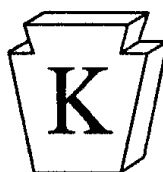




# ABS Alloy Blending System



**KEYSTONE SYSTEMS, INC.**  
*Optimization Software for the Metals Industry*  
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**Donald E. Eckley** Donald E. Eckley is President of Keystone Systems, Inc. Since 1975, Mr. Eckley has been involved with developing and marketing software for optimum utilization and purchasing of raw materials for the metals industry. Prior to forming Keystone Systems in 1985, Mr. Eckley held positions as Vice President of a software development firm and as a Metals Industry Consultant for a remote computing company. Mr. Eckley has personally supervised or performed the actual software installation at more than 150 melting facilities worldwide.

**Alloy Blending System (ABS)** ABS is a fully integrated, linear programming software package that includes:

- *Least Cost Charge Design*
- *Least Cost Alloy Additions*
- *Inventory Control*
- *Month-To-Date Consumables*
- *Dynamic Formula Processor*
- *Chemistry Routing*
- *Scrap Control*
- *Purchase Evaluation*
- *Material Forecasting*
- *Management Reporting*

**Least Cost Charge Design (MIX)** MIX reduces metal mix costs by optimizing the use of raw materials. MIX ensures production of a more consistent final product and generally provides a higher quality control over the finished heat. MIX also helps reduce off-analysis heats caused by manual calculation errors.

**Least Cost Alloy Additions (TAP)** TAP calculates the least costly combination of alloys required to meet your final chemistry working aims. TAP performs alloy additions calculations at computer speed, thus aiding in the reduction of tap time and unnecessary additions.

**Inventory Control (INV)** INV maintains a database of current raw material information. The INV program is used to process new material receipts, record material usage and provides many standard inventory reports.

**Month-To-Date (MTD)** MTD accumulates, reports, and exports month-to-date and year-to-date inventory information. This information includes receipts, usage, and adjustments, as well as beginning and ending inventory weight and cost values.

**Dynamic Formula Processor (DFP)** DFP is a very powerful add-on product for users of the Alloy Blending System. With DFP, you can optimize virtually any linear formula or elemental relationship. Whether you use DFP to control the total residuals going into the charge or to control for a specific chemical relationship, least cost optimization techniques will automatically be utilized.

**Chemistry Routing (CHRIS)** CHRIS is an interface product that automates the collection and dissemination of analytical test results from your spectrometer to the various ABS databases. Interfaces for most major spectrometers are available. Custom interfaces can also be provided.

**Scrap Control System (SCS)** SCS expedites the processing of newly purchased scraps and recycled material by linking actual chemical test results (*from your spectrometer*) with the material receiving information. With SCS, you essentially operate a hands-free chemistry collection and distribution system.

**Purchase Evaluation (PURE)** PURE is a complete decision support sub-system for raw materials purchasing. PURE is used to aid in: 1) reducing inventory by providing detailed material usage information, 2) determining the "break-even" price for quoted materials, and 3) reacting wisely to material shortages by analyzing the effects before they occur.

**Material Forecasting (MFP)** MFP, like PURE, is also a decision support sub-system for raw material requirements planning. MFP utilizes linear programming techniques to determine the most economical materials to purchase in order to satisfy your melt schedule. MFP easily adjusts to schedule changes, too.

**Management Reporting System (MARS)** MARS is used to prepare historical consumption and chemistry reports. MARS is also used to select and export consumption and chemistry data for external use in spreadsheets, database systems, and SPC analysis.

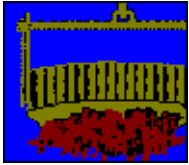
### ~ In General ~

The ABS modules may be licensed separately or as a complete package. Custom modifications, if desired, are available on either a fixed-price or time-and-material basis.

The Alloy Blending System is available in single or multi-user versions and operates on Intel hardware platforms utilizing Windows (95, 98, 2000, NT, or XP). ABS requires a Pentium class CPU with a minimum of 32MB of RAM and 50MB of available disk storage (*dependent upon the number of programs licensed and the amount of data entered*).

Keystone Systems provides complete documentation and training on the ABS software. Free upgrades and support are provided for the first 60 days after installation. An optional plan for on-going software maintenance and support is also available.

Refer to Keystone's Price Sheet for individual license fees.



# MIX

## Least Cost Charge Design



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The Least Cost Charge Design program (MIX) uses linear programming techniques to obtain the least costly combination of raw materials required to meet your desired chemistry working aims. Two versions of the MIX program are available - "Batch" and "Melter/Holder".

