts will be routed directly to the assembly rack located in A-4 instead of to the stockroom and the location noted on the Finish Stock paper work.

The cage dispatcher will clip the Finish Stock slips for the components to the assembly vouchers book as they are received. When the last component is completed, the dispatcher will refile the assembly paper work into his active load by work station and due date. If, for some reason, the assembly paper work has not been indexed, the dispatcher will file the Finish Stocks in a separate 3 X 5 file by shop order and reference number, not by drawing. This will make it simpler for the cage dispatcher to locate the component Finish Stocks when the assembly paper work is received. The dispatcher will check his 3 X 5 file against all assembly paper work as he receives it.

When the move man moves the spacers, partitions, etc. to the assembly rack, he will locate the rolled spacers, backing rings and end pieces in the upper compartments and the partitions and individual spacers in the floor compartments, making sure that all parts are located by shop order and stage number and that the identification tags are on the parts and in plain view.

To make this system work efficiently it is necessary that complete shop orders of the components be brought through the factory at the same time. They must be indexed together, dispatched together and machined together.

Otherwise we will not have an even flow of assembled diaphragms. Planning must be arranged so that this may be done.

This is a big step towards a better production control. We must eliminate straggling diaphragms and bring through units instead of partial units. It is a system which requires coordination and cooperation on the part of factory, planning and production and its successful operation will insure our meeting schedule dates.

This first shop order effected will be Delaware Power, S.O. 170-3052.

D.E. Broderick/Supervisor
D.E. Broderick
Diaphragm Section
Ext. 4970

DFB/bl

SUBJECT: Replacement of Machine Tools

Schenectady, January 4, 1950

Mr. W. A. Nelson
Building #273

In order for the Turbine Division to adopt and maintain a consistent and complete Machine Tool Replacement Program, the following steps must be taken:

1. A complete tabulation of machine tools on hand should be prepared and arranged by types and sizes. The tabulation should include:

   A. Present Condition
   B. Present Utilization
   C. Age
   D. First Cost

2. Each specific category should have the annual Repair Costs tabulated. This should then be evaluated as to its applicability in justifying a machine replacement appropriation.

3. All possible surplus machines should be eliminated to reduce the annual depreciation charges.

4. Each category should have its oldest machines checked carefully to see if the purchase of new equipment would be economical. As an aid in doing this the notes outlined below might prove helpful.

5. From this analysis of the records an average retirement age could be found for each type of machine. Then, as each machine approached this age, it would be very carefully reviewed to see if replacement were justified. This average retirement age could be recalculated annually, if necessary.

6. If it is found that the average expected life is significantly longer than twelve years (say twenty years or more) it might be worthwhile to attempt to get a special depreciation rate for this division. This would, of course, make it easier to justify replacements.

In the course of the investigation certain items have come under consideration. On the following pages is a brief discussion of each of these salient points.

1. What are Cost Savings?

   They are the various time, rework, fixture, and set-up savings plus the Differential Repair Cost Savings.

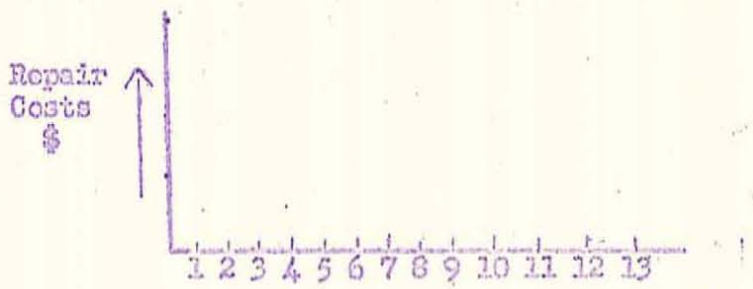
2. What are Differential Repair Cost Savings? How can they be calculated?

   Repair Cost includes down time costs as well as actual money spent on repairs. The repair records should be tabulated in the following manner:

Machine No.	Initial Cost	$ to Repair First Year of Life	% of I.C.	Av. % of I.C. For Repairs in First Year

   The same system should be followed for the second, third, fourth and fifth year of life. This would give the anticipated repair costs for a new machine of the same type.

   For any particular machine being considered for replacement, the yearly repair costs should be listed. These figures should be plotted on a Cost-Life graph.



The best fit trend line should be plotted and projected into the next five years.

To calculate the repair cost savings per year the following table might be useful:

Years From Present	Projected Repair Cost of Old Machine	Anticipated Repair Costs of New Machine	Differential Repair Cost Savings
1st			
2nd			
3rd			
4th			
5th			

3. The overall Cost Savings can be calculated from the following formula; the subscript indicates years from present:

$$CS_1 = \frac{\text{Hour saved}}{\text{Hour}} \times \frac{\text{Hours}}{\text{Year}} \times \frac{\$}{\text{Hour}} = \frac{\$\ \text{Saved}}{\text{Year}}$$ (Less time to do same job.)

$$+ \frac{\$\ \text{Rework Saved}}{\text{Hour}} \times \frac{\text{Hours}}{\text{Year}} = \frac{\$\ \text{Rework Saved}}{\text{Year}}$$ (Increased Accuracy)

$$+ \frac{\text{Hour Setup Saved}}{\text{Hour}} \times \frac{\text{Hours}}{\text{Year}} \times \frac{\$}{\text{Hour}} = \frac{\$\ \text{Setup Saved}}{\text{Year}}$$ (Speedier Setup)

$+ \$$ Dep. on another old machine (If a second machine can be made surplus.)

$+ \$$ Repair Savings $+ \$$ Down Time Savings (Additional repair Cost of keeping old machine next year.)

$+ \$$ Other Savings (Any special savings)

$CS_2 = \frac{\text{Hour saved}}{\text{Hour}} \times \frac{\text{Hours}}{\text{Year}} \times \frac{\$}{\text{Hour}} = \frac{\$ \text{ Saved}}{\text{Year}}$ (Less time to do same job.)

$+ \frac{\$ \text{ Rework Saved}}{\text{Hour}} \times \frac{\text{Hours}}{\text{Year}} = \frac{\$ \text{ Rework Saved}}{\text{Year}}$ (Increased Accuracy)

$+ \frac{\text{Hour Setup Saved}}{\text{Hour}} \times \frac{\text{Hours}}{\text{Year}} \times \frac{\$}{\text{Hour}} = \frac{\$ \text{ Setup Saved}}{\text{Year}}$ (Speedier Setup)

+ $ Dep. on another old machine (If a second machine can be made surplus.)

+ $ Repair Savings + $ Down Time Savings (Additional repair) (Cost of keeping old machine a second year.)

+ $ Other Savings (Any special savings)

4. Some consideration should be given to how much the old machine is worth. If no one can use it and it will be surplus or scrap, a replacement is more difficult to justify than if the machine can find utilization elsewhere in the organization. This might very well be a deciding factor in determining replacement.

5. A significant factor is the risk involved in purchasing a particular type of machine. Certain types have a better resale value than others. Figures should be tabulated on resale value (open market) of types which are in general use. The time required for repayment must be predicated upon the risk involved in investing the additional money. Now, if certain types have shown a substantially more stable and higher resale value, account should be taken of this when deciding on the time required for cost savings to pay for the equipment.

6. The following is a formula which we have devised to calculate the cost savings necessary to justify the replacement of an old machine tool:

Let i = rate of return on investment necessary to justify risk-taking. This figure must be set by top management,, and since taxes takes 40% of net profits.

$\frac{i}{.6}$ = Rate of return (including taxes) necessary to attract additional investment.

Let IC_N = Initial Cost of New Equipment and

IC_O = Initial Cost of Old Equipment

then the additional depreciation = $(IC_N - IC_O)$ (.083) considering a 12 year depreciation rate.

Therefore, the total additional earnings required per year to justify the new investment =

$$\left(\frac{i}{.6}\right)(IC_N) + (IC_N - IC_O)(.083) \qquad (1)$$

and the ~~rate of return~~ return on the investment =

$$\frac{i}{.6} + \frac{(IC_N - IC_O)(.083)}{IC_N} =$$

$$\frac{i}{.6} + \left[\left(1 - \frac{IC_O}{IC_N}\right)(.083)\right] \qquad (2)$$

These additional earnings must be realized thru Cost Savings. Therefore, if $CS_1 + CS_2 + \ldots + CS_n > n(1)$ where $n = \frac{1}{(2)}$, it is more economical to purchase a new machine rather than keep the old one.

TURBINE MANUFACTURING DIVISION

Burton Grad

Burton Grad

BG:aso

SUBJECT: Overdue E-3 Cage Orders

Schenectady, December 22, 1949

Mr. W. Pruessman
Building #273

The orders were tabulated again last week. The summary follows and the details are in Table II at the end of this report.

TABLE I

Summary as of December 19, 1949

Foreman	Total Orders on Hand	Total Overdue Orders on Hand
Borst	266	117
Post	177	95
Larkins	117	72
Smith	78	52
Endries	150	96
In Area Total	788	432
Others	98	20
TOTAL	886	452

The overdues are at their lowest point since July; however, there has been a special circumstance. All of the orders in the stockroom which were being counted as overdue have now been eliminated; we have attached the uncompleted vouchers to the assembly paperwork and eliminated the move card from the file.

