A Sustainability Vision for the Automotive Services Industry:

Using The Natural Step Framework to Develop a Plan Toward Sustainability for Automotive Mechanical and Collision Repair Shops

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Project Overview

Automobiles have a significant impact on the environment. With the growing concern over global warming, the focus on this environmental impact will only get stronger.

In 1997 Oregon Department of Environmental Quality (DEQ) began development of the Automotive Eco-Logical Business Program to encourage automobile services and collision repair shops to take extra voluntary steps in protecting the environment. There was a desire in 2000 to expand this program beyond Portland and to investigate the feasibility of enhancing the program by adding a perspective of environmental sustainability based on the Natural Step framework.

Participants from fifteen automotive shops and service organizations were invited to meet in a series of six two-hour meetings in Wilsonville to create a vision of what a fully sustainable automotive service operation might look like if it met the four system conditions of The Natural Step.

In these meetings the participants examined the work processes in an automotive services operation, developed an aspects and impacts analysis of those processes, scored each aspect for its degree of unsustainability, and developed a vision or defined goal as to how each aspect could be managed if it were fully sustainable. This vision of sustainability was then used to create an implementation timeline with potential actions that operators could begin taking now to move their shops toward sustainability.

This Sustainability Implementation Plan gives both the auto shops and DEQ valuable insights as to how to apply The Natural Step four system conditions to reduce environmental liability, improve worker safety and increase profits within the auto services industry.

For the business owners this Plan offers a basis for making capital equipment and other business decisions in a more prudent manner. For DEQ and other policy makers this Plan can be used as a tool to proactively guide future activities in an area that will most likely receive closer scrutiny.

With interest in environmental sustainability growing faster in Oregon than most parts of the United States, Oregon has an opportunity to be a model and play a leadership role in the movement toward sustainability.

Project Background

Automobiles have a huge impact on the environment. In addition to being one of the greatest contributors to global warming, the air and water pollution they create have a significant impact on public health contributing to cancer, premature deaths, and the aggravation of chronic respiratory illnesses such as asthma.[1] Authors Michael Brower and Warren Leon in *The*

[1] Union of Concerned Scientists - http://www.ucsusa.org/index.html

Consumer's Guide to Effective Environmental Choices [2] cite automobiles as the leading cause of negative environmental impact and recommend that the public play a stronger role in reducing this impact.

Eco-Business Program

In 1997, as a proactive attempt to deal with these environmental concerns, the Portland area Pollution Prevention Outreach (P2O) Team, an inter-agency group comprised of DEQ and seven local agencies, began development of the Automotive Eco-Logical Business Program to encourage automobile services and collision repair shops to take extra voluntary steps in protecting the environment beyond those that are required by state regulation. Those shops that participated received P2O certification of their accomplishments, P2O supported advertising and promotion, and free technical assistance.

The program was launched in the Portland metropolitan region in 1999 with the combined support of DEQ; the cities of Gresham, Portland and Troutdale; the Unified Sewerage Agency; Washington County; Clackamas County; and Metro. Private industry and non-profit organization support came from American Automobile Association (AAA) of Oregon/Idaho, Pacific Automotive Trades Association, Automotive Service Association, and the Oregon State Interest Research Group (OSPIRG).

By the fall of 2000, twenty-two shops had been certified in the Portland area and there was interest within DEQ to extend the program to Salem as a first step in reaching other parts of the state. At the same time there was a growing interest from within DEQ and with a few auto repair shops to extend the program's vision beyond just pollution prevention toward one of environmental sustainability. Two shop owners, Bob Anderson of A.J.'s Auto Repair in Salem and Jim Houser of Hawthorne Auto Shop in Portland, had attended trainings on a sustainability framework called The Natural Step (TNS). They were encouraging DEQ to consider The Natural Step framework as a tool that could move the automotive services program toward environmental sustainability.

Sustainability & The Natural Step

The sustainability movement is based on the growing realization that while current environmental efforts may improve the overall state of human health and the environment they do not necessarily assure that the planet and its natural systems are sustainable. The concept of sustainability recognizes that a holistic or systems view is required and that pollution prevention and other environmental programs need to operate at a level that assures "the needs of the present [generation are met] without compromising the ability of future generations to meet their own needs."[3]

The idea of sustainability, though, is so vast that it can easily become a point of contention as to what does the concept really mean and how does one effectively develop strategies and programs that lead to true sustainability. A growing number of public and private sector organizations have begun to utilize The Natural Step framework as a practical means of dealing with these concerns.

[2] Michael Brower and Warren Leon, *The Consumer's Guide to Effective Environmental Choices* (Three Rivers Press, New York, 1999)

[3] United Nation's Brandtland Commission

The Natural Step

The Natural Step is a concept that was developed by Swedish oncologist, Karl Henrik Robèrt in 1989. Dr. Robèrt was seeing cancer symptoms in children that he knew were not due to lifestyle and he began to suspect the causes were environmental. When he probed more deeply he quickly encountered the ongoing debate within the scientific community about the cause and effect of various environmental issues and found it immensely confusing. He began to believe that these discussions were focused too much at the detail level and what was needed was a formulation of first order, scientifically based principles that could be used as a common basis for discussion. He formulated what he thought was the basic science that underlies sustainability. Twenty-one drafts later, he and fifty of Sweden's leading scientists agreed that Dr. Robert's thesis provided a scientific foundation for guiding society toward sustainability. Dr. Robèrt used this foundation to create four system conditions that can guide any organization or enterprise toward sustainability. He called these four principles, The Natural Step.

These four system conditions[4] are:

1. *In order for a society to be sustainable, nature's functions and diversity are not systematically subject to increasing concentrations of substances extracted from the earth's crust.*

   What this means is that in a sustainable society human activities such as the burning of fossil fuels and the mining of metals and minerals can not occur at a rate that causes them to systematically increase in the ecosphere. There are thresholds beyond which living organisms and ecosystems are adversely affected by increases in substances from the earth's crust. Problems may include an increase in greenhouse gases leading to global climate change, contamination of surface and ground water, and metal toxicity which can cause functional disturbances in animals. In practical terms, the first condition requires society to implement comprehensive metal and mineral recycling programs and decrease economic dependence on fossil fuels.

2. *In order for a society to be sustainable, nature's functions and diversity are not systematically subject to increasing concentrations of substances produced by society.*

   In a sustainable society, humans will avoid generating systematic increases in persistent substances such as DDT, PCBs, and Freon. Synthetic organic compounds such as DDT and PCBs can remain in the environment for many years, bioaccumulating in the tissue of organisms, causing profound deleterious effects on predators in the upper levels of the food chain. Freon, and other ozone depleting compounds, may increase risk of cancer due to added ultraviolet radiation in the troposphere. Society needs to find ways to reduce economic dependence on persistent human-made substances.

[4] The Natural Step – U.S. website - www.naturalstep.org

3. *In order for a society to be sustainable, nature's functions and diversity are not systematically impoverished by over-harvesting or other forms of ecosystem manipulation.*

   In a sustainable society, humans will avoid taking more from the biosphere than can be replenished by natural systems. In addition, people will avoid systematically encroaching upon nature by destroying the habitat of other species. Biodiversity, which includes the great variety of animals and plants found in nature, provides the foundation for ecosystem services which are necessary to sustain life on this planet. Society's health and prosperity depend on the enduring capacity of nature to renew itself and rebuild waste into resources.

4. *In a sustainable society resources are used fairly and efficiently in order to meet basic human needs globally.*

   Meeting the fourth system condition is a way to avoid violating the first three system conditions for sustainability. Considering the human enterprise as a whole, society needs to be efficient with regard to resource use and waste generation in order to be sustainable. If one billion people lack adequate nutrition while another billion have more than they need, there is a lack of balance with regard to meeting basic human needs. Achieving greater fairness is essential for social stability and the cooperation needed for making large-scale changes within the framework laid out by the first three conditions.

   To achieve this fourth condition, humanity must strive to improve technical and organizational efficiency around the world, and to live using fewer resources, especially in affluent areas. System condition number four implies an improved means of addressing human population growth. If the total resource throughput of the global human population continues to increase, it will be increasingly difficult to meet basic human needs as human-driven processes intended to fulfill human needs and wants are systematically degrading the collective capacity of the earth's ecosystems to meet these demands.

Since the articulation of The Natural Step in 1989, hundreds of companies and municipalities have used The Natural Step framework as tool in guiding their efforts toward sustainability. The concept has particularly taken root in Oregon. Active users include companies such as Nike, Ashforth Pacific, Collins Pine, Norm Thompson, Progressive Investment, and Rejuvenation and governmental entities such as the City of Portland, Metro, Multnomah County, Oregon DEQ and Tri-Met.