**BATCH VERSION:** The standard or "Batch" version is for melting operations that essentially pour the entire charge, leaving only a small or no liquid heel for the next charge.

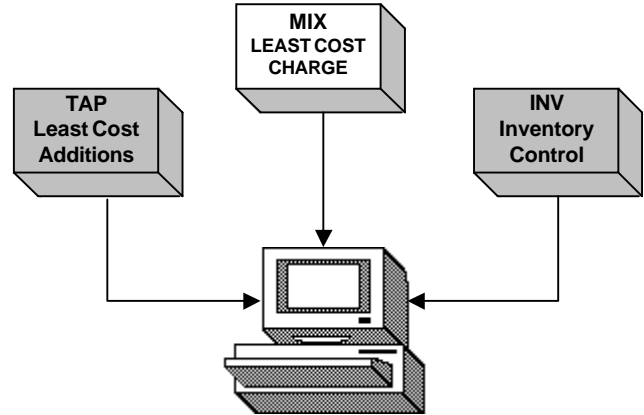
**MELTER/HOLDER VERSION:** The "Melter/Holder" version was developed for clients utilizing a melter/holder type of operation. This version contains all of the features and capabilities of the "Batch" version, plus the added capability to calculate a charge for a holding furnace utilizing liquid metal from up to three on-line melters. The "Melter/Holder" version also has provisions for calculating a melter/holder "backcharge".

An unlimited number of grade/alloy specifications can be permanently created and accessed by MIX. The program allows you to specify up to 45 individual restrictions per grade/alloy. A restriction can be a specific material, a certain type of material, or an entire file of materials. Restrictions can be expressed as either a fixed weight or a percentage of the design weight.

The MIX program will search through your inventory and prepare a list of qualified candidates for the charge. The program then determines the optimum solution from as many as 1,200 material candidates.

The MIX program can solve for either one heat/charge or a campaign of heats/charges. MIX calculates material requirements for either a cold charge (*no metal exists in the furnace*) or a hot charge (*hot metal exists in the furnace*). MIX distinguishes between available and committed inventory when calculating the blend. This ensures that materials are not over committed.

After the optimum solution is calculated, the program provides a selection of "Resolve Options". One option allows you to change the restrictions and recalculate the solution (*there is no limit to the number of re-solves you can perform*). Another option will display the "shadow prices" showing the cost disadvantage for those materials considered for the charge but, for cost reasons, were not chosen.



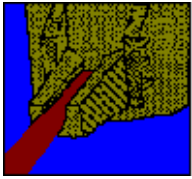
Also, if you have raw materials that you believe should have been used in the solution but weren't, MIX will tell you why those materials were not chosen.

When a solution meets all physical, chemical, and operational requirements, MIX can reserve the materials and quantities, excluding them from further consideration.

MIX contains numerous setup options to customize the procedural flow of the program for your particular operating environment. Provisions are available for calculating optimum unit weight solutions, as well as metric solutions.

The MIX program is a powerful tool that is very easy to operate and contains numerous "help" facilities for inexperienced users. MIX reflects over 25 years of refinements and improvements to meet most every client's needs.

**METALS BROKERS / SCRAP DEALERS:** A specially developed Least Cost Charge Design program is available for Metals Brokers and Scrap Dealers. This MIX program contains all of the features and capabilities of the standard melt shop version, with the exception of processing heels. This version contains a "profit worksheet" feature not available in the standard melt shop version. The "profit worksheet" calculates and reports costing and blend profitability information to assist in decision making. The blend profit can be calculated by either: 1) Gross Sales Price or 2) Elemental Price. Both blended and unblended profit values and percentages are computed and reported.



# TAP

## Least Cost Alloy Additions



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The Least Cost Alloy Additions program (TAP) is used to calculate the least costly combination of alloys required to meet your “intermediate” or “final” chemistry working aims. TAP utilizes linear programming techniques to obtain the least cost alloys required.