We would like to see a test man assigned to the task of straightening out the operation of the E-3 Cage. There are a great number of details which need to be cleared up; they require personal attention and individual follow-up. The purpose of the assignment would be to put the E-3 Cage in a position where they could locate any job immediately and dispatch all of the jobs properly.

Planning has reduced their overdues for the third consecutive week; according to their record they have only 16 overdue E-3 diaphragm orders. Let's hope that this will very soon be zero.

Again, we should like to emphasize this point: Each foreman should go into the Cage at least once a day to see how his orders on hand stand. If this is done, some advance notice of pile-ups can be obtained.

We would like to know what is being done about getting a detailed cage report published each week by Production. This was mentioned in our last letter, but so far no one from Production has contacted us on the subject.

TURBINE MANUFACTURING DIVISION

Burton Grad

Burton Grad

BG:aso
CC: W. Klinkow
N. Coutant
W. Nelson
D. Broderick
R. Egan
L. Borst
V. Post
J. Larkins
J. Smith
G. Endries
J. Brown
D. Eagan

TABLE II

As of December 19, 1949

BURST

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
3A2	Gear Hobber	4	11	4	9	13/15
3B1	Shear	0	12	0	0	0/12
3B3	Straighten	6	2	1	2	3/8
3B9	Grind	5	6	1	0	1/11
3B7	Shaper	0	0	0	0	0/0
4B5	Mill & Punch Drill	5	13	3	12	15/18
5B5	Planer	1	0	1	0	1/1
5B11	Bend	2	9	1	8	9/11
5B11	Rebend	0	0	0	0	0/0
7B9	Saw Off & Notch	8	29	8	5	13/37
7B3	Roll & punch	0	9	0	5	5/9
7B7	Punch & Form	5	11	0	6	6/16
6B17	Mill	7	2	7	2	9/9
6B1	Shaper	0	0	0	0	0/0
7B1	Dealing Rings	0	5	0	0	0/5
3B2	4 Spindle Dr. Mill	2	0	2	0	2/2
3B4	4 Spindle Dr. Mill	1	0	1	0	1/1
4B10	1 Spindle Dr. Mill	2	16	2	9	11/18
4B2	Hand Saw	6	18	0	0	0/24
4B4	Mill	0	0	0	0	0/0
4B6	Duplex Mill	4	6	2	0	2/10
4B8	Drill	2	4	0	0	0/6
4B12	Sundstrand Mill	2	13	2	6	8/15
4B14	Sundstrand Mill	0	0	0	0	0/0
2B4	Mill	8	3	1	0	1/11
6B6	Hydrotel	0	0	0	0	0/0
6B8	Roller	1	10	1	4	5/11

BURST

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
6310	Vertical Mill	1	0	1	0	1/1
726	Radial Drill	1	0	1	0	1/1
[illegible]	Milling Machine	0	0	0	0	0/0
834	Planer	1	2	0	1	1/3
302	Nozzle Rings	0	2	0	0	0/2
250	Grind and Polish	5	4	5	4	9/9
	TOTAL	79	187	44	73	117/266

TABLE II

As of December 19, 1949

POST

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
2A8	Caulking Strip	0	0	0	0	0/0
3-4A1	Anneal	12	2	10	2	12/14
3A8	Asm 1st Stg. Nozzle	2	23	2	18	20/25
3A6	Asm Ring and Web	3	20	2	4	6/23
3A8	Asm B/O	12	15	7	3	10/27
5A2	Seal and Tack Weld	4	2	2	0	2/6
5A2	Weld Comp.	10	10	8	7	15/20
	Weld Noz. Part Asm.	3	36	2	6	8/39
	BTH Weld	0	5	0	5	5/5
7A1	B/O	5	13	5	12	17/18
	TOTAL	51	126	38	57	95/177

TABLE II

As of December 19, 1949

TARKINS

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
6A4	14' B.M.	2	2	0	2	2/4
9B2	5' B.M.	8	20	2	16	18/28
11A1	Joint Dph.	2	4	2	2	4/6
7A2	Adj. Spacers	2	0	1	0	1/2
7A3	10' B.M.	3	5	2	0	2/8
8A2	8' B.M.	3	0	3	0	3/3
12B1	8' B.M.	1	0	1	0	1/1
11B4	6' B.M.	1	5	1	5	6/6
13A3	Bullard	3	7	2	5	7/10
9A3	I/O	6	8	3	6	9/14
9A2	Planer	6	0	2	0	2/6
6A1	Milling Mach.	9	3	4	1	5/12
11A3	6' Rad. Drill	1	0	1	0	1/1
12A1	8' Rad. Drill	4	12	2	9	11/16
	TOTAL	51	66	26	46	72/117

TABLE II

As of December 19, 1949

SMITH

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
11A2	Chip & Clean	26	20	18	13	31/46
11A2	Noz. Rings	0	0	0	0	0/0
11A2	Finish Chip	6	3	4	2	6/9
14A1	Repair Weld	1	13	1	10	11/14
11A2	Chip After Weld	0	7	0	4	4/7
	Adjust Area	0	0	0	0	0/0
	TOTAL	35	43	23	29	52/78

ENDRIES

14A5	L/O for spt. pins	0	16	0	12	12/16
15A3	Make Supt. bars, shims, etc.	0	62	0	21	21/62
15A5	Dr. For supt. pins	5	5	3	3	6/10
14A2	Mill Supt. Pins	4	20	4	17	21/24
16A2	Asm Pckg.	7	12	7	10	17/19
17A1	Paint	3	16	3	16	19/19
	TOTAL	19	131	17	79	96/150

OTHERS

	X-Ray	0	6	0	4	4/6
	Bldg. #49	9	92	0	16	16/92
	TOTAL	0	98	0	20	20/98

SUBJECT: A New Method for Planning and Handling E-3 Diaphragm Orders That Require Repair Chipping and Welding. (Cast Steel and Fabricated Diaphragms only)

Schenectady, December 13, 1949

Messrs. W. Klinkow
E. Keefer
H. Rosse
V. Strock

In an effort to expedite and simplify the dispatching, handling and planning of Diaphragm orders that require repair chipping and welding, the following procedure has been adopted:

1. On all diaphragms which normally require repair, Planning will have inserted, in the proper places, blue extra cost vouchers to cover "chip for weld", "repair weld", and "chip after weld". These will be charged as follows:

   (a) Cast steel diaphragms will be charged on the TGS-IR- against the Foundry.

   (b) The other type will be charged to "AH".

2. These operations will be dispatched as they arise, and the move card, of course, marked to correspond to the vouchers.

3. When these vouchers are turned in by the operator the Foreman will cross out, if necessary, the preliminary charge, indicate the correct responsibility, and sign the voucher.

4. If for any reason the repair operations are not necessary, the leader or Foreman in the area must so mark the move card and initial it; they will of course, write the proper destination on the move card and have the move man or crane follower shift the job correctly.

In order to make this system work the following instructions must be issued:

1. All chippers and welders must obtain their jobs from the dispatch cage. They must not work on any diaphragm unless they have a move card to cover it. They must hand the move cards directly to the crane follower when they finish a job. These rules apply to repairs as well as to original work.

2. All crane followers and move men should only move jobs when they are given a move card to cover it. If for any reason a crane follower moves a diaphragm (or component) to a different place than that usually designated he must keep the move card and hand it directly to the move man within 30 minutes. No move card is to be placed in the move boxes until the job is actually delivered.

There will, of course, be a period of two or three months before the orders will all be coming through with the proper vouchers attached; therefore, the following interim procedure will be adopted:

1. Planning will have approximately 350 sets of vouchers hectographed for the following operations:

   (a) Chip for weld.
   (b) Repair weld.
   (c) Chip after weld.

   These should be charged as to whether or not the diaphragm is Cast Steel.

2. These voucher sets will be kept in the dispatch cage and as jobs are handed out for chipping the three sets of vouchers will be attached and handed out as necessary.

3. This letter is a notification to all groups concerned that the procedure described above will go into effect on Monday, December 19, 1949. By copy of this letter we are asking each Superintendent, Foreman or Leader to inform his group of the pertinent information herein.

TURBINE MANUFACTURING DIVISION

Burton Grad
John Brown

BG:aso
CC: W. A. Nelson
G. O. Truex
A. E. Harris
D. Eagan
J. Smith
J. Bolster
E. Salvino
R. McCormick
H. Miller
J. Whitmyre
File (5)

SUBJECT: A New Method for Planning and Handling Area Checks on E-3 Diaphragm Orders.

Schenectady, December 13, 1949

Messrs. W. Klinkow
E. Keefer
J. Whitmyre

In order to expedite the area check inspection on diaphragms, and in order for the E-3 Cage to maintain control of the handling of orders, the following procedure has been adopted:

1. Each diaphragm that requires either a Preliminary Area check or a 100% Area check will have inserted, in the proper place, a planned voucher calling for the Inspection.

2. There will also be inserted, after each of these Inspection vouchers, a planned voucher calling for "Adjust Area per Engineering Instructions".

3. The Inspection voucher will be given to the operator who performs the previous operation - either chipping or L/O for 100% area. When an inspector has completed a job he will sign the voucher and hand it to the E-3 Cage.

4. Therefore, it will be necessary for the E-3 Cage to set up a cubbyhole for the orders in-process of being inspected. The dispatch card will move through this file when the inspection voucher is turned in.