One of the reasons The Natural Step framework has become so popular is that it not only provides a path toward full sustainability but also suggests strategies as to how this can be done in ways that allow a business to be continuously profitable. Some business people, in fact, find the science underlying TNS so compelling, they can see the inevitability of how society must change and realize that if they change their organization first they will have a competitive advantage.

Consequently, with this much local support for The Natural Step, it was felt reasonable to explore using this sustainability framework as a basis for future enhancement of the Automotive Service Eco-Logical Business Program.

Project Process

Project Premise & Objectives

The intention of this project was to go beyond pollution prevention by encouraging automotive shops to head in the direction of sustainability based on the four system conditions of The Natural Step. The idea was to give these shops an idea of what the "end game" would be regarding environmental practices and to do this in a way that also showed them how they could be continuously profitable.

An important component of using The Natural Step is a process called "backcasting". Backcasting is the opposite of forecasting. Instead of using current trends to forecast the future, backcasting allows one to step forward in time and imagine the kind of future that is desired. With this view in mind one then "backcasts" from there to the current situation. With The Natural Step the process involves imagining what a fully sustainable future would look like for an organization whose practices met the four TNS system conditions.

The thinking behind this project then was to create a vision of sustainability for Oregon automotive service shops. The specific objectives were:

1. Teach volunteer auto services shops how to use The Natural Step backcasting process to identify ways to reduce and prevent air, water, hazardous and solid waste pollution and move towards environmental sustainability.
2. Help volunteer businesses draft and implement work practice plans with realistic and achievable short-term and long-term goals based on a vision of moving beyond pollution prevention (P2) without compromising quality and profitability.
3. Establish a mentorship program to assist other automotive businesses in reducing their environmental footprint and to enable them to also move towards environmental sustainability.

Project Organization

The organizers of this project included Oregon Department of Environmental Quality (DEQ), the Oregon Chapter of the Automotive Service Association (ASA), and Pacific Automotive Trades Association (PATA).

The proposed process was:

1. To select pilot automotive service businesses who are interested in incorporating TNS into their business strategy, starting with trade association members.

2. To assist pilot businesses in the definition of a sustainable automotive service business by using a backcasting strategic planning approach.

3. To assist pilot businesses in the development of a plan for the integration of sustainable business practices into their businesses.

Process Implementation
A meeting was held in Salem on September 27, 2000 to present both the Automotive Eco-Logical Business Program to prospective Salem auto shops and to gauge interest in auto shops that might want to participate in this project. A follow up meeting was held in the ASA offices in Wilsonville to explain more fully what The Natural Step is and to develop a final list of auto shop participants. From that meeting the owners of fifteen automotive service shops and suppliers in Portland and Salem were invited to participate in a series of six two-hour meetings where the group would go through a backcasting process with the intention of defining what a fully sustainable automotive services business would look like based on the four system conditions of The Natural Step. The list of shops is shown in Exhibit I.

The group meetings were intended to take the participants through a backcasting process that involved:

- creating a process flow diagram of the operations within an auto repair or body shop,
- analyzing those processes for sustainability violations based on the four principles of The Natural Step,
- envisaging how the processes and system could be redesigned to eliminate those violations, and
- developing strategies that could be used to guide an organization from its present unsustainable state toward one that aligned with The Natural Step system conditions.

To accomplish this task, six meetings were scheduled as follows:

	Meeting - Task	Dates
#1	Develop process flowchart of auto repair business	11/15/00
#2	Analyze for system condition violations	11/29/00
#3	Finish system condition violations, begin system redesign to eliminate violations	12/13/00
#4	Finish system redesign to achieve sustainability	1/03/01
#5	Develop an implementation timeline	1/17/01
#6	Brainstorm potential actions to initiate the process	1/30/01

Project Meetings

Automotive process flow chart
At the first meeting the group developed process flows separately for an auto repair shop and for an auto body shop. These flows are shown in Exhibits II-1 and II-2. Next the group analyzed each process against the four system conditions of The Natural Step placing labels by the items in violation with a number 1 to 4 based on the principle that was being violated. This analysis is shown in Exhibits III-1 and III-2 respectively. The shaded areas in the last two exhibits highlighted the processes the group felt they had the greatest leverage in correcting.

A summary of the types of violations occurring in both auto service operations is shown in Exhibit IV.

With these violations in mind, the next step in the backcasting process was to visualize a future where none of these violations were occurring. The group was also instructed to create this vision without regard to the cost, timing or technology required. The intention was to create a vision of a fully sustainable automotive services operation unfettered by constraints.

Sustainable Automobile
It became clear rather quickly that a vision of sustainability was highly dependent on the way automobiles are designed and supported by the automobile industry. Consequently, the group began its visualization process by defining what a fully sustainable automobile might look like as it arrives at their shop.

Considerable work has already been done in this area by Amory Lovins and the Rocky Mountain Institute around a concept Amory calls a "HyperCar$_{sm}$". The group reviewed this work (See Exhibit V) and developed a summary of the key attributes of what a "sustainable" automobile might look like that has arrived at their shop for repair. This summary is shown in Exhibit VI.

Although it might seem presumptive to assume such a "sustainable" automobile could ever exist, the group felt it was important to isolate the sustainability issues that were outside their control so that they could focus on the part of their operations that they could reasonably influence.

Aspects and Impacts Analysis
With this vision of a "sustainable" automobile in mind, the group developed an aspects analysis of what happens within their shop based on the process work flows shown in Exhibits II-1 and II-2. Using this aspects table a rating system (See Exhibit VII - Natural Step Sustainability Scoring System) was used to score each part of the process as to the degree of violation of the four TNS system conditions. This resulted in an "impacts" analysis that showed not only where the environment was being impacted but also how relatively severe each impact was. The intention of this process was to know later where future improvements to shop practices could be concentrated. Although there is considerable overlap between auto mechanical repair shops and auto collision shops, the group felt the differences were significant enough to justify a separate aspect and impacts analysis for each. The two analyses are respectively shown in Exhibit VIII-1 and VIII -2.

Development of Sustainability Strategies

Vision of a Sustainable Automotive Services Shop
Now with an understanding of what portions of their business have the greatest environmental impact and which of these impacts fall in areas that are subject to their control, the participants began to create a long term vision of how each of these impacts would look if they were aligned with the four principles of the Natural Step.

In developing sustainability goals for each impact, it became clear that certain strategies began to emerge in the areas of waste, materials and energy. Each of these areas was discussed in some length. The key decisions and their rationale is noted below.

WASTE

All enterprises develop waste. The current strategy is to reduce it where possible and then send the rest to a landfill. The science underlying sustainability shows that this thinking is ultimately flawed and that eventually all waste must be utilized.

The basis for this conclusion starts with the recognition that the earth is a closed system so far as matter is concerned. This means that sending waste to a landfill is not getting rid of it only putting it some place else. A vision of sustainability requires that ultimately all waste must find a use or value within the economic system, or as architect and designer, William McDonough says, "Waste from one process must become food for another."[5] This suggests a strategy of *zero waste*, a strategy that requires circular thinking instead of linear, a strategy where all waste is returned to the social and economic system through either reuse, recycling or composting. A zero waste strategy meets the efficiency portion of the 4th system condition of The Natural Step.

MATERIALS

System condition #1 states that it is not sustainable to extract things from the earth's crust faster than nature can re-assimilate and recreate them. Since it took nature millions of years to create fossil fuels, metals and other minerals, it is not sustainable to continue to depend on materials that are created from virgin material extracted from the earth's crust. This suggests that materials used in the construction and maintenance of automobiles must ultimately come from fully recycled or renewable sources. This ultimately means that fossil fuels need to be eliminated as a component of material composition such as in plastics and lubricants.

System condition #2 states that it is not sustainable to continue to develop synthetic materials faster than nature can break them down. This means phasing out and ultimately eliminating from automobile usage synthetic substances that were designed to be persistent, items such as CFC, PVC and other "stable" gasses and plastics.

System condition #3 recognizes that the services of nature, through the creation of green cells, plants and other living systems, are the basis for cleansing and restoring order to the environment. Consequently it is vital not to use materials that are toxic or threaten the quality of water, air and other support systems required to maintain healthy, living infrastructure. This suggests the elimination of all toxic substances such as heavy metals (mercury, cadmium, lead, etc.) that are life threatening or other substances such as MTBE (methyl tertiary butyl ether) that can damage life support systems such as clean water.