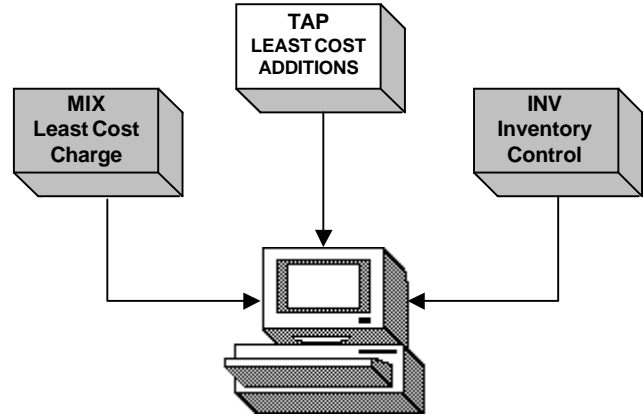
An unlimited number of grade/alloy specifications can be permanently created and accessed by TAP. The program allows you to specify up to 40 individual restrictions per grade/alloy. A restriction can be a specific material, a certain type of material, or an entire file of materials. Restrictions can be expressed as either a fixed weight or a percentage of the prelim weight.

The program allows the user to designate those elements which will be controlled through metallurgical practice and those which will require a calculation for dilution. If the dilution requires more metal to be added than is possible or practical, the program will display a warning message and compute a minimum “pour-off” weight.

The TAP program only considers materials that you have indicated are available for use during the intermediate or final additions phase of the heat/charge. The TAP program differs from the Least Cost Charge Design (MIX) program in that it begins with a determined “bath weight” with a specific chemistry to achieve.

An important feature of TAP is the ability to specify a minimum and/or maximum tap weight required, which can improve melting yields and reduce scrap returns.

TAP was designed to interface with various spectrometers, so manual entry of the preliminary test results is usually not necessary.



The TAP program incorporates all of the resolving features of the MIX program, including the ability to change your working aims. Often by changing your aims, especially the upper limit, you are able to reduce the total alloy additions required due to unnecessary dilution. You can also lower the aims if you expect an “elemental pickup” from the previous heat/charge.

There is no limit to the number of times you can resolve the solution before accepting the calculation. When a solution meets all physical, chemical, and operational requirements, TAP can reserve the materials and quantities, excluding them from further consideration.

TAP contains numerous setup options to customize the procedural flow of the program for your particular operating environment. Provisions are available for calculating optimum unit weight solutions as well as metric solutions.

The TAP program is a powerful tool that is very easy to operate and contains numerous “help” facilities for inexperienced users. TAP reflects over 20 years of refinements and improvements to meet most every client’s needs.



# INV Inventory Control



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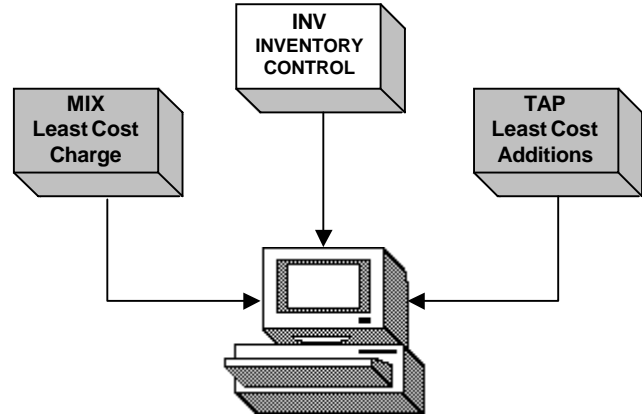
The Inventory Control program (INV) is a complete raw materials inventory management package. The INV program is used to process new material receipts, record material usage and provide various inventory reports.

With the installation of the INV program, you will have access to a perpetual inventory system. Purchasing, Operations, and Management personnel will all benefit from the Inventory Control program by having immediate access to current inventory levels and values, committed inventory information, daily inventory receiving and consumption information and more.

The Inventory "Receipts" function provides the ability to enter both new raw materials and receiving information for existing raw materials. All receipts transactions are date and time stamped to ensure complete traceability. A detailed receiving report is prepared after the receipts have been posted. The detailed receipts information can optionally be stored and exported for use by existing in-house applications. The receipts data can also be stored and reported via the optional Month-To-Date Consumables (MTD) System.

The Inventory "Usage" function provides the ability to record actual raw material consumption (usage) information. Only after the actual usage information is entered for a heat/charge is the perpetual inventory adjusted to reflect the new balance. All usage transactions are also date and time stamped to provide traceability. A detailed usage report is automatically prepared after the usage figures have been posted. This report contains the true (actual) weight and cost values for the heats/charges processed. The detailed usage information can optionally be stored and exported for use by existing in-house applications. The usage values can also be stored and reported via the optional Month-To-Date Consumables (MTD) System.