5. The E-3 dispatcher should, when he hands out the inspection voucher, remove the "adjust Area" voucher from the paperwork and send it to Planning through the Extra Cost box.

6. When the inspection voucher is turned in, the dispatch card is moved to a cubbyhole marked "Adjust Area". This cubbyhole will have three sections---the first one is for those awaiting Engineering Instructions, the second is for those ready to have the Area adjusted, and the third is for those in-process of being corrected.

7. When the Engineering Instructions for correcting the area comes through, Planning will calculate the price, enter it on the voucher, which has been sent to them by the dispatch cage, and deliver the Instructions with the voucher attached to the E-3 Cage. This will be the cage's signal to move the dispatch card from the "waiting Instructions" section to the "Ready for Adjusting" section.

8. When the operator wishes to have a job to correct the area, the cage will give him the priced voucher and the properly filled in move card.

9. A point should be stressed in this connection; no matter what operation occurs preceding inspection, the operator must hand the move card to the crane follower in order to have it moved; if it is more convenient the move card may be handed to the move man. However, when a job is done the move card must be turned in.

Since there will be a period of two to three months before all orders will be coming through with the proper vouchers attached, we are adopting the following interim policy:

1. Vouchers will be prepared by Planning to cover "12 hole area check" and "Adjust area per Engineering Instructions".

2. These will be filed at the E-3 Cage and will be handed out as the orders go to the proper stations.

3. The rest of the procedure is identical.

This procedure will go into effect on Monday, December 19, 1949.

TURBINE MANUFACTURING DIVISION

John Brown
Burton Grad

BG:aso
CC: G. Truex
D. Eagan
J. Smith
G. Endries
J. Bolster
A. Fallone
E. Salvino
R. McCormick
H. Miller
J. Whitmyre
H. Rosse
V. Strock
File (5)

B. Ford

December 12, 1949

SUBJECT: ROUTINE FOR HANDLING PAPERWORK FOR WELD AND/ OR ANNEAL OPERATIONS BETWEEN E-13 AND E-3 CAGES

E-3, E-13 Dispatchers
E-3, E-13 Movemen

There are two ways in which E-13 items, that need weld and/ or anneal, may be handled, via the paperwork routine.

(1) An item may be a planned operation for which there is a green voucher with the paperwork.

(2) It may be necessary to clear an I.R. in order to restore to drawing.

Therefore it will necessitate two separate methods to handle both types of orders.

(1) If weld and/ or anneal is planned, the dispatcher should follow this procedure:

a. When the move card is released for the operation preceding weld or anneal, a temporary move card should be prepared by the E-13 dispatcher.

b. The vouchers for weld and/ or anneal should be attached to the temporary move card and sent to the E-3 cage by the dispatcher.

c. When the job is moved to the furnace or the weld booth, the move man who delivers it should stop at the E-3 cage and sign the temporary move card. This will be the E-3 dispatcher's signal to release the vouchers to the "Jobs to be Dispatched" section of the control board.

d. The move card and vouchers will be handed out when the welder or furnace operator is ready to begin.

e. No jobs may be moved away from the furnace or weld booth unless the operator has the proper move card.

(2) If weld and/ or anneal is required to clear on I.R. the dispatcher should follow this procedure:

a. When a job has been moved into the I.R. square, it should remain there until the blue extra work vouchers have cleared back to the E-13 cage.

b. Upon receiving the blue vouchers the E-13 dispatcher should prepare a temporary move card and attach the vouchers to it. The original move card should be released to the move man, and the temporary move card, with the vouchers attached, sent immediately to the E-3 cage.

c. Same as part #1.

d. Same as part #1.

e. Same as part #1.

J.W. Brown
Chief Dispatcher

JWB.

SUBJECT: Overdue E-3 Cage Orders

Schenectady, December 15, 1949

Mr. W. Pruessman
Building #273

The orders in the E-3 Cage have again been tabulated. The Summary follows and the details are in Table II at the end of the report. It should be noted that the detailed count is presented in different form than heretofore; all of the operations supervised by each Foreman are now tabulated separately.

TABLE I

Summary as of December 9, 1949

Foreman	Total Orders On Hand	Total No. Of Overdues
Borst	278	121
Post	168	93
Larkins	91	50
Smith	77	56
Endries	157	122
In Area Total	771	442
Others	112	53
TOTAL	883	495

The overdues declined about 5% from the previous week's total; the total on hand stayed the same. The very discouraging reverse trend in Mr. Borst's Section is primarily caused by the moving around that is being done there; a secondary reason is the sudden advent of numerous orders on certain stations. Mr. Endries has finally cleared the overdue "Key" orders from his list; this is shown by Mr. Endries' lowest total to date. Except for those variations there has been little "significant" change.

We have progressed very satisfactorily on solving certain of the E-3 Cage problems; letters have been written which cover the subject and we hope to have our new methods in operation by Monday, December 19, 1949.

Planning has for the second straight week reduced their overdues on hand; however, they still have 27 E-3 orders on hand that are past their starting dates.

Voucher typing is still a bottleneck; even though they typed 2300 orders last week they still have 2350 more to do. With Planning being pushed they expect to turn out from 2000-2500 orders each week. Therefore, it seems evident that unless more girls are hired in Voucher Typing the present help will have to continue to work nights and Saturdays.

It is felt that a detailed cage report should be made out each week and given, by Production, to the Foremen concerned. This would enable the various supervisory groups to take whatever action seemed necessary.

TURBINE MANUFACTURING DIVISION

Burton Grad

Burton Grad

BG:aso
CC: W. Klinkow
N. Coutant
W. Nelson
D. Broderick
R. Egan
L. Borst
V. Post
J. Larkins
J. Smith
G. Endries
J. Brown
File - 2

TABLE II

As of December 9, 1949

BORST

Station Number	Operation Name	Orders Needed Per Day	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
3A2	Gear Hobber	11	4	7	4	7	11/11
3B1	Shear	3	4	25	4	0	4/29
3B3	Straighten	4	3	3	2	3	5/6
3B9	Grind	16	5	0	0	0	0/5
3B7	Shaper	5	5	0	1	0	1/5
4B5	Mill & Punch Drill	3	6	3	5	3	8/9
5B5	Planer	1/2	0	4	0	2	2/4
5B11	Bend	3	1	4	1	4	5/5
5B11	Rebend	3	0	0	0	0	0/0
7B9	Saw off & Notch	8	13	31	11	9	20/44
7B3	Roll & Punch	8	4	4	1	4	5/8
7B7	Punch & Form	8	0	3	0	0	0/3
6B17	Mill	8	1	10	0	9	9/11
8B1	Shaper	8	0	0	0	0	0/0
7B1	Backing Rings	8	0	13	0	0	0/13
3B2	4 Spindle Dr. Mill	1/3	1	0	1	0	1/1
3B4	4 Spindle Dr. Mill	1/3	1	1	1	1	2/2
4B10	1 Spindle Dr. Mill	1/4	1	16	1	10	11/17
4B2	Hand Saw	8	6	27	1	0	1/33
4B4	Mill	6	1	0	0	0	0/1
4B6	Duplex Mill	6	10	0	4	0	4/10
4B8	Drill	3	0	8	0	2	2/8
4B12	Sundstrand Mill	4	5	7	5	7	12/12
4B14	Sundstrand Mill	4	0	0	0	0	0/0
274	Mill	16	15	1	1	1	2/16
6B6	Hydrotel	2 1/2	0	0	0	0	0/0
6B8	Keller	1/4	1	6	1	4	5/7

BORST

Station Number	Operation Name	Orders Needed Per Day	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
6B10	Vertical Mill	16	0	2	0	2	2/2
7B6	Radial Drill	3	1	0	1	0	1/1
D-3	Milling Machine	?	2	4	0	1	1/6
8B4	Planer	2/3	4	1	2	1	3/5
8B2	Nozzle Rings	?	0	0	0	0	0/0
290	Grind and Polish	2	1	3	1	3	4/4
	TOTAL		95	183	48	73	121/278

TABLE II

As of December 9, 1949

POST

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
3A8	Caulking Strip	0	0	0	0	0/0
3-4A1	Anneal	7	7	6	6	12/14
3A8	Asm 1st Stg. Nozzle	5	15	5	8	13/20
3A8	Asm Ring and Web	1	25	1	4	5/26
3A8	Asm B/O	10	12	10	1	11/22
5A2	Seal and Tack Weld	8	1	6	0	6/9
5A2	Weld Comp.	16	5	11	2	13/21
	Weld Noz. Part Asm.	1	29	1	7	8/30
	BTH Weld	1	4	0	4	4/5
7A1	B/O	5	16	5	16	21/21
	TOTAL	54	114	45	48	93/168

Note: We are listing these following items separately and not including them in the total count since they are already incorporated in the F-13 Gage Count.