ENERGY

Current energy usage is heavily dependent on fossil fuels, a violation of system condition #1. A vision of sustainability suggests that all energy eventually needs to come from renewable sources such as solar, wind, water, etc. Even these sources need to be utilized in a way that does not violate any of the four system conditions. This means, as an example, that the use of hydropower needs to be fish friendly, wind needs to be bird friendly or photovoltaic cells should not use toxic, heavy metals in their manufacture.

[5] See William McDonough speeches and other writings at http://www.mcdonough.com/

System condition #4 also suggests that the use of energy cannot be unlimited, that there should be an energy budget that meets the "fairness" requirement of this system condition. A recent backcasting exercise done by members of the building and construction industry concluded that this condition could be met if the amount of energy consumed does not exceed the amount of solar energy falling on a business or residential site. [6] Their reasoning was that if each organization did this there would be a comparable amount of energy available for all to use. It is similar to the concept of an "eco-logical footprint" proposed by author, Mathis Wackernagel.[7]

Sustainability Vision and Implementation Timeline

The next step the group undertook was to apply the above sustainability strategies to each of the aspects listed in the tables shown in Exhibit VIII to create a statement or "vision" of how that item might look if it were managed in a fully sustainable manner. An example is to consider the first aspect listed "Components - Metal". This refers to the metal parts that are used in the construction of an automobile. If these components were used in a manner consistent with the four system conditions of The Natural Step, they would never be thrown away; i.e., sent to a landfill. Nor would they be sourced from virgin ore extracted from the earth's crust. A sustainable strategy would say that a circular, closed loop system needs to be created in which all metals are either reused or recycled to be used again.

If this is the ultimate "vision" or goal for this aspect of running an automotive services shop, what steps might one take now to begin moving in that direction? One example could be to begin surveying automotive parts vendors on the percentage of recycled metals they are now using. Another might be to initiate a program to begin using more rebuilt parts. Each of these actions are the initial steps one might undertake to begin moving toward a vision of sustainability.

The group undertook a process like this for each listed aspect by first defining a vision of sustainability and then developing a list of initial activities that might be conducted to begin moving shop operations from its current state toward one of full sustainability. The result of this work was used to prepare "Sustainability Implementation Plans" for both auto mechanical repair shops and for auto collision repair shops.

For purposes of this exercise the target for sustainability was arbitrarily placed at the year 2020 while the implementation activities only looked at the first two years of the process. The idea, though, was that by filling in the other timelines this matrix could be used as a management tool to guide an automotive service operation toward sustainability. This time line matrix is shown in Exhibit IX. The table in Exhibit IX-1 was developed for auto mechanical repair shops while table in Exhibit IX-2 was developed for auto collision repair shops.

Possible Implementation Actions

At this point in the process the group had now created a vision of what a fully sustainable automotive repair and automotive body shop might look like if it met the four system conditions

[6] See " Using The Natural Step As A Framework Toward The Construction and Operation of Fully Sustainable Buildings" by contacting Oregon Natural Step Network at www.ortns.org

[7] See "Ecological Footprints of Nations" at http://www.ecouncil.ac.cr/rio/focus/report/english/footprint/

of The Natural Step. The group had also created an implementation timeline and had identified initial actions that could be taken to move toward this vision of sustainability.

The last question the group tackled is what could be done by the various stakeholders in this process - *themselves, other shops, trade associations, suppliers, government, etc.* - to begin to turn this vision in to a reality. The group brainstormed answers to this question and the summary of their thinking is shown in Exhibit X. It became clear that the ability of an individual shop to influence the supply chair for parts and materials is somewhat limited. However, by consolidating the demands of a number of shops through trade associations and, potentially, the Eco-Logical Business Program, there is a much greater opportunity to influence suppliers. For instance, a sizeable coalition of shops from Oregon interested in sending their used oil to refiners and buying re-refined oil products could positively affect the availability and price of these products and services.

One example was to seek stronger incentives for auto shops to participate in the Eco-Logical Business (ELB) program such as tax credits or business preference from government agencies or trade associations such as AAA of Oregon. Other suggestions included working with parts vendors on recycling or product "take-back" programs.

Conclusions

The goal of this project was to go beyond pollution prevention to create a vision of full environmental sustainability based on the principles of The Natural Step. The Natural Step framework is non-prescriptive. It provides a compass that can guide an organization toward sustainability but it does not proscribe how to get there. Each organization is free to decide that on their own. The only condition is that their solution not violate the four system conditions of The Natural Step.

The work done by this group of automotive service people provides one example of how it could be done. The tables in Exhibit E specifically list the significant environmental aspects of an automotive service business, provides a vision of sustainability for each based on The Natural Step system conditions, and offers suggested actions that could be taken now as means of working toward that vision.

One criticism leveled by businesses toward government environmental regulations is that they frequently change and that there seems to be no end in sight. Businesses may dislike regulations but they dislike changing regulations even more. This project offers a view of what the "end game" can be regarding environmental regulation of automotive service shops. For the enlightened business owner this gives them a glimpse into the future. It gives them an opportunity to make capital equipment decisions on the basis of how well they lead toward this vision of sustainability. It gives owners an opportunity to assess the environmental claims made by their suppliers and know if those claims support a strategy toward sustainability or possibly lead to a dead end. In fact for those owners who aggressively pursue this vision, it gives them a competitive advantage. It gives them an opportunity to make investments and to secure market position earlier than their competitors.

For public sector personnel, this project offers guidance on environmental policy and regulation. It provides a framework for knowing if current actions are leading toward full sustainability or

not. It can offer a basis for common dialogue between government and business that can lead to resolution of issues quicker and with less contention. This has certainly been true in Europe where public and private sector people spend more time finding solutions to environmental problems instead of debating the underlying causes. A similar benefit can be found in using this tool to enhance programs such as DEQ's Green Permits Program. Having a vision of sustainability can allow both DEQ and a Green Permit applicant to know how far they need to go with their environmental efforts.

Next Steps

There are a variety of next steps that DEQ and the automotive service industry could next take. Many were suggested by the participants and listed in Exhibit X. From this list and others there are a few follow-up actions that come to mind.

1. Complete the Sustainability Implementation Plan in Exhibits IX-1 and IX-2 and use it as a guide toward enhancing the current Eco-Logical Business Automotive Services program. Explore the possibility of various levels of certification such as Bronze, Silver and Gold levels that recognize those businesses that are particularly proactive.
2. Review this project with policy level personnel in all branches of government to offer them an opportunity to create programs that anticipate environmental impacts before they happen. The growing concern over global warming will only cause greater pressure to reduce society's dependence on fossil fuel. This suggests that pressures on the automotive industry to move toward sustainability will only get more intense. Instead of waiting for a crisis to happen, policy makers can use this view of sustainability to proactively avoid them.
3. Most aspects of this sustainability vision will require unprecedented cooperation between government and business organizations. One area where this could begin is in the development of pilot product "take-back" programs. The European Union and automotive industry have already developed agreement on how such programs will occur in Europe. It could be useful to begin exploring how such closed loop material flow systems might work in this country. A similar effort in the carpet industry led by states in the Midwest has resulted in the creation of a voluntary carpet take-back program by leading carpet manufacturers. Oregon might want to explore spearheading a similar effort in portions of the automotive industry.

In conclusion, Oregon has an opportunity to show leadership in an area that has significant environmental impact - the automotive industry. Although Oregon's size and economic impact is relatively small, its reputation for environmental leadership is strong enough that Oregon's influence can be significant. What is most telling from this project is that there is enthusiastic support to move toward environmental sustainability by a number of leading automotive service organizations and trade groups. This offers Oregon a unique opportunity to move forward in this area, an opportunity that should not be missed.