The Inventory "Reports" function provides access to numerous standard inventory reports. Many reports provide both actual and/or standard costing information.



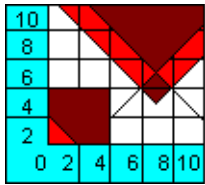
A sampling of the standard reports includes:

*Aged Inventory*  
*Quantity On-Hand*  
*Inventory Value*  
*Detailed Receipts / Usage*  
*Elemental Analysis of Inventory*  
*Inventory Changes / Corrections*

Custom-developed reports can also be provided.

The Inventory "Export" function is an optional extra-cost feature available. This function was developed for those clients who wish to link the ABS Inventory System with an existing in-house receiving, inventory, or material consumption application. The "Export" function eliminates the need for double data entry of receipts and usage information.

**MONTH-TO-DATE CONSUMABLES (MTD):**  
The Month-To-Date program (MTD) collects all raw material usage and receipt information and provides reports displaying the month-to-date and year-to-date values. The MTD information is usually maintained for one month, whereupon the existing values are rolled into the Year-To-Date (YTD) file and the MTD file is initialized (cleared) for the next month. In addition to the normal reporting functions, the MTD and YTD information can be exported for use in other in-house applications.



# DFP

## Dynamic Formula Processor



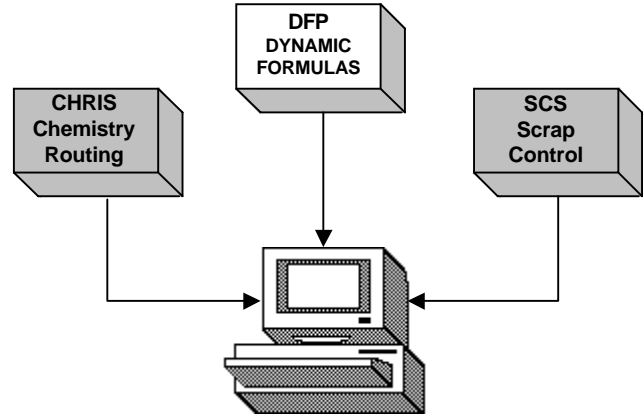
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The Dynamic Formula Processor (DFP) is an extremely powerful add-on product for users of the Alloy Blending System. With the Dynamic Formula Processor, you can optimize virtually any linear formula or elemental relationship. Whether you use the Dynamic Formula Processor to control the total residuals going into the charge or to control for a specific chemical relationship, least cost optimization techniques will automatically be utilized.

The Dynamic Formula Processor provides you with a new dimension in optimizing raw materials and controlling physical chemistry relationships.

The Dynamic Formula Processor allows you to:

- Widen the working aims for your natural elements (*CR, NI, MO, etc.*) while imposing tighter controls on the more important elemental relationships (*chrome equivalence, nickel equivalence, carbon equivalence, total sludge, pounds per square inch [PSI] etc.*);
- Reduce your current alloy additions cost, often by as much as \$300 per charge, over traditional computational methods;
- Maintain complete control and privacy of your formulas and easily modify them if they differ from industry standards;
- Quickly and cost-effectively adjust to your customers' requirements for new or additional chemistry relationships.

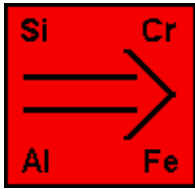


The DFP program is fully integrated with all of the existing Alloy Blending System's optimizing modules. Optimization of elemental relationships is automatically performed when designing charges, calculating least cost alloy additions, computing material requirements, and even performing purchase evaluations.

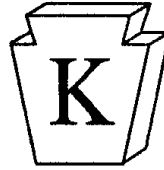
If your shop operates with a heel (*hot metal left in the furnace or melter*), the Least Cost Charge Design (MIX) program will automatically calculate the complex elemental contribution the heel will provide.

If you are using the Least Cost Alloy Additions (TAP) program, the preliminary chemistry's complex elemental contribution will also be automatically calculated.

The DFP feature is extremely easy to implement and use. Four versions of the DFP program are available allowing you to establish a maximum of 5, 10, 15 or 20 dynamic formulas. Each formula can have a maximum of 10 sets of arithmetic expressions. If your customers are requiring you to meet tighter and more complex chemistry specifications, DFP can help.