3-4A1	Brg. Anneal	0	17
5A2	Brg. Weld	2	6

TABLE II

As of December 9, 1949

LARKINS

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
8A4	14' B.M.	2	3	2	1	3/5
9B2	5' B.M.	10	3	4	3	7/13
11A1	Joint Dph.	3	3	2	3	5/6
7A2	Adj. Spacers	4	0	1	0	1/4
7A3	10' B.M.	3	1	1	0	1/4
8A2	8' B.M.	4	0	2	0	2/4
12B1	8' B.M.	3	0	2	0	2/3
11B4	6' B.M.	1	1	1	0	1/2
9A3	L/O	10	9	6	7	13/19
9A2	Planer	2	4	1	1	2/6
6A1	Mill. Mach.	4	3	2	2	4/7
11A3	6' Rad. Drill	2	3	2	2	4/5
12A1	8' Rad. Drill	7	3	1	3	4/10
13A3	Bullard	2	1	1	0	1/3
	TOTAL	57	34	28	22	50/91

TABLE II

As of December 9, 1949

SMITH

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
14A1	Repair Weld	1	11	1	10	11/12
11A2	Chip Steel & Cast Iron	38	14	22	13	35/52
11A2	Chip Noz. Rings	3	1	3	1	4/4
11A2	Finish Chip	6	3	4	2	6/9
	TOTAL	48	29	30	26	56/77

ENDRIES

14A2	Mill for Supt. Pins	0	26	0	26	26/26
14A9	Drill for Crush Pins, etc.	0	9	0	9	9/9
14A5	L/O for Crush Pins	2	19	2	16	18/21
15A3	Make Supt. bars, shims, spacers, etc.	0	51	0	28	28/51
16A2	Asm packing	7	13	6	12	18/20
17A1	Paint	5	25	3	20	23/30
	TOTAL	14	143	11	111	122/157

OUTSIDE

	X-Ray	4	0	4	0	4/4
	C-10 Bay (Chipping)	0	7	0	6	6/7
	Building #49	0	73	0	15	15/73
	Stockroom	0	28	0	28	28/28
	TOTAL	4	108	4	49	53/112

SUBJECT: Overdue E-3 Cage Orders

Schenectady, December 7, 1949

Mr. W. Fruessman
Building #273

The weekly tabulation shows the following results. The details are in Table II at the end of the report:

TABLE I

Summary

Foreman	Total Orders on Hand 11-1-49	12-5-49	% Change	Total No. of Overdues 11-1-49	12-5-49	% Change
Borst	270	220	-18.5	122	91	-25.4
Post	166	197	+18.7	109	107	-1.0
Larkins	168	66	-60.8	100	48	-52.0
Smith	122	80	-34.4	83	64	-22.9
Endries	268	203	-24.2	240	150	-37.5
In Area Total	994	766	-22.9	654	460	-29.4
Others	128	115	-10.2	98	59	-39.8
TOTAL	1122	881	-21.4	752	519	-30.9

These figures show the change in the overall and overdue picture in the past five weeks. The news appears to be encouraging; however, there are certain special factors which have contributed to the decreases in the overdues. They are:

1. Redating of Messrs. Borst's and Post's orders to conform to the latest Manufacturing Schedule. This also applies to the orders in Building #49.

2. Cleaning dead wood from Mr. Endries' cubbyholes. There has been a definite trend toward reducing total load. This is startlingly evident in Mr. Larkins' Section, where at many stations the men have no work.

In line with your request I have prepared a list of required loads

for various jobs in Mr. Borst's Section. It was done by debating with the Cage Dispatcher and with Mr. Borst as to the anticipated average pay per order at each of the various stations. This figure is, at best, a "sophisticated guess"; it should, therefore, be taken with a grain of salt. It is the best estimate that can be made on past experience, but there are so many variables involved - different kinds of orders, different sizes, different quantities and varying production requirements - that it is, of necessity, open to fairly large errors.

The average price per order is the figure given in column I of Table III.

The next step was to have Mr. Borst inform us of his present man-shifts at each station. This figure appears in Column II.

Next we considered that the average operator's pay per hour was $2.00. Using this approximation we arrived at a figure for the number of hours which would be required per man-shift to do one average order. This figure is reproduced in Column III.

Using this figure and the information concerning the number of eight hour man-shifts operating we calculated the number of jobs that would be required to keep any given station in operation one day. This result is in Column IV.

The following is an example of the foregoing calculations:

OPERATION NAME -- STRAIGHTEN

(Column I) Average price per order - $1.75

(Column II) Number of Man-Shifts - $.40 (Note: One man spends 40% of his time on this job.)

(Column III) Number of hours per man-shift to do one order = $\frac{\text{Average Price}}{\text{Avg. Rate/hr. x No. of man-shifts}}$

$= \frac{\$1.75}{\$2.00 \times \$.40} = 2.2$ hrs./man-shift = 2 1/4 hr./man-shift

(Column IV) Number of orders needed to keep the station occupied for one day = $\frac{\text{Hours/man-shift/day}}{\text{Hours/man-shift/order}}$

$= \frac{8}{2.2} = 3.6 = 4$ orders/day needed to keep this station occupied

127 orders are needed to keep all of Mr. Borst's stations busy for one day.

This figure is significant when viewed in conjunction with the total orders on hand; there are only 220 orders on hand for Mr. Borst's operators.

We have been working with Mr. Brown in an attempt to iron out various difficulties in the E-3 Cage operation. There have been three main problems on which we have taken or are taking action. First, we have attempted to establish a pattern for the handling of "Repair Weld" and "Chip after Weld"; we expect to have results by the weekend. Second, we have written a procedure to be used for Bearing Weld and Anneal paperwork; by next week we should see some action on this topic. Third, we have been clearing the additional dead wood from the E-3 Cage cubbyhole and establishing a three sectional arrangement for Mr. Endries' operations. This consists of one section - "Not ready to begin", a second section - "Ready to start", and a third section - "In process". When this method functions properly the Cage will be able to hand out the orders to Mr. Endries' men.

We are still waiting for Mr. Broderick to set up the accumulation system for Mr. Post's section. He has informed us that a rack has been ordered. The instructions were issued approximately two months ago, but it still isn't functioning properly. We would like to see something definite accomplished on this problem within the next two weeks.

We would like to see each foreman instructed to visit the cage each morning to see what his work load looked like. This should enable him to spot any station that's climbing too fast.

Typing is still in very sad shape and needs continuing attention. Planning has improved quite a bit, but it will have to improve quite a bit more before it is out of the woods.

If the detailed analysis of Mr. Borst's Section is satisfactory we will be glad to extend it to the other sections.

TURBINE MANUFACTURING DIVISION

Burton Grad

Burton Grad

BG:aso

CC: W. Klinkow
N. Coutant
W. Nelson
D. Broderick
R. Egan
D. Eagan
L. Borst
V. Post
J. Larkins
J. Smith
G. Endries
J. Brown
File - 2

TABLE II

Board I as of December 5, 1949

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
Post						
3A8	Caulking Strip	0	2	0	0	0/2
3-4A1	Anneal	11	12	6	5	11/23
3-4A1	Brg Anneal	0	6	0	0	0/6
3A8	Asm 1st stg Noz.	9	13	8	7	15/22
3A8	Asm Ring & Web	3	25	0	4	4/28
3A8	Asm B/O	9	18	9	7	16/27
5A2	Seal & Tack Weld	6	1	4	0	4/7
5A2	Weld Comp.	9	6	9	3	12/15
	Weld Noz. Part Asm	2	24	2	9	11/26
5A2	Brg Weld	3	3	0	0	0/6
Borst						
3A2	Gear Hobber	1	1	0	0	0/2
3B1	Shear	0	28	0	0	0/28
3B3	Straighten	7	3	1	3	4/10
3B9	Grind	3	3	0	1	1/6
3B7	Shaper	2	0	1	0	1/2
4B5	Mill & Punch Drill	2	3	1	2	3/5
5B5	Planer	1	2	1	2	3/3
5B11	Bend	1	2	0	2	2/3
5B11	Rebend	0	0	0	0	0/0
7B9	Saw Off & Notch	0	32	0	19	19/32
7B3	Roll & Punch	6	10	5	8	13/16
7B7	Punch & Form	0	1	0	0	0/1
6B17	Mill	0	8	0	8	8/8
8B1	Shaper	0	0	0	0	0/0
7B1	Backing Rings	0	1	0	0	0/1
3B2	4 Sp. Draw Mill	1	0	1	0	1/1
3B4	4 Sp. Draw Mill	1	0	1	0	1/1
4B10	1 Sp. Draw Mill	0	16	0	11	11/16

Borst

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
4B2	Hand Saw	1	23	1	1	2/24
4B4	Mill	0	0	0	0	0/0
4B6	Duplex Mill	7	0	0	0	0/7
4B8	Drill	1	12	0	0	0/13
4B12	Sundstrand Mill	0	9	0	8	8/9
4B14	Sundstrand Mill	0	0	0	0	0/0
274	Mill	13	6	2	1	3/19
6B6	Hydrotel	0	0	0	0	0/0
6B8	Keller	2	4	2	3	5/6
6B10	Vertical Mill	1	0	1	0	1/1
7B6	Radial Drill	1	0	1	0	1/1
D-3	Drilling Mach.	2	1	2	0	2/3
8B4	Planer	0	0	0	0	0/0
8B2	Nozzle Rings	0	0	0	0	0/0
290	Grind & Polish	1	1	1	1	2/2
	TOTAL	106	276	59	105	164/382