Exhibit I - List of Participating Automotive Service Operations

Participant	Organization	City	State
Bob Anderson	AJ's Auto Repair	Salem	OR
James Monsey	Carquest Auto Parts	Salem	OR
Brad Roseler	Dave Power Automotive and Marine	Salem	OR
Kurt Garbe	Esquire Motors, Inc	Portland	OR
Jim Houser	Hawthorne Auto Clinic	Portland	OR
Brant Ward	Inland Technology Inc.	Tacoma	WA
Frances Hartwell	Kadel's Salem Auto Body	Salem	OR
Ken Lovegrove	Lovegrove Collision Centre	Salem	OR
Bill Filley/Ryan Hancock	Meade & Greenlee Auto Service	Salem	OR
Jack Crawford	Oregon Commercial Heating	Wilsonville	OR
Ray Thompson	Oregon Commercial Heating	Molalla	OR
Michael Burton	Salem Keizer School Dist	Salem	OR
Lorolei Brown/Steve Morehead/Bob Brown	Steve Morehead's Auto Repair	Salem	OR
Jerry Vollmer	Today's Automotive Services	Salem	OR
Dane Tepper	Valley Specialists	Salem	OR

Exhibit II-1 - Process flows for Auto Mechanical Repair Shop

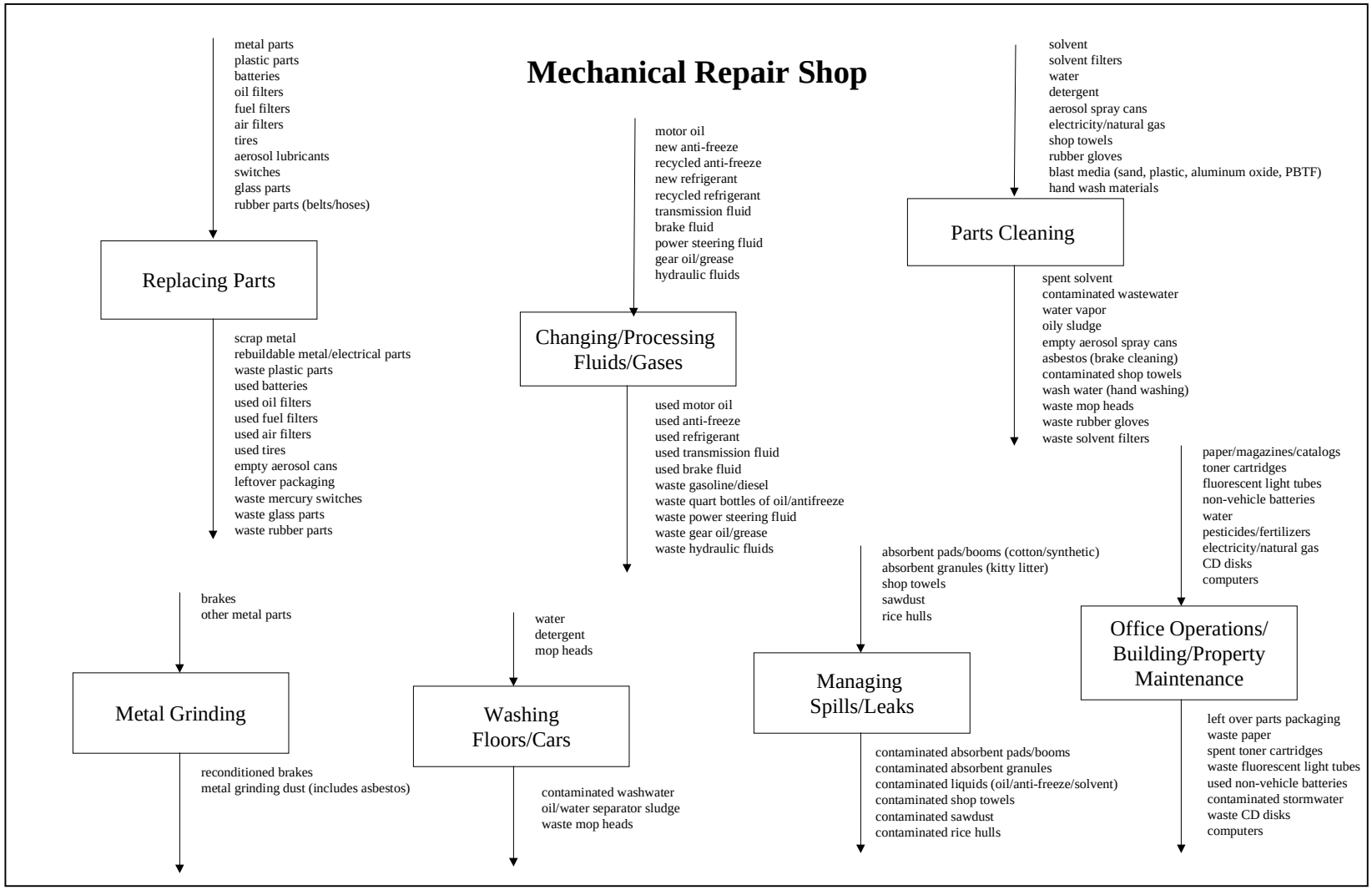


Exhibit II-2 - Process flows for Auto Collision Repair Shop

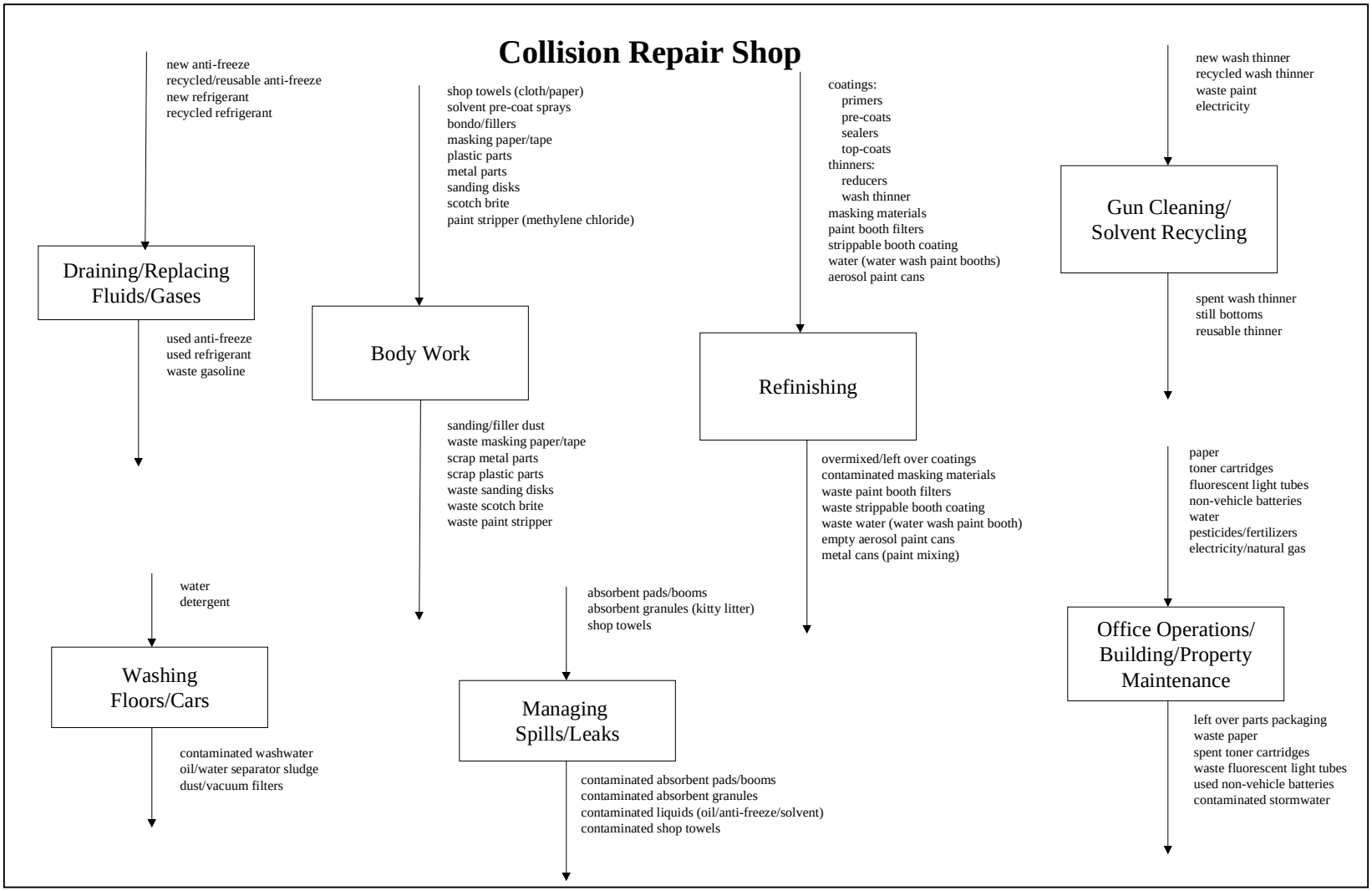


Exhibit III -1 - Auto Mechanical Repair Shop Process Flows with TNS Violations

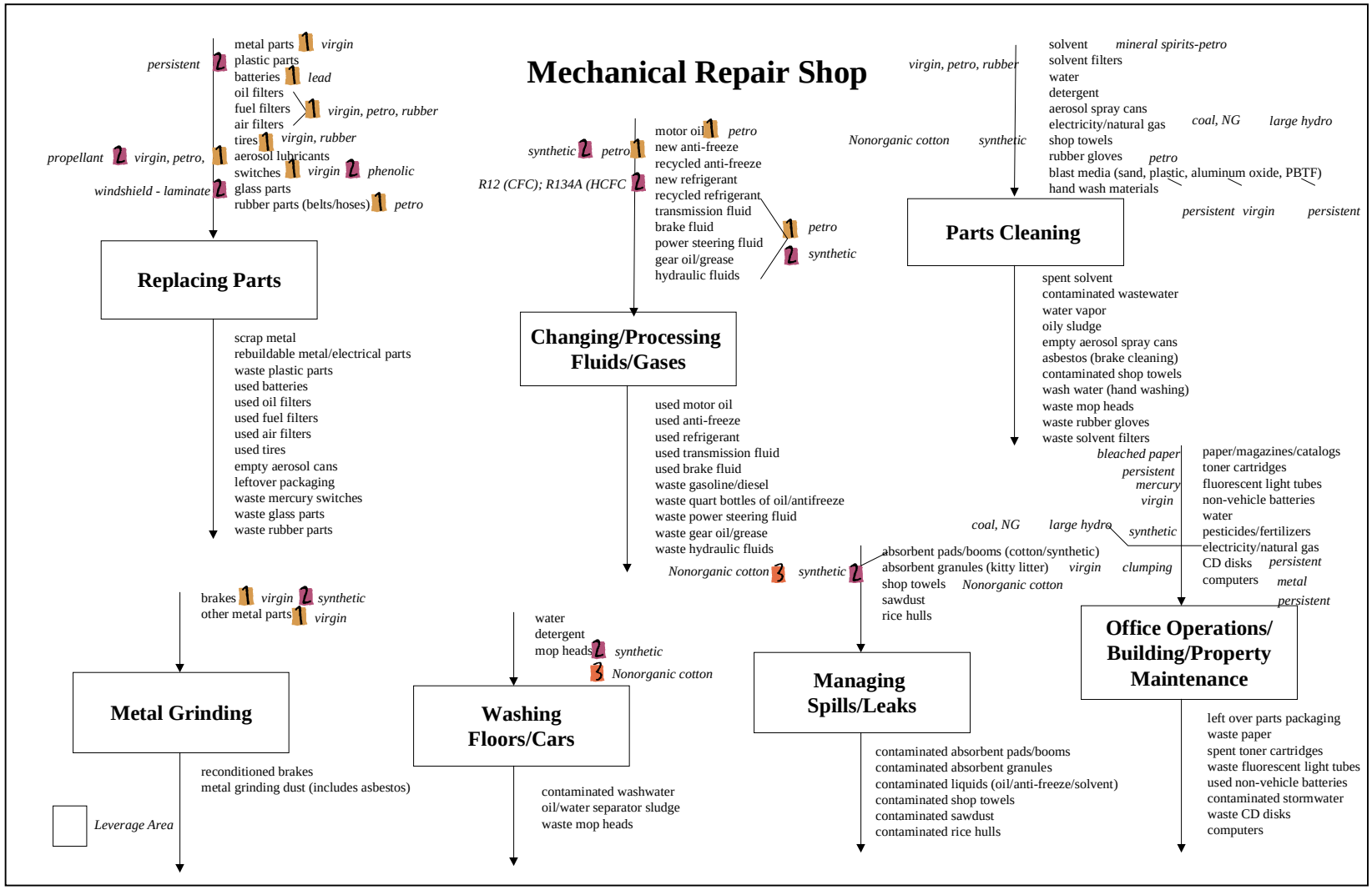


Exhibit III -2 - Auto Collision Repair Shop Process Flows with TNS Violations

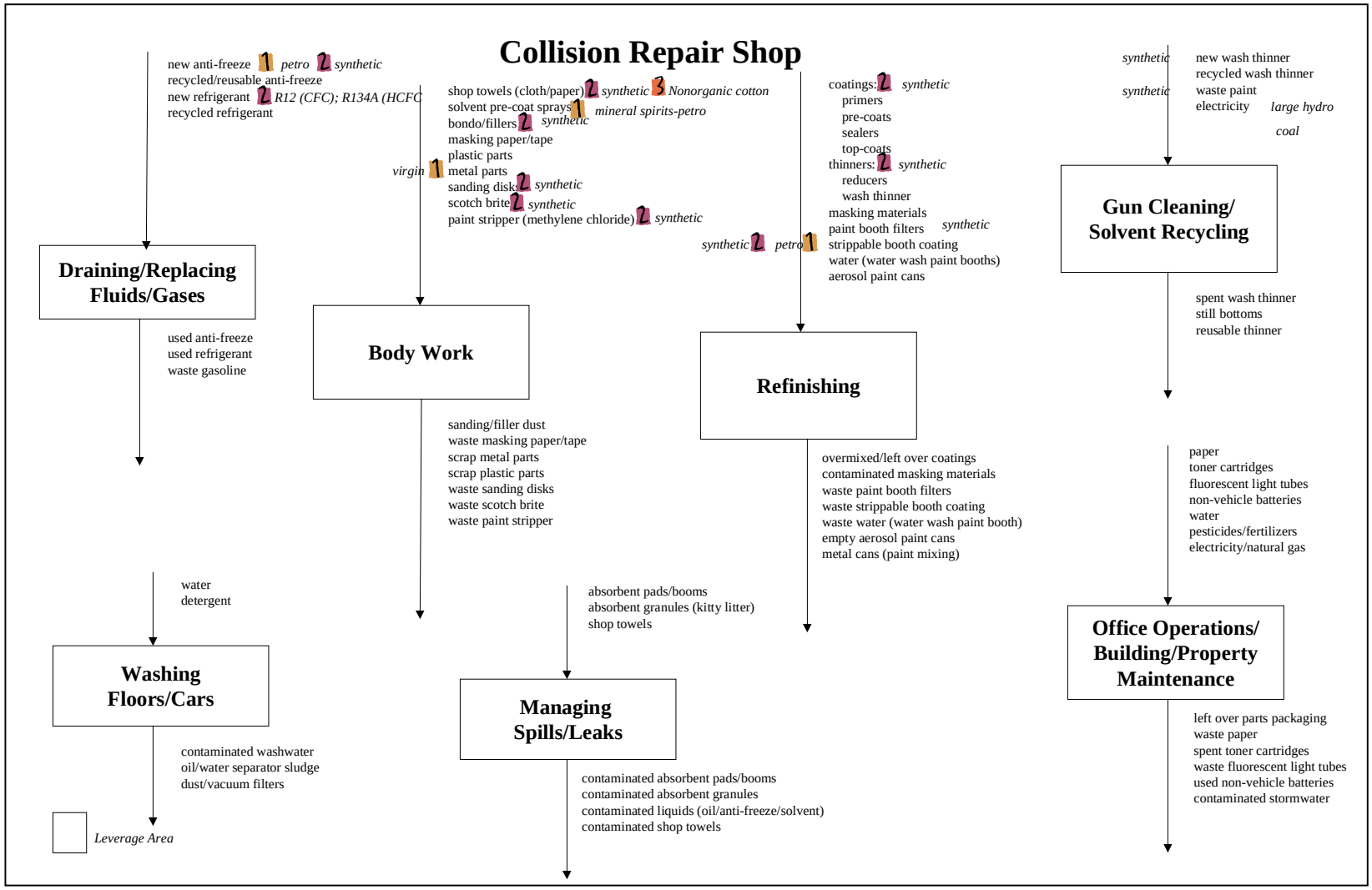


Exhibit IV- Summary of Auto Shop System Condition Violations

			TNS System Condition			
Area	**Item**	**Violation examples**	**1**	**2**	**3**	**4**