# CHRIS Chemistry Routing System



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The Chemistry Routing System (CHRIS) is an add-on product that automates the collection and dissemination of analytical test results. CHRIS was designed and developed to enhance the ABS System by providing improved shop chemistry control. CHRIS will:

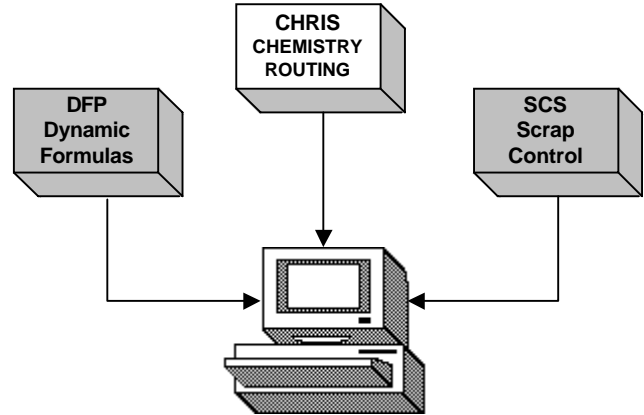
- Process and distribute heel and preliminary chemistry test results directly to the Alloy Blending System's Least Cost Charge Design (MIX) and Least Cost Alloy Additions (TAP) programs;
- Process and distribute chemistry test results for all incoming scraps and recycled materials directly to the Alloy Blending System's Scrap Control System (SCS);
- Process and distribute final test results directly to the Alloy Blending System's Management Reporting System (MARS);
- Provide a hands-free chemistry collection, distribution, and data storage system;
- Interface with most major manufacturers' analytical instruments, thereby providing more cost-effective utilization of existing analytical testing equipment. The following instruments are currently supported:

Alcan OES • Labco • Philips • Siemens • Spectro-Windows version • Thermo-Optek (Fisons/ARL) - Winoe (all versions) and Impact+

The CHRIS System can process and distribute the following types of lab tests:

**Hot Metal Chemistry** - The first type of lab test the CHRIS System can process is "hot metal chemistry." Hot metal chemistry tests are either heel samples or preliminary samples. CHRIS will distribute the heel or preliminary chemistry to the appropriate ABS program. This very important function eliminates the possibility of manual input errors. In almost all instances, this function also helps reduce the total charge time, thereby helping to reduce total operating costs.

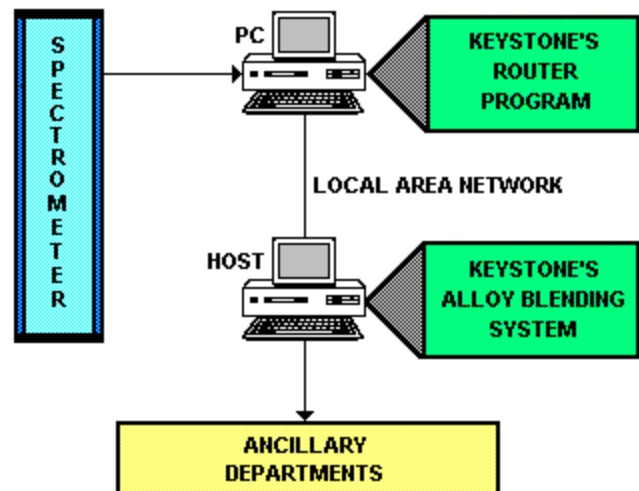
**Scrap Chemistry** - The second type of lab test that CHRIS can process is "incoming or recycled scrap chemistry." Scrap chemistry results are distributed and stored in the received scrap chemistry database. The Scrap Control System (SCS) provides the ability to later transfer the scrap chemistry to the active ABS inventory. When scrap chemistries are transferred to the active inventory, the scrap receipts and scrap transferred databases are updated.

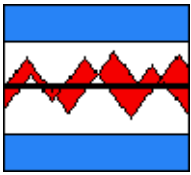


All scrap chemistry information is, therefore, collected and distributed without any manual intervention. This hands-off chemistry distribution system ensures better chemistry control by eliminating manual data entry errors.

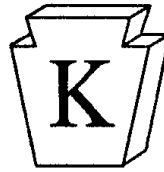
**Final Chemistry** - The third type of lab test that CHRIS can process is "final chemistry." Final chemistry results are the results taken at tap or casting time. CHRIS collects and stores the final chemistry results into an historical database, which can be made available to virtually anyone connected to the network. This "chemistry data bank" eliminates the redundant collection and distribution of the final chemistry test results. The information in the chemistry data bank can be selected by various key identifiers (*alloy code, tap date, etc.*) and exported for later SPC analysis or to other preferred database products.