TABLE II

Board II as of December 5, 1949

Larkins

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
8A4	14' B.M.	1	3	1	2	3/4
9B2	5' B.M.	10	1	5	1	6/11
11A1	Joint Dph.	1	7	1	7	8/8
7A2	Adj. Spacers	3	0	1	0	1/3
7A3	10' B.M.	4	0	3	0	3/4
8A2	8' B.M.	2	0	2	0	2/2
12B1	8' B.M.	2	0	2	0	2/2
11B4	6' B.M.	2	0	1	0	1/2
9A3	L/O	0	0	0	0	0/0
9A2	Planer	7	3	4	2	6/10
6A1	Mill. Mach.	1	0	1	0	1/1
11A3	6' Rad. Drill	3	2	2	2	4/5
12A1	8' Rad. Drill	5	3	3	2	5/8
Smith						
14A1	Repair Weld	11	0	9	0	9/11
11A2	Chip Steel & Cast Iron	31	23	25	16	41/54
11A2	Chip Noz. Rings	2	3	2	3	5/5
11A2	Finish Chip	2	8	2	7	9/10
Post						
	BTH Weld	0	6	0	5	5/6
7A1	B/O	5	24	5	24	29/29
Larkins						
13A3	Bullard	3	3	3	3	6/6

Endries

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
14A2	Mill Supt. Pins	2	18	1	16	17/20
14A9	Drill for Crush Pins, etc.	18	9	18	9	27/27
14A5	L/O for Crush Pins	5	28	4	24	28/33
15A3	Make Supt. Bars, Shims, spcrs, etc.	0	82	0	47	47/82
16A2	Asm packg, etc.	10	18	8	11	19/28
17A1	Paint	0	13	0	12	12/13
Outside						
	X-Ray	4	0	4	0	4/4
	C-10 Bay (Chipping)	0	9	0	6	6/9
	Building #49	72	0	19	0	19/72
	Stockroom	0	30	0	30	30/30
	TOTAL	206	293	126	229	355/499

TABLE III

A calculation of the orders required per day for any of Mr. Borst's stations.

Operation Done	Column I Avg. Price Per Order	Column II Number of Man-Shifts	Column III Number of hours per man-shift to do one order	Column IV Number of orders to keep the station busy one day.
Gear Hobber	$ 1.50	1	3/4	11
Shear	$ 2.50	.45	2 3/4	3
Straighten	$ 1.75	.40	2 1/4	4
Grind	$ 4.50	4	1/2	16
Shaper	$ 3.00	1	1 1/2	5
Mill & Punch Drill	$ 8.00	1.5	2 3/4	3
Planer	$ 5.00	.15	16 3/4	1/2
Bend & Rebend	$ 10.00	2	2 1/2	3
Saw off & Notch	$ 2.00			
Roll & Punch	$ 4.50			
Punch & Form	$ 1.25	1.5	1	8
Mill	$ 5.00			
Shaper	?			
Backing Rings	$ 1.00			
4 Spindle Draw Mill	$125.00	3	21	1/3
1 Spindle Draw Mill	$110.00	2	27 1/2	1/4
Hand Saw	$ 2.00	1	1	8
Mill & Duplex Mill	$ 2.00	1	1	8
Drill	$ 6.00	1	3	3
Sundstrand Mill	$ 9.00	2	2 1/4	4
Mills	$ 16.00	16	1/2	16
Hydrotel	$ 20.00	3	3 1/4	2 1/2
Keller	$ 55.00	1	27 1/2	1/4
Vertical Mill	$ 3.50	3	1/2	16
Radial Drill	$ 6.00	1	3	3
Planer	$ 25.00	1	12 1/2	2/3
Grind & Polish	$ 40.00	6	3 3/4	2

Subject: AREA ADJUSTMENT

In order to further facilitate the function of dispatch on diaphragms, it will be necessary to supplement our present planning sequence with suitable vouchers to cover the routing and cost of making area adjustment. Cost is at present controlled by fairly satisfactory pricing information. However, the means of getting the labor vouchers to the operator is by no means ethical from a dispatch stand point.

Area adjustment is required on all diaphragms and 1st stage nozzles. The amount of adjustment varies according to Engineering requirements as follows:

1st stage nozzle	100 per cent area check
All diaphragms with a steam path less than 3½" in width or over 14" in width	12 hole prelim. check
All diaphragms with a steam path from 3½" to & including 14"	100 per cent area check

Since this entails adding operations for this work to all diaphragm planning cards, the data books will require additional pages to cover this condition.

The procedure for handling these vouchers will be as follows: The planner will include in his sequence of operations as follows:

L/O for area check (on 100 per cent checks only)

Inspect area & submit report

Adjust area per Engineering Instructions

Since it is not known at the time of planning what adjustments are required, there will be no price put on the voucher when typed. In order to avoid confusion in typing the vouchers, the planner will insert "S.S." in the pricing column.

It nas been agreed to by Mr. Brown that he will instruct the dispatch cage to forward the "adjust area" voucher to the planning dept. by placing this voucher in the box used to collect Extra Cost etc., at the time the Inspection voucher is dispatched. A planning representative who normally picks up this information will forward to the planner in charge of area adjustment this voucher to be held until necessary Engineering Instructions are received. On receipt of this information

the price will be calculated to existing data and the price inked in on the voucher. The planner will initial the voucher as is required on all prices handled in this manner. On completion of pricing, the planner will forward to the cage the priced voucher plus the Engineering Instructions for adjustment. The planning representative who forwarded the information from the cage will be responsible to see that the dispatcher receives this information. The dispatch cage will dispatch in the usual manner.

In order that planning may have on record at all times, a copy of the price, it is requested that Engineering deliver an original and one copy of their instructions to planning, the Planning Department to file one copy with the price stated, the original to be forwarded for instructions.

E. KEEFER

cc:
J. Smith
B. Grad
J. Brown
L. Lagan
J. Thomas
F. Sommers
P. Petersen
R. Roginska
W. Kaletta
G. Endries
W. Klinkow
J. Kozielski

SUBJECT: Overdue Planning

Schenectady, December 6, 1949

Mr. W. A. Nelson
Building #273

We have been very carefully following the efforts made by Planning to reduce their overdue backlog. There has been in this connection some question as to the accuracy of the report which Production issues on the subject. Therefore, a check has been made in Production and Planning of overdue diaphragm orders. The results follow:

PLANNING REPORT - 12-5-49 at 11:00 A.M.

Mr. Petersen - 6 orders overdue
Mr. Sommers - 11 orders overdue
Mr. Thomas - 16 orders overdue

Total 36 orders overdue

PRODUCTION REPORT - 12-5-49 at 3:00 P.M.

In Overdue Planning File - 44 orders.

Of these 44 orders 11 had typing dates of 11-23-49 or later.

We find from these figures that there is a positive correlation between the two figures. We must assume that there will be about 15% of the orders in the works - waiting blueprints, in the mail, or not sorted yet.

This figure, 44 overdue orders, means just that - 44 orders that are past the starting date. Now, Production should not wish to blame Planning for those things which are not Planning's fault. Hence, Mr. R. Egan has agreed to put an asterisk beside each order on the overdue list which shows a typing date which is less than two weeks earlier than the date of the report. Any tabulation made should then take this factor into account.

We would like to take this opportunity to commend Planning for the reduction in overdues which occurred last week. However, caution should be taken because Production feels that there will be, very shortly, a rush of new orders coming through. If the present overtime policy is continued there would seem to be no reason why Planning won't be able to very soon cut their diaphragm overdues to zero.

TURBINE MANUFACTURING DIVISION

Burton Grad

Burton Grad

BG:aso
CC: W. Pruessman
N. W. Coutant
W. Klinkow
D. Egan
E. Keefer
D. Broderick
R. Egan
File - 2

Schenectady, December 2, 1949

Mr. W. Klinkow
Building #273

A number of difficulties have come up concerning the handling of orders in the Chipping and Welding Sections. We have had occasion to investigate these problems and our analysis follows:

1. The Second Shift chippers and the jointers pick their own jobs and do not get the vouchers from the Cage until the work is complete.

   SOLUTION: All shifts must obtain the jobs from the Cage. The Foremen concerned should instruct the men to do so.

2. Most (90%) steel diaphragms require repair welding after chipping and then need to have "chip after weld". This is now done on Extra Cost Vouchers. The difficulty that arises is that the welding booth does the diaphragms in any order which is convenient to them and the Cage loses control of the sequence of operations. The "move card" is not following the job accurately in these cases and the Cage is misinformed as to position and operation to be performed.

   SOLUTION: Insert "if necessary" blue vouchers in place (after chipping) on each steel diaphragm. The charge should be left blank to be filled in by the Foreman responsible for chipping (Mr. Smith). This operation (Repair Weld) would then be planned for and the diaphragm would then move to the Welding Booth with the move card returning to the Cage. The welders should be instructed to go to the Cage in order to be assigned jobs to do. If Repair Weld were not necessary the leader, or move man in the area would instruct the crane follower as to the proper place to send the diaphragm. This fact would then be noted on the move card by either the leader or move man. When the corrected move card arrives at the Cage, the "if necessary" vouchers could be destroyed.

3. It has been difficult for the crane followers to know which jobs need welding and which have been welded. This leads to a confusion in moving orders.

per Kleinhans OK

SOLUTION: Paint an "Out" area on one side of the Booth and an "In" area on the other side.

4. Crane followers are moving jobs to areas other than those designated. This is usually caused by a lack of space at certain stations. The move men according to Mr. Strock do not have the time to check the disposition of each order. As it stands now they merely sign all cards in the move card box without regard as to whether the intentions on the move card were properly carried out. This, of course, leads to confusion when the chipper or jointer or other operator is handed the job. He must "waste" his valuable time hunting for the part he wishes.