Materials	*Parts - metal*	Use of less abundant, virgin mined metals & minerals	X		X	
		Use of heavy metals (mercury, lead, cadmium)	X			
	Parts - plastic	Use of persistent, synthetic, petroleum-based materials	X	X		
	Consumables	Use of petroleum based products (solvents, oils, paints, rubber gloves)	X	X		
	Packaging	Use of virgin mined metals (cans)	X		X	X
		Use of persistent, synthetic, petroleum-based plastic	X	X		X
		Use of cardboard & paper from non-sustainably harvested forests			X	X
	Office equipment	Use of electronic equipment with virgin and heavy metals, petro-based persistent plastics (PVC),	X	X	X	X
	Office supplies	Use of bleached paper, plastic diskettes/CD-ROMs, etc.		X	X	X
	Solid Waste	Landfill disposal of parts, consumables and packaging that mixes toxins, persistent synthetics and compostable materials			X	X
Fluids	*Lubricants*	Petroleum based (oil, transmission, hydraulic, brake)	X		X	
	Cleaning agents	Use of persistent, synthetic solvents		X		
	Liquid Waste	Disposal in rivers and ground of liquids containing petro-based and persistent synthetic substances	X	X	X	X
Gases	*Coolants*	Use of persistent, synthetic materials (CFC, HCFC)		X		
	Propellants	Use of persistent, synthetic materials (aerosol sprays)		X	X	
	Waste	Toxic, global warming (auto exhaust)			X	
Energy	*Sources*	Non renewable (Coal, gas, nuclear, diesel)	X			
		Large scale hydro			X	
	Usage	Inefficient building, machines, lighting				X