The CHRIS System can operate in a single or multi-computer environment. The following illustrates a typical multi-computer configuration:





# SCS Scrap Control System



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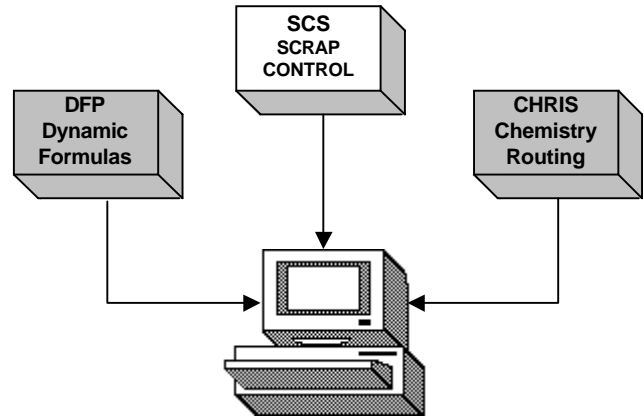
The Scrap Control System (SCS) is an add-on product for the Alloy Blending System that is used to automate the actual linking of chemical test results (of newly purchased scraps, internally recycled scraps, remelts, etc.) with purchased or recycled raw material receiving information. With the SCS System, you will:

- Improve the confidence and accuracy of all your raw material chemistry information;
- Expedite the time required to qualify raw materials for use by the ABS Least Cost Charge Design (MIX) and Least Cost Alloy Additions (TAP) programs;
- Reduce or virtually eliminate data entry errors that would occur with manual data entry of raw material chemistry information;
- Maximize your spectrometer investment.

With the SCS System, you essentially build a raw material receipt record. This is accomplished by extracting the desired chemistry information from the scrap chemistry database and the desired quantity, cost, vendor, etc. information from the scrap receipts file. New scrap receipts can be “imported” from existing in-house receiving systems, including bar code readers, or entered via the Scrap Receipts program.

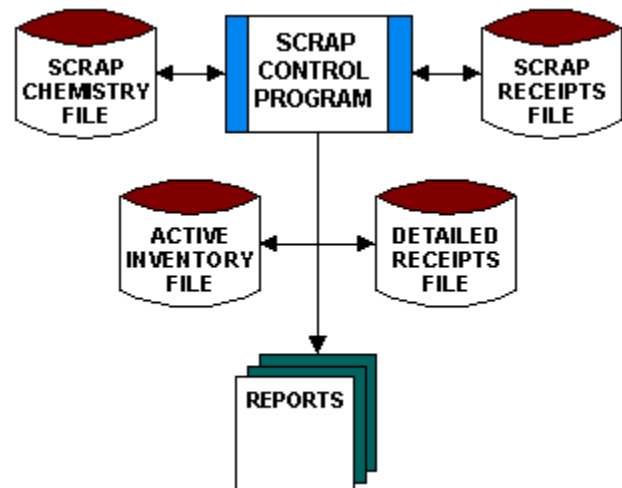
The Scrap Control System is fully integrated with Keystone’s Chemistry Routing System (CHRIS). After the incoming or recycled scrap chemistry test results are taken, they are distributed and stored in a scrap chemistry database via CHRIS. Within SCS, you can select the desired chemistry record and assign the chemistry to a received scrap record.

With SCS, you can select and assign the test results from a single test sample or have the average chemistry from as many as 3,000 samples assigned. SCS automatically computes the average chemistry of all test samples selected.



SCS also provides the ability to transfer a scrap record directly to the active ABS inventory. When a scrap record is transferred, the detailed scrap receipts and the scrap chemistry databases are updated. With SCS, scrap chemistry information is collected and distributed without any manual input. This hands-free chemistry collection and distribution system ensures better chemistry control by elimination of manual data entry errors.