SOLUTION: There are a number of possibilities. The simplest seems to be that the crane followers should be instructed to move a job to the area designated on the move card whenever possible; if this is impossible or excessively awkward, the crane follower may move it elsewhere; however, he must, in these cases, inform the move man of the change in destination. The move man should then indicate the correct location on the move card before signing it.

No crane followers take part from movement NOT P.W.

We would like to have replies from the various groups affected as to what action they plan to take.

TURBINE MANUFACTURING DIVISION

BG

John Brown
Burton Grad

BG:aso

CC: D. Hagan, W. Nelson, J. Smith, J. Bolster, J. Larkin, V. Strock, H. Rosse, E. Salvino, File - 3

Schenectady, December 1, 1949

Mr. W. Pruessman
Building #273

The following is a summary of the Overdue Orders on hand in the E-3 Cage. The detailed report appears in the back of this report in Table II:

TABLE I

Foreman	Total of Orders on Hand	Total No. of Overdues
Borst	256	99
Post	191	109
Larkins	89	49
Smith	99	62
Endries	230	198
	865	517
Others	119	61
	984	578

The increase is primarily in Mr. Endries' Section. He was given approximately 60 new orders to make support bars, spacers, etc. He has said that this will be reduced to a more reasonable level during the week, as the individual orders require very little time. Outside of this the total orders on hand would have shown a reduction, thanks to Messrs. Borst, Smith and Larkins.

In the discussion with Mr. Coutant, there seemed to be general agreement with our last letter, November 23, 1949. However, Mr. Coutant places more emphasis on the part that Engineering has played in causing the backlog. We were agreed that as to diaphragms the fault lies primarily with the auxiliary functions - Engineering, Planning, and Voucher Typing. This is not to whitewash the Factory Group in any way because it is felt that the Foremen should check the Cage every day as to the status of orders on hand. They should also, start to think in terms of the Manufacturing Schedule, not just the Steam Schedule.

The Cage Operation is definitely not smooth. The dispatchers are not in a position to hand out orders to a number of the stations because of failings in the system. There will be a further discussion with Mr. Brown in order to try to straighten out these difficulties.

We are trying to work out a method such that we can include in our next report the number of orders required per day to keep various operations going. We will also include an explanation of the method. This will only be for Mr. Borst's group. If the manner of attack is approved it can then be extended to the other sections.

There will be another letter later this week to report progress in solving the Cage problems.

TURBINE MANUFACTURING DIVISION

Burton Grad

Burton Grad

BG:aso
CC: W. Klinkow
N. Coutant
W. Nelson
J. Brown
D. Broderick
R. Egan
D. Eagan

TABLE II

Board #1 as of November 26, 1949

Post

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
3A8	Caulking Strip	0	2	0	0	0/2
3-4A1	Anneal	7	1	6	1	7/8
3-4A1	Brg. Anneal	0	0	0	0	0/0
3A8	Asm. 1st stg. nozzle	11	11	11	7	18/22
3A8	Asm Ring & Web	2	30	0	4	4/32
3A8	Asm B/O	4	29	3	17	20/33
5A2	Seal & Tack Weld	8	4	5	1	6/12
5A2	Weld Noz.	7	13	7	8	15/20
	Weld Noz. Port. Asm	2	27	2	10	12/29
5A2	Brg Weld	0	0	0	0	0/0

Borst

3A2	Gear Hobber	4	2	0	2	2/6
3B1	Shear	2	30	0	0	0/32
3B3	Straighten	6	3	2	3	5/9
3B9	Grind	4	7	3	4	7/11
3B7	Shaper	0	0	0	0	0/0
4B5	Mill & Punch Drill	6	0	3	0	3/6
5B5	Planer	0	0	0	0	0/0
5B11	Bend	1	3	0	2	2/4
5B11	Rebend	0	0	0	0	0/0
7B9	Saw off & Notch	6	26	6	0	6/32
7B3	Roll & Punch	3	14	3	9	12/17
7B7	Punch & Form	0	1	0	0	0/1
6B17	Mill	15	0	12	0	12/15
8K1	Shaper	0	0	0	0	0/0
7B1	Backing Rings	0	1	0	0	0/1
3B2	4 Spindle Draw Mill	2	0	2	0	2/2
3B4	Draw Mill	1	0	0	0	0/1
4B10	Draw Mill	2	13	2	11	13/15

Borst

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
4B2	Hand Saw	1	35	1	0	1/36
4B4	Mill	0	0	0	0	0/0
4B6	Duplex Mill	7	0	0	0	0/7
4B8	Drill	3	1	1	1	2/4
4B12	Sundstrand Mill	2	0	0	0	0/2
4B14	Sundstrand Mill	0	0	0	0	0/0
274	Mill	15	5	4	3	7/20
6B6	Hydrotel	0	3	0	3	3/3
6B8	Keller	1	5	1	3	4/6
6B10	Vertical Mill	2	1	2	1	3/3
7B6	Radial Drill	0	0	0	0	0/0
0-3	Drilling Mach.	5	9	5	5	10/14
8B4	Planer	4	1	4	0	4/5
8B2	Nozzle Rings	0	0	0	0	0/0
290	Grind & Polish	4	0	1	0	1/4
	Total	137	277	86	95	181/414

TABLE II

Board #2 as of November 26, 1949

Larkins

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
8A4	14' B.M.	2	2	0	0	0/4
9B2	5' B.M.	8	1	5	1	6/9
11A1	Joint Dph.	1	6	1	3	4/7
7A2	Adj. Spacers	2	0	2	0	2/2
7A3	10' B.M.	3	0	2	0	2/3
8A2	8' B.M.	2	0	2	0	2/2
12B1	8' B.M.	3	0	1	0	1/3
11E4	6' B.M.	2	2	1	2	3/4
9A3	L/O	8	15	7	6	13/23
9A2	Planer	4	0	1	0	1/4
6A1	Mill Mach.	3	5	3	2	5/8
11A3	6' Rad. Drill	3	5	3	2	5/8
12A1	8' Rad. Drill	1	7	0	2	2/8
Smith						
14A1	Repair weld	9	0	7	0	7/9
11A2	Chip Steel	27	20	18	14	32/47
11A2	Chip Cast Iron	16	8	8	0	8/24
11A2	Finish Chip	7	12	5	10	15/19
Post						
	B.T.H. Weld	1	3	1	3	4/4
7A1	B/O	3	26	2	21	23/29
Larkins						
13A3	Bullard	3	1	2	1	3/4

Endries

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
14A2	Mill Supt. Pins	2	15	2	13	15/17
14A9	Drill for Crush Pins,etc.	13	12	13	11	24/25
14A5	L/O for Crush Pins	4	36	4	29	33/40
15A3	Make Supt. Pins,Shims, Spacers, etc.	0	98	0	77	77/98
16A2	Asm, Pckg, etc.	15	18	15	17	32/33
17A1	Paint	5	12	5	12	17/17
Outside						
	X-Ray	4	0	4	0	4/4
	C-10 Bay (Chipping)	0	18	0	10	10/18
	Building #49	65	0	15	0	15/65
	Stockroom	32	0	0	32	32/32
	Total	248	322	129	268	397/570

File

SUBJECT: Overdue E-3 Cage Orders

Schenectady, November 23, 1949

Mr. W. Pruessman
Building #273

The Overdue Orders have again been checked. The summary follows. The detailed tabulation appears in Table II at the end of this report.

TABLE I

Foreman	Total Orders	Overdue Orders
Borst	271	103
Post	185	103
Larkins	110	43
Smith	122	56
Endries	172	160
	860	465
C-10 Bay - Chipping X-Ray Bldg. #49 - Stockroom	118	61
TOTAL	978	526

The further reduction in overdues seems to be caused by reductions in Messrs. Larkins', Smith's and Endries' Sections. However, it should be noted that the largest reduction (Mr. Endries') was entirely a paper reduction. There were numerous orders still in file which has been completed one to four weeks before. The dispatcher brought the file up to date and henceforth he will use a different method of removing the dispatch cards from file.

The drop in total number of orders is caused by the drops in Messrs. Borst's, Post's and Endries' Sections. Again it should be noted that Mr. Endries' reduction is merely a paper drop.

Mr. Borst, however, has intentionally reduced the total orders on hand. It was found that a few machines seemed to be causing the high level of on-hand orders. Therefore, Mr. Borst has put extra men and extra hours on these machines in an attempt to reduce the orders and overdues to a more reasonable level.

Mr. Smith has obtained (as you know) a number of additional men and their assistance appears to be helping out slightly.

Building #49 does vortexing and rough grinding for Mr. Borst. They not only do partitions, but also fan blades and buckets. Their procedure in the past has been to let the partitions accumulate for about one month in order to save set-ups. The effect of this is a very erratic load on drilling and milling for Mr. Borst.

There seems to be a definite hold-up in Production before the orders are sent to Planning. This applies primarily to "hot" orders. When the Engineering Division is late, or the order is late for any reason, there should be a general rush to see to it that the order in question reaches the floor by the starting date. However, it has been noted that many of these orders bog down in Production for three to eight days. It seems to be caused by an overload on the clerk who is responsible for clearing the move cards and blueprint (Mrs. L. Tureki). The result is that by the time Planning gets the move card (their order to begin planning) ten to twenty days may have elapsed from the time the original order was written in Production; and, furthermore, up to thirty days may elapse from the time the order is first written to the date on which it reaches the factory floor.