Exhibit V - Hypercar Design and Technology

A New Perspective on Automobile Design—Whole-System Design

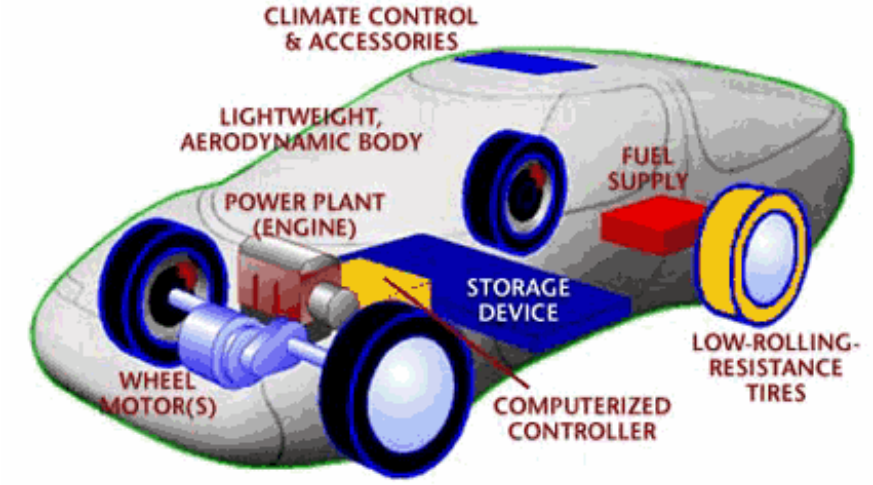
Cars are complicated, so automotive engineers and designers have to specialize. Their job is to make a given component or subsystem the best it can be. This is how the modern automobile has evolved, through an incremental process of small improvements, without much fundamental change to the overall concept.

The trouble is, optimizing parts individually often ends up "pessimizing" the whole: integration and synergy are lost; complexity, oversizing, and inefficiency result. What's lacking is a sense of the big picture, the whole system.

Whole-system design means optimizing not just parts but the entire system—in this case the complete car, although for an extra challenge one could try to optimize the automotive industry and refueling infrastructure at the same time, as the HypercarSM concept begins to do. Naturally, this is more difficult at first. It takes ingenuity, intuition, and teamwork. Everything must be considered simultaneously and analyzed to reveal mutually advantageous interactions (synergies) as well as undesirable ones.

The HypercarSM concept is a case in point. Its defining features are ultralight construction, low-drag design, hybrid-electric drive, and minimized accessory loads. Individually, none of these is economically or technically very worth doing; artfully integrated, though, they produce a whole system that's more efficient, works better, is cheaper to run, and may even be cheaper to make.

The benefits of whole-system design aren't always apparent at the outset, because they often emerge from unexpected interactions within the system. For example, ultralight materials are very expensive per pound. On a part-by-part basis, they're often impractical to use (which is why they haven't yet caught on with automakers). Yet by using them instead of steel in the whole body and chassis, system-wide benefits (such as parts consolidation, assembly simplification, and cheaper tooling) can offset the increased material costs.



Moreover, advanced-composite material can make the car light enough to make hybrid-electric drive more affordable, because the drivesystem can be that much less powerful and therefore smaller while providing good performance. That in turn makes the whole vehicle lighter, which in turn allows other components be made still lighter or even be eliminated, and so on (this concept is known as mass decompounding).

This sort of downsizing and elimination of components in a HypercarSM vehicle can further offset the increased materials and design costs, if they aren't already offset by manufacturing savings. So in part-by-part isolation the ultralight materials aren't economic, but as part of a whole-system redesign they are.

Exhibit VI - Sustainable Automobile

Materials

- All materials are non-persistent, non-toxic and procured from reused, recycled, renewable or abundant (in nature) sources.
  - Examples: recycled metals, biodegradable plastics - made from corn starch grown through certified sustainable agricultural practices
- Where possible, materials used are lightweight, durable, and easily interchangeable
- All solid waste becomes feedstock for some other process through repair and reuse, recycling or composting.

Propulsion System

- Powered by non-polluting, renewal energy source
- Design considerations:
  - Electric power can be non-polluting
  - Hydrogen used in fuel cells can be a renewal energy source
  - Efficiency can be achieved through high energy to weigh ratio, non-excessive horsepower and regenerative braking
  - Electrical energy storage, such as batteries, use non-toxic, recyclable or renewable materials.

Consumables (e.g. tires, belts, fluids)

- All consumables are non-persistent, non-toxic and procured from reused, recycled, renewable or abundant (in nature) sources.
- All consumable waste becomes feedstock for some other process through repair and reuse, recycling or composting.
- Design considerations:
  - Tires
    - Natural rubber is a renewable resource
    - Favor tires that will last longer through the design of cars that are much lighter and material that can be retreaded
    - Consider innovative solutions such as hovercraft that eliminate need for tires
  - Fluids
    - Consider water or vegetable oils
  - Gases
    - Favor naturally occurring, abundant and inert gases (helium?)
    - Consider innovative solutions that eliminate or substantially reduce need for gases. Example: water evaporation air conditioning system

Performance

For marketing reasons, it is highly desirable (although not necessary for sustainability reasons) that the automobile offers comparable performance, comfort and safety as today's automobiles do. This includes such things as:

- speed
- acceleration
- load carrying capacity
- travel distance between refills
- comfort
- safety

Product Lifecycle

A sustainable automobile needs to be produced and reproduced using a circular lifecycle process.

- automobiles must be easily disassembled
- designed with easily replaceable parts
- made from uniform materials (standardized) that can be rebuilt/reused, recycled or composted
- maintainable through periodic testing and parts replacement

Exhibit VII - Natural Step Sustainability Scoring System

***The Natural Step* Four System Conditions**	
	In order for society to be sustainable, nature's functions and diversity are not systematically:
Extraction	**1) ...subject to increasing concentrations of substances extracted from the Earth's crust;**
Persistency & Toxicity	**2) ...subject to increasing concentrations of substances produced by society; or**
Biodiversity	**3) ...impoverished by overharvesting or other forms of ecosystem manipulation.**
Efficiency & Social Equity	**4) And, resources are used fairly and efficiently in order to meet basic human needs worldwide.**
Frequency of Activity	**What is the frequency of the activity during an average work day?**
Degree of Influence	**How much influence does auto repair shop have in changing this aspect?**

Points	Extraction	Persistency	Toxicity	Biodiversity	Efficiency	Frequency	Influence
1	100% Recycled	Biodegrade < 1 day	Base Mat'l Non-Toxic	Sustainably Harvested Ecosystem Complex	Local Source Small % Landfilled High energy efficiency	Rarely	Very little
2							
3	Mixed	Biodegrade <= 1 month	Moderately Toxic	Mixed	Mixed	Occasionally	Some
4							
5	Mined	Biodegrade > 1 month	Acutely Toxic	Nature is consumed Ecosystem Simplified	Distant Source High % Landfilled Low Energy Efficiency	Continuously	Substantial

Exhibit VIII - 1 - Aspects Analysis for Auto Mechanical Repair Shop

	"The Natural Step" System Conditions						TNS	Frequency	Degree of	Aspect
	Extraction	Persistency	Toxicity	Biodiversity	Efficiency	Equity	Subtotal	of Activity	Influence	Score
MATERIALS										
Components - Metal	4	5	3	2	3		17	5	4	**26**
Components - Plastic	4	5	4	2	5		20	2	1	**23**
Components - Glass	3	5	2	2	4		16	1	1	**18**
Components - Rubber	4	4	3	2	4		13	5	1	**19**
Filters	3	4	3	3	3		13	5	1	**19**
Batteries	4	5	4	2	2		17	5	1	**23**
Electrical components	4	5	4	2	4		15	5	1	**21**
PROCESSES										
Remachine parts	4	4	3	2	2		13	5	3	**21**
Clean parts (solvent)	4	4	3	2	3		13	5	5	**23**
Clean parts (non-solvent)	2	2	2	3	3		9	5	5	**19**
Clean shop	2	2	2	3	3		9	5	5	**19**
FLUIDS & GASES										
Motor oil	4	5	3	2	3		14	5	2	**21**
Transmission/brake fluid	4	5	3	2	3		14	5	2	**21**
Hydraulic fluid	4	5	3	2	3		14	5	2	**21**
Anti-freeze	2	2	3	3	2		10	5	2	**17**
Refrigerant	3	5	3	2	2		13	5	3	**21**
CONSUMABLES										
Solvents/Thinner	4	4	3	2	3		13	4	4	**21**
Detergent	2	2	2	2	4		8	3	4	**15**
Absorbents	3	3	2	3	4		11	1	3	**15**
Towels	2	2	1	3	1		8	5	4	**17**
Uniforms	2	3	1	3	1		9	5	4	**18**
Gloves	4	4	3	2	5		13	5	2	**20**
PACKAGING										
Metal	4	5	3	2	3		17	4	4	**25**
Plastic	4	5	4	2	5		20	1	4	**25**
Paper/Cardboard	2	2	2	5	2		11	5	4	**20**
Wood	1	1	1	5	3		8	1	4	**13**