The Scrap Control System can operate without a spectrometer interface. However, SCS provides the most benefit when interfaced directly with your spectrometer. The following illustration depicts the program and databases used by the basic Scrap Control System:





# PURE Purchase Evaluation



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The Purchase Evaluation program (PURE) is a complete decision support sub-system for determining the economic worth of raw materials. PURE uses linear programming techniques to determine:

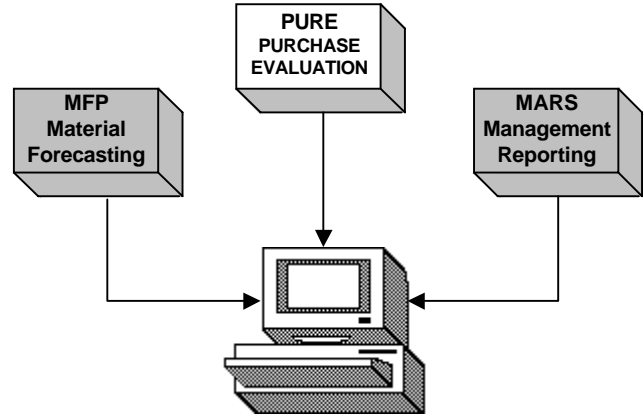
- The maximum or “break-even” price of materials quoted for purchase;
- The useable quantities for each quoted material;
- The metal mix cost impact that would occur due to the loss of a material source or supplier.

The PURE program provides immediate benefits by producing detailed material utilization information, prior to the purchase, in order to help reduce excess inventory. PURE is also used to perform financial “what if” analyses.

PURE has two major decision-making functions; the first is to assist you in “**evaluating**” raw materials for purchase, and the second is for performing “**impact**” studies.

The **evaluation function** is used to determine the economic worth that materials, “quoted” as available, have to your current metal mix cost.

The evaluation adheres to your metallurgical requirements and current inventory position when performing cost analyses. PURE also considers a “market” file which acts as a stabilizer to project a more reasonable analysis. The result of the evaluation is either positive or negative.

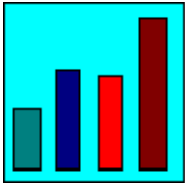


If the result is positive, PURE reports the anticipated quantities, the cost/lb. savings over current cost/lb. melting expense, and the “break even” price for the “quoted” or external material. The “break even” price is the price at which no further savings will be achieved. If the result is negative, PURE computes the cost/lb. necessary (*worth*) to make the material favorable for your use.

The **impact function** is used to perform “what if” studies. Some examples are “what if”...

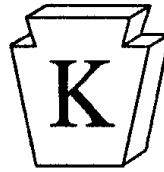
- We must pay more for a raw material when our current contract expires;
- We are unable to use a material due to equipment failure, weather conditions, contamination, etc.;
- We limit or curtail the use of certain scraps below current usage levels.

The impact function also provides detailed reports outlining actual and anticipated metal mix cost variances for the impact study.



# MFP

## Material Forecasting



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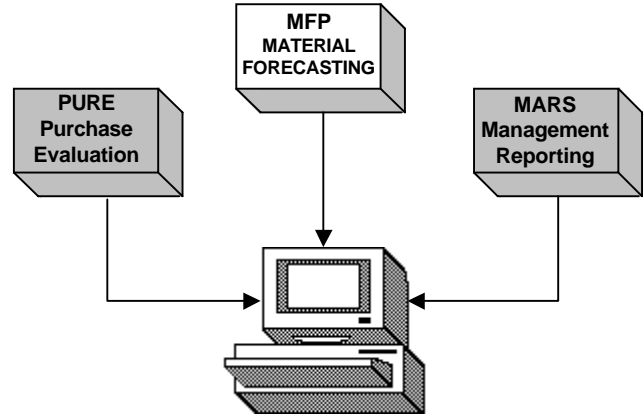
The Material Forecasting Program (MFP) is a complete decision support sub-system used for raw material requirements planning. Purchasing personnel, who are often unfamiliar with metallurgical practices, must make complicated, time-consuming long and short term buying decisions that accurately reflect their requirements based on vendor specifications. MFP uses linear programming techniques to determine the most economical materials to purchase in order to satisfy your anticipated melting schedule or campaign.

The MFP program is integrated with the existing Alloy Blending System (ABS) modules to take full advantage of current inventory information. It will enable you to project your raw material requirements more accurately while using least cost techniques, thereby creating a “least cost shopping list.” Also, MFP fully considers the metallurgical practices, melting restrictions, and elemental recoveries that will be applied at melting time to further qualify the material’s worth.

MFP can be used to calculate short term requirements (usually two weeks or less) or longer term requirements. Provisions exist within the MFP program to compensate for expected shop returns that will occur during the campaign period.

The MFP program derives its raw material requirements from three sources:

- *Current Inventory*
- *Market File*
- *Quoted File*

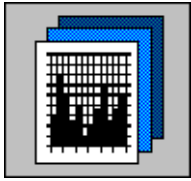


The “market” file, in essence, is a list of approved suppliers and material stocks available for use and consideration. The “quoted” file is an optional second source of materials. Usually, the quoted materials are short runs, one-time buys, or materials that have a highly fluctuating availability or cost.