Mr. Shryver's voucher typing section is also behind. As of November 21, 1949 at 10:00 A.M., there were thirty-three E-3 orders in typing which were past their starting dates. There were also ten more orders which will become due on the floor during the next week. This voucher typing definitely seems to be a bottleneck right now. It would seem that the voucher typing group should be at least two or three weeks ahead of due date on all of the orders so that if a late order came through special attention could be paid to it.

We would like to reiterate, at this point, one of our contentions in the last letter, November 16, 1949. Planning has a large backlog of overdue orders. Planning has for the past three months had a large backlog of overdue orders. Unless something is done about it Planning will continue to have a large backlog of overdue orders. They have been working Saturdays since last summer, but they have been unable to reduce the overdues. It is

felt here that Planning should work nights in order to reduce their overdue backlog. They should schedule their work to have the orders planned about four weeks ahead of starting date.

Unless Engineering catches up on their overdue instructions the entire department will continue to have a large number of overdue and late orders. As of November 16, 1949 there were approximately 170 orders past the date due for the Engineering Instructions.

However, one point should be noted here. If Production, Planning and Typing were caught up completely, any order on which the Engineering Instructions were received a little late could be pushed so that it would still reach the floor by the starting date.

The accumulation of parts for packing has improved some during the past few weeks; but, it must be borne in mind that the accumulations are still way behind manufacturing schedule. This is a Production problem and it must be considered their responsibility to catch up and keep up. If overtime or additional help is needed here it should be authorized.

As you have probably noticed, the further that we have gone into the problems the more "villains" we have uncovered. So far we have mentioned Engineering, Planning, Production, Manufacturing, Dispatching and Voucher Typing. What this all boils down to is that each section is not pulling its own weight. As we see it, the only way to catch up to the manufacturing schedule is to have management put pressure on each group to eliminate their own bottlenecks. In order to do this management must have the information allocating responsibility for overdues. As we see it, the logical place to get this information is from Production and Dispatching. The Cages can tell you (with the proper techniques) whether the manufacturing group is at fault on any particular order, and if they are whose particular fault it is. The Production group can tell you if the various feeder groups (Planning, Typing, etc.) are keeping their work up-to-date. With that information available management could "pin" the blame to the proper person or group and aid them in eliminating their tie ups.

As to the various manufacturing groups the following is a summary as it is seen here of the cause for their overdues.

Mr. Borst: He has been dogged by the lateness of orders reaching him. He has also been hampered by the way the orders come in bunches. A third factor has been the hold-ups in Building #49 and a fourth has been the lack of accurate information as to exactly what jobs would hit the floor each week. Notwithstanding these excuses there has been a definite lag in picking up the slack. It is felt that it should be emphasized to each Foreman that the Cage should be consulted regularly in order to obtain a true picture of what is ready to start. If load charts were maintained and the feeder groups were up to date there would be no reason for this section to have any overdues.

Mr. Post: A complete check was made of the overdues in this group. It was found that 60% were not even ready for the indicated operation. This was caused by the procedure used in releasing the dispatch cards to the cage. This is in the process of being corrected by Production according to Mr. Broderick. The other 40% were primarily orders received late or had waited for other operations to be completed. The main reason for the orders not being ready to begin Assembling on time was that the components had not been completed by Mr. Borst. The reasons for this were explained in the previous paragraph. Therefore, we may conclude that Mr. Post is maintaining and should continue to maintain a current operation.

Mr. Larkins: He cannot do his jobs unless he is fed by Messrs. Borst, Post, and Smith. Most of his machines are up to par. They only have a few orders on hand to do, and since the orders that they are receiving are overdue they will continue to show a certain percentage of overdue. However, there are a few tight operations on which special emphasis should be placed. Layout is the greatest offender. However, it would seem that if orders are fed to Mr. Larkins on time his operations should be able to hold their own.

Mr. Smith: Here we come to a sore spot. Mr. Smith still needs more help. He has approximately 150 diaphragms (at his stations and in C-10 Bay) that need some sort of chipping. He's catching up slowly, very slowly, even with working Saturdays, so it seems that he just doesn't have the manpower to maintain the flow of chipped diaphragms necessary to reach and keep up with the manufacturing schedule. This is a serious bottleneck, and management needs to take steps to eliminate it.

Mr. Endries: This group is entirely dependent on Messrs. Larkins, and Smith and the Production Section. Unless the diaphragms reach him in time he is unable to finish them and pack them in time. Unless the accumulations are ready he is still unable to finish the diaphragms. He has two operations which require more attention - mill support pin and make support bars, shims, spacers, etc. He has promised to make these operations current as soon as possible. In counting his overdues a serious fallacy occurs. The orders are charged to Mr. Endries even though he is waiting for an inspection, or area check, an accumulation, or for another diaphragm for bolting. There should be a section of each cubbyhole devoted to orders not ready to start the operation. This could then be segregated in the detailed cage count so as to direct the responsibility to where it belongs. On the whole Mr. Endries' group is doing the work as it is coming to them.

All of this discussion has pointed up two key failings in the present system. First, the present gage analysis is inadequate and misleading. Second, on a going basis load charts are essential to a well managed operation.

The solution which presents itself is obvious - assign someone or obtain someone to perform those two functions. As to assigning someone, the supervisors concerned (Mr. Brown and Mr. Broderick) claim that their employees are currently overloaded and could not be expected to undertake any new tasks. If, however, a clerk could be obtained, he could perform the following functions:

1. Maintain machine load charts from a duplicate copy of the cost card.

2. Establish responsibility for overdues by issuing a report each week of a detailed count of the E-3 Cage.

3. Aid Mrs. Turski in getting the orders to Planning as soon as possible.

4. Assist Mr. Egan by making reports on overdues in the various auxiliary groups.

5. Work with Mr. Fitzgerald in tracing and expediting overdue cards.

6. If the proceeding tasks do not make a 40 hour week, he could perform some of the same functions in the E-33 Cage.

If any additional details are desired by anyone concerned on the foregoing data and contentions we will be most happy to discuss the problems involved.

TURBINE MANUFACTURING DIVISION

Burton Grad

Burton Grad

BG:aso
CC: D. Broderick
N. Coutant
J. Brown
W. Nelson
W. Klinkow
R. Egan
D. Eagan
File - 2

TABLE II

Board I as of November 19, 1949

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
Post						
3A8	Caulking strip	0	2	0	0	0/2
3-4A1	Anneal	7	1	6	1	7/8
3-4A1	Brg. Anneal	0	0	0	0	0/0
3A8	Asm 1st Stg. Noz.	7	13	7	9	16/20
3A8	Asm in Ring & Web	3	33	2	4	6/36
3A8	Asm in B/O	5	31	5	17	22/36
5A2	Seal & Tack Weld	7	4	3	3	6/11
5A2	Weld Comp.	9	11	9	6	15/20
	Weld Noz. Part Asm.	1	24	1	7	8/25
5A2	Brg. Weld	0	0	0	0	0/0
Horst						
3A2	Gear Hobber	0	2	0	2	2/2
3B1	Shear	8	35	0	0	0/43
3B3	Straighten	1	4	1	4	5/5
3B9	Grind	4	16	2	11	13/20
3B7	Shaper	0	0	0	0	0/0
4B5	Mill & Punch Drill	6	0	3	0	3/6
5B5	Planer	0	0	0	0	0/0
5B11	Bend	2	0	1	0	1/2
5B11	Rebend	0	0	0	0	0/0
7B9	Saw off & Notch	13	25	8	6	14/38
7B3	Roll & Punch	2	0	2	0	2/2
7B7	Punch & Form	4	0	0	0	0/4
6B17	Mill	3	7	3	3	6/10
8B1	Shaper	0	0	0	0	0/0
7B1	Backing Rings	0	20	0	4	4/20
3B2	4 Spindle Draw Mill	1	0	1	0	1/1

Borst

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
3B4	Draw Mill $125	1	0	0	0	0/1 — 4 Spindle. See previous
4B10	Draw Mill $10	2	15	2	13	15/17 2-(2)
4B2	Hand Saw 2.00	1	34	1	3	4/35 1 (1/2) shift
4B4	Mill 2.00	1	0	1	0	1/1 } 1 (1/2)
4B6	Duplex Mill 2.00	7	0	2	0	2/7 }
4B8	Drill 6.00	0	4	0	2	2/4 1 Shift.
4B12	Sundstrand Mill 9.00	2	0	2	0	2/2 2 shifts.
4B14	Sundstrand Mill 9.00	1	0	1	0	1/1 }
274	Mill 9.00	16	5	4	4	8/21 to mill Wash. 16 men Shift.
6B6	Hydrotel	0	3	0	3	3/3 → 3 shifts
6B8	Keller 55.00	1	5	1	3	4/6 → 1 shift.
6B10	Vertical Mill 3.50	0	0	0	0	(?) 0/0 2 shifts
7B6	Radial Drill 6.00	0	0	0	0	0/0 1 shift
D-3	Milling Mach. 30.00	2	11	2	5	7/13 }
8B4	Planer 20.00 *	2	0	2	0	2/2 } 1 shift
8B2	Nozzle Rings 45.00	0	0	0	0	0/0 }
290	Guide and Polish 30.00 (?)	2	3	1	0	1/5 3 shifts 6 men
	Total	121	306	73	110	183/429