FACILITIES									
Storm Water Drainage	1	2	2	4	3	12	5	3	**20**
General Energy Use	4	3	2	5	3	17	5	3	**25**
Landscaping	2	3	3	3	3	11	1	5	**17**
OFFICE OPERATIONS									
Computer	5	5	4	2	4	16	5	2	**23**
CD Disks	4	5	4	2	5	15	5	1	**21**
Toner cartridges	4	5	4	2	2	15	5	3	**23**
Copier	3	5	3	2	4	13	5	3	**21**
Paper	2	2	3	5	2	12	5	4	**21**
Fluorescent lighting	5	5	5	2	3	17	5	4	**26**
EMPLOYEES/CUSTOMERS									
Transportation	5	4	5	2	4	16	5	3	**24**

NOTE: Aspect Score = (TNS Subtotal) + (Frequency of Activity) + (Degree of Influence)

Exhibit VIII - 2 - Aspects Analysis for Auto Collision Repair Shop

	"The Natural Step" System Conditions						TNS	Frequency	Degree of	Aspect
	Extraction	Persistency	Toxicity	Biodiversity	Efficiency	Equity	Subtotal	of Activity	Influence	Score
MATERIALS										
Components - Metal	4	5	3	2	3		17	5	3	**25**
Components - Plastic	4	5	4	2	5		20	5	1	**26**
Components - Glass	3	5	2	2	4		12	5	1	**18**
Components - Rubber	4	4	3	2	4		13	3	2	**18**
Stripper	4	4	4	2	4		14	2	3	**19**
Paint	4	4	5	2	3		15	5	3	**23**
Body Filler	4	3	2	2	3		11	5	3	**19**
Sealers	4	3	3	2	3		12	5	3	**20**
PROCESSES										
Refinish	4	4	5	2	3		15	5	3	**23**
Clean parts (solvent)	4	4	3	2	3		13	5	5	**23**
Clean parts (non-solvent)	2	2	2	3	3		9	5	5	**19**
Clean cars	2	2	2	3	3		9	5	4	**18**
Clean shop	2	2	2	3	3		9	5	5	**19**
CONSUMABLES										
Solvents/Thinner	4	4	4	2	3		14	5	2	**21**
Detergent	2	2	2	2	4		8	5	4	**17**
Absorbents	3	3	2	3	4		11	1	3	**15**
Towels	2	2	1	3	1		8	5	4	**17**
Uniforms	2	3	1	3	1		9	5	4	**18**
Gloves	4	4	3	2	5		13	5	2	**20**
Masking Materials	3	3	2	3	4		11	5	3	**19**
Paint Booth Filters	3	3	2	3	4		11	2	4	**17**
PACKAGING										
Metal	4	5	3	2	3		17	5	4	**26**
Plastic	4	5	4	2	5		20	2	4	**26**
Paper/Cardboard	2	2	2	5	2		11	5	4	**20**
Wood	1	1	1	5	3		8	1	4	**13**

FACILITIES									
Storm Water Drainage	1	2	2	4	3	12	5	3	**20**
General Energy Use	4	3	2	5	3	17	5	3	**25**
Landscaping	2	3	3	3	3	11	1	4	**16**
OFFICE OPERATIONS									
Computer	5	5	4	2	4	16	5	2	**23**
CD Disks	4	5	4	2	5	15	5	1	**21**
Toner cartridges	4	5	4	2	2	15	5	3	**23**
Copier	3	5	3	2	4	13	5	3	**21**
Paper	2	2	3	5	2	12	5	4	**21**
Fluorescent lighting	5	5	5	2	3	17	5	4	**26**
EMPLOYEES/CUSTOMERS									
Transportation	5	4	5	2	4	16	5	1	**22**

NOTE: Aspect Score = (TNS Subtotal) + (Frequency of Activity) + (Degree of Influence)

Exhibit IX -1 - Sustainability Implementation Plan for Auto Repair Shop

		2001	2002	2005	2010	2015	2020
MATERIALS							
	Components - Metal	(1) Survey primary vendors on percentage of recycled metals used, (2) initiate parts recycling program with parts vendors, (3) locate market for rebuilt parts, (4) establish standards for rebuilt parts to ensure quality, (5) research quality rebuilders (labor claim supplier if part fails) and make list available to all shops.	(1) Develop program to extend life of parts through more intensive rework program;(2) start in-house rebuilding; (3) Initiate take back program with vendors.				All metal components are part of a closed loop recycling system.
	Components - Plastic	(1) plastic welder to extend life; 2) in-house rebuilding	Lobby for recycling & take back				Use non toxic, non persistent, biodegradable substitute
	Components - Glass	(1) Separate safety glass from regular glass; (2) Recycle regular glass					
	Components - Rubber	Initially support downcycling	Lobby for recycling & vendor take back				
	Filters	(1) oil bath air filter					1. Metals are in a closed loop recycling system. 2. Plastics are non-toxic, non-persistent, biodegradable. 3. Product is easy to disassemble into recyclable and compostable parts.
	Batteries	(1) 100% recycle, (2) Sell longer life batteries					
	Electrical components	(1) Rebuild rotation devices (starter, alternator); (2) Lobby for vendor take back of other components					

Exhibit IX -1 - Sustainability Implementation Plan for Auto Mechanical Repair Shop (Cont.)

		2001	2002	2005	2010	2015	2020
PROCESSES							
	Remachine parts	Recycle parts that can no longer be remachined					Process output is "zero waste" by either not creating it or finding uses for the waste in some other process.
	Clean parts	(1) hot water parts washer w/shop floor wash water; (2) enzyme cleaners					
	Clean shop	(1) keep shop clean; (2) trays to catch spills; (3) shop rags or damp mop to clean spills (laundered)					
FLUIDS & GASES							
	Motor oil	(1) Consider using used motor oil as a heating source; (2) extend oil change intervals; (3) rerefined motor oil; (4) education program on rerefined oil	(1) Investigate ability to clean, reuse motor oil; (2) Initiate discussions with vendors about renewable options; (3) local refinery; (4) onsite oil recycler				All fluids & gasses come from renewable, certified sustainable sources.
	Transmission/brake fluid						
	Hydraulic fluid						
	Anti-freeze	Process onsite					
	Refrigerant						

Exhibit IX -1 - Sustainability Implementation Plan for Auto Mechanical Repair Shop (Cont.)

		2001	2002	2005	2010	2015	2020
CONSUMABLES							
	Solvents	(1) Reuse, (2) Recycle	Use high flash, low volatility non-petro product				All consumables are made of non-toxic, non-persistent biodegradable material.
	Detergent	(1) Reduce usage with better shop cleaning practices, (2) Use biodegradable, non-caustic, non-toxic material	Use non-aqueous method				
	Absorbents						
	Towels	(1) organic cotton (wrinkles!); (2) in house laundry w/wastewater used in landscape; (3) microbes for laundry					
	Uniforms						
	Gloves	(1) recycle gloves; (2) nitrocellulose gloves (dissolvable); (3) wash latex gloves; (4) barrier cream instead of gloves; (5) take back program	(1) replace fluids so gloves aren't necessary				
PACKAGING							All packaging use is minimized.
	Metal	Use reusable, returnable packaging					Metals are in a closed loop recycling system.
	Plastic	(1) Eliminate where possible, (2) Seal orifices only					Plastics are non-toxic, non-persistent, biodegradable.
	Paper/Cardboard/Wood	Use reusable, returnable packaging that is also biodegradable					Preference is to using recycled material first. Waste is disposed through reuse, recycle or composting.

Exhibit IX -1 - Sustainability Implementation Plan for Auto Mechanical Repair Shop (Cont.)