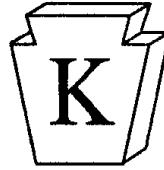
The MFP program produces a series of material requirement reports. These reports include: 1) Anticipated Melting Variance, 2) Elemental Requirements, 3) Detailed Requirements, and 4) Summary Requirements (*including Forecasted “Cash Requirements”*).

MFP can easily adapt to changes in your melting schedule and recalculate the new material requirements. MFP is extremely easy to use and it greatly reduces the clerical effort required with most manual forecasting methods used today.

The MFP program helps you reduce your overall inventory investment by diminishing or eliminating the purchasing of unfavorable or slow moving items.



# MARS Management Reporting System



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*Optimization Software for the Metals Industry*  
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The Management Reporting System (MARS) is an independent procedure for the collecting and reporting of production and chemical information about each heat, blend, or cast produced.

When used in conjunction with the Alloy Blending System's Inventory Control (INV), Chemistry Routing (CHRIS), and Optimization programs (MIX and TAP), the MARS System completely automates the tedious task of collecting this critical data. MARS data can be used to produce detailed melting reports, as well as graphical representation of production and chemistry data.

The MARS System is typically accessed and used by Management, Purchasing, Operations, and Quality Control personnel. Reports, graphs, and spreadsheets can be designed that highlight the operational variables that relate to each manager's area of responsibility.

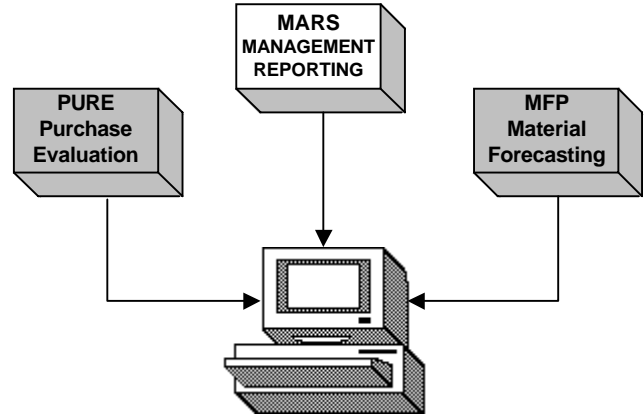
The standard MARS system is generally used to capture and report data for two major purposes:

### *~ Production Performance ~*

The Production/Costing Reporting option provides five (5) standard reports. They include: 1) Detailed/Summary Consumption, 2) Detailed Log, 3) Total/Average Consumption, 4) Elemental Consumption, and 5) Cost Variance by grade code or grade family. Many reports provide detail or summary variations.

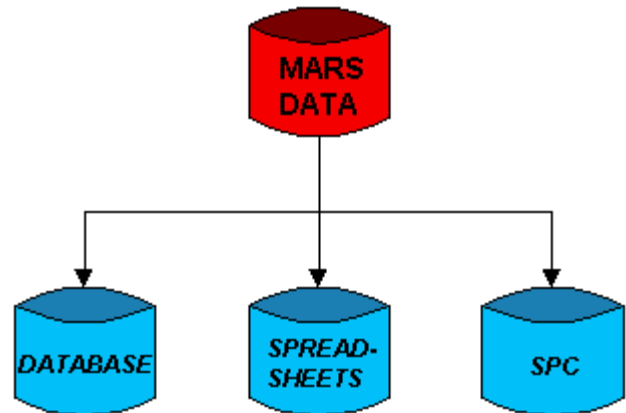
### *~ Chemistry Control ~*

The Chemistry Reporting option provides twelve (12) standard chemistry information reports. They include: Heel Chemistry, P1, P2, Final, Charge Aim and Recovery, Intermediate Aim and Recovery, Final Aim and Recovery, Total Recovery, and Elemental Usage.



The standard MARS System also includes database utilities for deleting, auditing, exporting and importing log records, as well as viewing log status information.

One of the more frequently used features of the MARS System is the "Export" function. With the "Export" function, data records can easily be selected and exported for use in spreadsheets, database systems, and SPC programs.



Keystone can expand the standard MARS System or develop custom-designed reports for your unique melting and management reporting structure. Typical custom reports requested include detailed melt logs, melt variance, melt shop production, elapsed time, ingots cast, man-hours per ton, etc.