TABLE II

Board II as November 19, 1949

Lorking

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
8A4	14' B.M.	2	2	1	0	1/4
9B2	5' B.M.	3	1	2	1	3/4
11A1	Joint Dia.	0	6	0	4	4/6
7A2	Adj. Spacers	2	0	1	0	1/2
7A3	10' B.M.	2	4	2	1	3/6
8A2	8' B.M.	1	1	1	0	1/2
12B1	8' B.M.	6	3	3	1	4/9
11B4	6' B.M.	3	1	1	1	2/4
9A3	L/O	6	31	4	5	9/37
9A2	Planer	3	1	0	0	0/4
6A1	Mill Mach.	4	7	0	4	4/11
11A3	6' Rad. Drill	2	5	0	5	5/7
12A1	8' Rad. Drill	1	12	0	6	6/13
Smitch						
12A1	Repair Weld	11	0	6	0	6/11
11A2	Chip Steel	24	35	9	14	23/59
11A2	Chip Cast Iron	10	22	7	4	11/32
11A2	Finish chip	8	12	6	10	16/20
Post						
	MH Weld	1	1	1	1	2/2
7A1	D/P	4	21	2	19	21/25

Lorkins

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue Cards In Process	Overdue Cards Waiting	Overdues Total Cards
13A3	Bullard	1	0	0	0	0/1
Endries						
14A2	Mill Supt. Pins	26	0	23	0	23/26
14A9	Drill For Crush Pins, etc.	10	9	10	9	19/19
14A5	I/O for Crush Pins	4	26	4	21	25/30
15A3	Make Supt. Bars, Shims, Spcrs.	45	0	42	0	42/45
16A2	Asm., Pkg., etc.	12	22	12	21	33/34
17A1	Paint	4	14	4	14	18/18
Outside						
	X-Ray	5	0	3	0	3/5
	C-10 Bay (Chipping)	0	11	0	11	11/11
	Building #49	0	69	0	20	20/69
	Stockroom	0	33	0	27	27/33
	Total	200	349	144	199	343/549

SUBJECT: Overdue E-3 Cage Orders

Schenectady, November 16, 1949

Mr. W. Pruessman
Building #273

In line with our conversations of last week, the following is a further report on the condition and causes of Overdue E-3 Orders.

Table I is a summary tabulation as of November 12, 1949 of Overdue Orders. The detailed tabulation appears in Table II at the end of this report.

TABLE I

Summary

Foreman	Total No. of Orders	No. of Overdue Orders
Borst	311	111
Post	220	100
Larkins	121	62
Smith	127	71
Endries	211	202
	990	546
Storage, X-Ray, Outside, Bldg. #49	147	39
TOTAL	1137	585

The cards in Board II have now been corrected to conform with the present manufacturing schedule. This caused approximately fifty cards to change from the overdue to the not-due classification.

There appears to have been some improvement in the finishing sections - Messrs. Larkins, Smith and Endries. However, it is much too soon to draw any sound conclusions.

A certain portion of the overdues may be laid in the lap of Planning. According to Mr. R. Egan's tabulation of November 9, 1949 there were approximately 120 orders due to reach production still not planned. These overdues are not entirely the fault of Planning as certain jobs are ordered late because of delay in receiving Engineering instructions. Other orders are held up by drawings, or non-available (in typing) planning cards. Production tries to allow two weeks between planning and starting date. However, the typing section had as of November 9, 1949 approximately 80 E-3 orders untyped that were past their starting dates. This is an improvement, though, over the untyped orders of a few weeks ago.

These problems result in many orders reaching the cage late. Unless the factory can start on time they cannot and should not be expected to finish on time.

Although the basic operation of the cage seems sound, a number of difficulties in the actual operation have cropped up and they will be discussed with Mr. J. Brown as soon as possible.

The cause for a large percentage of Mr. Post's overdue orders is the lack of component parts. The dispatch cards are automatically released on their starting date even if the components are not ready. Therefore, we have the unique situation where the various components may count as overdue and the assembly counts as overdue also. We have discovered that Mr. Broderick has worked out a solution for this condition.

The release of work is very irregular; one week men will be sent home and the next week they will have to work overtime to reduce the overdues. This is especially true of Mr. Borst's section. No solution has yet presented itself for this problem.

There are also a number of orders which are awaiting packing and accumulation, however, this has been reduced in the past few weeks by the efforts of Production. There are other orders which are complete and are counted as overdue because they have not been moved to Test yet. This shows the need for additional storage area.

We are continuing our investigations and hope to have more encouraging news next week. Each foreman is being pushed to reduce his

overdue backlog and to make his operation current. These will, of course, be further reports to indicate our progress.

TURBINE MANUFACTURING DIVISION

Burton Grad

Burton Grad

BG:ase

cc: H. Coutant ✓
W. Klinkow ✓
D. Broderick ✓
R. Egan ✓
D. Hagan ✓
J. Brown ✓
W. Nelson ✓
File ✓

TABLE II

Board I as of November 12, 1949

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue In Process	Overdue Waiting	Overdues Total Cards
Larkins						
8A4	14' B.M.	2	0	0	0	0/2
9B2-4-6, 10B2	5' B.M.	11	7	10	2	12/18
11A1	Joint	2	4	1	4	5/6
7A2	Adj. Spcr.	0	1	0	1	1/1
7A3	10' B.M.	3	1	2	1	3/4
8A2	8' B.M.	2	2	0	0	0/4
12B-1-3, 13B1	8' B.M.	3	3	2	2	4/6
11B4	6' B.M.	10	1	10	0	10/11
9A3	L/O	9	32	1	8	9/41
9A2	Planer	2	3	0	0	0/5
6A1	Milling Mach.	0	3	0	2	2/3
11A3	6' Rad. Drill	1	7	1	4	5/8
12A1	8' Rad. Drill	1	8	1	8	9/9
Smith						
14A1	Repair Weld	0	10	0	9	9/10
11A2	Chip Steel	24	37	16	17	33/61
11A2	Chip Cast Iron	10	30	8	9	17/40
11A2	Finish Chip	4	12	4	8	12/16
Post						
	B.T.H. Weld	3	2	3	2	5/5
7A1	B/O	3	31	2	13	15/34
Lovicins						
13A3	Bullard	0	3	0	2	2/3

TABLE II

Endries

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue In Process	Overdue Waiting	Overdues Total Cards
14A2	Mill Supt. pin	0	26	0	23	23/26
14A9	Dr. for crush pin	15	13	15	13	28/28
14A5-7	L/O crush pin	4	24	4	23	27/27
15A3-4	Supt. bar, shim spcr.	0	47	0	43	43/47
16A2	Asm packing	5	21	5	20	25/26
17A1	Paint	36	20	36	20	56/56
C-10 Bay Storage	Chipping		15		14	14/15
X Ray		2		1		2/1
	TOTAL	152	363	122	248	

TABLE II

Board II as of November 12, 1949

Post Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue In Process	Overdue Waiting	Overdues Total Cards
3A8	Caulk Strip	0	2	0	0	0/2
4A1	Anl.	10	4	6	2	8/14
3A8	1st Stg. Asm	11	12	8	11	19/23
3A8	Asm ring & web	4	43	3	9	12/47
3A8	Asm B/O	2	31	1	17	18/33
5A2	Seal tack weld	6	8	1	2	3/14
5A2	Weld comp.	8	8	7	2	9/16
	Weld noz. part.	2	30	2	9	11/32
Borst						
3A6	Gear Hobber	11	2	0	2	2/13
3B1 & 5	Shear	2	43	1	6	7/45
3B3	Straighten	0	0	0	0	0/0
3B9, 4B3, 4B1	Grind	2	32	0	11	11/34
3B7	Shaper	1	0	0	0	0/1
4B5	Mill & Punch Drill	5	2	0	1	1/7
7B9	Saw off & Notch	9	41	9	9	18/50
5B11	Bend	4	1	2	1	3/5
7B7	Punch & Form	3	14	1	8	9/17
7B1	Backing rings	0	5	0	3	3/5
3B2	4 Spin. Draw Mill	3	0	2	0	2/3
3B4	Dr. Mill	2	0	1	0	1/2
4B10	Dr. Mill	4	16	4	10	14/20
4B2	Hand Saw	9	46	5	6	11/55
4B6	Duplex Mill	4	0	3	0	3/4
4B8	Drill	2	4	0	4	4/6
4B12	Sundstrand Mill	3	0	1	0	1/3
274	Mill	7	2	4	2	6/9
6B6	Hydrotel	0	4	0	4	4/4
6B8	Keller	2	1	1	1	2/3
7B6	Rad. Dr.	0	2	0	0	0/2

TABLE II

Borst

Station Number	Operation Name	Total Cards In Process	Total Cards Waiting	Overdue In Process	Overdue Waiting	Overdues Total Cards
D-3	Mill Mach.	2	13	2	4	6/15
SB4	Planer	2	0	1	0	1/2
SR2	Noz. Ring	0	2	0	1	1/2
290	Gr. & Pol.	4	0	1	0	1/4
	TOTAL	124	368	66	125	