		2001	2002	2005	2010	2015	2020
FACILITIES							
	Storm Water Drainage	(1) cistern to capture rainwater to use internally (storage and distrubution system)	(1) water network (like power grid), send back to grid during high rain; (2) floating parking lot pumps water back to roof; (3) hydraulic lifts				Eliminate by processing on-site
	General Energy Use	(1) Conduct energy audit; (2) Begin purchasing "green" energy from electric utility; (3) opaque roof; (4) solar water heater; (5) better education about environmental architectural contractors	(1) Create & begin implementation of energy efficiency program; (2) concepts for environmental building design				All energy is derived from renewable sources. Energy budget is equal to or less than solar energy falling on business site.
	Landscaping	(1) use grey water; (2) use rocks instead of plants; (3) use bioswales for treatment	(1) work with City to focus on native plants in beautification strips				Use native vegetation that requires no human maintenance.
OFFICE OPERATIONS							
	Computer, copier, phones & other office equipment.	(1) take back program (IBM, Gateway); (2) lease computers					Product is highly energy efficient and 100% recycled.
	CD Disks	(1) Favor higher density disks; i.e. DVD	Migrate to direct, high speed Internet access				100% reused and/or recycled.
	Toner cartridges	(1) refillable cartridges					
	Paper	(1) Use both sides of paper; (2) use erasable paper					Sourced either from recycled material or certified sustainable forests. Output is 100% recycled and/or composted.
	Lighting	(1) Skylights; (2) solar energy for night time; (3) recycle fluorescent tubes; (4) take back program; (5) low mercury bulbs; (6) use metal halide rather than incandescent; (7) full spectrum light					Favor daylighting, supplemented by recyclable and/or non-toxic, non-persistent biodegradable lighting material.
EMPLOYEES/CUSTOMERS							
	Transportation	(1) bus tickets; (2) electric bicycle; (3) locate shop near mass transit					Business is located with easy accessible to public or other sustainable transportation systems.

Exhibit IX -2 - Sustainability Implementation Plan for Auto Collision Repair Shop

		2001	2002	2005	2010	2015	2020
MATERIALS							
	Components - Metal	(1) Survey primary vendors on percentage of recycled metals used, (2) initiate parts recycling program with parts vendors	Develop program to extend life of parts through more intensive rework program.				All metal components are part of a closed loop recycling system.
	Components - Plastic	(1) plastic welder to extend life; 2) in-house rebuilding	Lobby for recycling & take back				Use non toxic, non persistent, biodegradable material
	Components - Glass	(1) Separate safety glass from regular glass; (2) Recycle regular glass					
	Components - Rubber	Initially support downcycling	Lobby for recycling & vendor take back				
	Paint	Use less through better employee training	Use low temperature, powder coating materials				Eliminate or use non-toxic, non-persistent biodegradable material
	Body filler and sealers	Investigate low VOC (volatile organic compounds)					Use non-toxic, non-persistent biodegradable material
	Stripper	Use less toxic, citrus based materials					

Exhibit IX -2 - Sustainability Implementation Plan for Auto Collision Repair Shop (Cont.)

		2001	2002	2005	2010	2015	2020
PROCESSES							
	Refinish	Use computer to better determine paint mix ratios					Process output is "zero waste" by either not creating it or finding uses for the waste in some other process.
	Clean parts	Repair					
	Clean car	Separate grime from water and recycle both					
	Clean shop						
CONSUMABLES							
	Solvents/Thinner	(1) Reuse, (2) Recycle	Use high flash, low volatility non-petro product				All consumables are made of non-toxic, non-persistent biodegradable material.
	Detergent	(1) Reduce usage with better shop cleaning practices, (2) Use biodegradable, non-caustic, non-toxic material	Use non-aqueous method				
	Absorbents						
	Towels	(1) organic cotton (wrinkles!); (2) in house laundry w/wastewater used in landscape; (3) microbes for laundry					
	Uniforms						
	Gloves	(1) recycle gloves; (2) nitrocellulose gloves (dissolvable); (3) wash latex gloves; (4) barrier cream instead of gloves; (5) take back program	(1) replace fluids so gloves aren't necessary				
	Masking materials	(1) Favor vendors who offer reusable material; (2) investigate sprayable masking coatings					
	Paint booth filters	Use water bath filters where scum can be separated and filters reused					

Exhibit IX -2 - Sustainability Implementation Plan for Auto Collision Repair Shop (Cont.)

		2001	2002	2005	2010	2015	2020
PACKAGING							All packaging use is minimized.
	Metal	Use reusable, returnable packaging					Metals are in a closed loop recycling system.
	Plastic	(1) Eliminate where possible, (2) Seal orifices only					Plastics are non-toxic, non-persistent, biodegradable.
	Paper/Cardboard/Wood	Use reusable, returnable packaging that is also biodegradable					Preference is to using recycled material first. Waste is disposed through reuse, recycle or composting.
FACILITIES							
	Storm Water Drainage	(1) cistern to capture rainwater to use internally (storage and distrubution system)	(1) water network (like power grid), send back to grid during high rain; (2) floating parking lot pumps water back to roof; (3) hydraulic lifts				Eliminate by processing on-site
	General Energy Use	(1) Conduct energy audit; (2) Begin purchasing " green" energy from electric utility; (3) opaque roof; (4) solar water heater; (5) better education about environmental architectural contractors	(1) Create & begin implementation of energy efficiency program; (2) concepts for environmental building design				All energy is derived from renewable sources. Energy budget is equal to or less than solar energy falling on business site.
	Landscaping	(1) use grey water; (2) use rocks instead of plants; (3) use bioswales for treatment	(1) work with City to focus on native plants in beautification strips				Use native vegetation that requires no human maintenance.

Exhibit IX -2 - Sustainability Implementation Plan for Auto Collision Repair Shop (Cont.)

		2001	2002	2005	2010	2015	2020
OFFICE OPERATIONS							
	Computer, copier, phones & other office equipment.	(1) take back program (IBM, Gateway); (2) lease computers					Product is highly energy efficient and 100% recycled.
	CD Disks	(1) Favor higher density disks; i.e. DVD	Migrate to direct, high speed Internet access				100% reused and/or recycled.
	Toner cartridges	(1) refillable cartridges					
	Paper	(1) Use both sides of paper; (2) use erasable paper					Soured either from recycled material or certified sustainable forests. Output is 100% recycled and/or composted.
	Lighting	(1) Skylights; (2) solar energy for night time; (3) recycle fluorescent tubes; (4) take back program; (5) low mercury bulbs; (6) use metal halide rather than incandescent; (7) full spectrum light					Favor daylighting, supplemented by recyclable and/or non-toxic, non-persistent biodegradable lighting material.
EMPLOYEES/CUSTOMERS							
	Transportation	(1) bus tickets; (2) electric bicycle; (3) locate shop near mass transit					Business is located with easy accessible to public or other sustainable transportation systems.

Exhibit X - Possible Implementation Actions

THIS GROUP	OTHER AUTO SHOPS	TRADE ASSOCIATIONS	DEQ/GOVT	OTHER
Capital equipment purchases – anticipate technology change and buy cheaper equipment now	Ask parts vendors to coordinate regular delivery	Lobby for tax credit for ELB certification	Legislation for tax credit for ELB certification	Get AAA to favor ELB shops
Laundry in shop	Use case studies to show savings and other non-tangible benefits	Distribute info and economics in: • National trade magazine • Local trade newsletters • Any publicity • Trade shows • Case studies	Distribute info and economics in: • National pollution prevention magazines • Local newsletters • Any publicity • Trade shows • Case studies	
Rainwater used for landscaping	Senior shops mentor for ELB certification	Educate manufacturers on less packaging and take-back program	Take back legislation for: • Mercury • PVCs (plastic)	
Native plants		Identify incentives: • Cheaper insurance • Workers comp • Liability • Other money savings	Publish final TNS report in trade journals	
Share info with other shops		Favor eco-suppliers	Require state shops to sub work out to ELB shops	
Use lower wattage or compact fluorescent bulbs		Distribute information in ELB toolkit	Revise purchasing procedures to allow for more expensive green products	
Aqueous parts washer		Green corner on newsletter	ELB program statewide	
Aqueous brake cleaner		Help shops market ELB	Public outreach education on ELB/TNS	
Refillable pressurized containers for throttle body			Develop pilot with auto dealer shop (FORD)	
Case studies			Preference ELB dealers when buying new cars	
Seek reduced insurance rates from providers and change providers that do not provide reduction			DEQ backcasting exercise with vendors, machine shops	
Use re-refined oil			Free technical assistance for ELB certification	
Set up tours with local repair tech college classes and invite local reporter			Update ELB certification checklist with additional electives from TNS backcasting	