

Engineering Ethics

Review:

- ❑ Ethical issues come up very often for engineers.
- ❑ They often have serious consequences.
- ❑ They are resolved by practical reasoning.

Every ethical problem involves
a relation of means to goals.

Ethical problems become particularly prominent when they involve a conflict of goals.

Basic goals that often come into conflict for engineers:

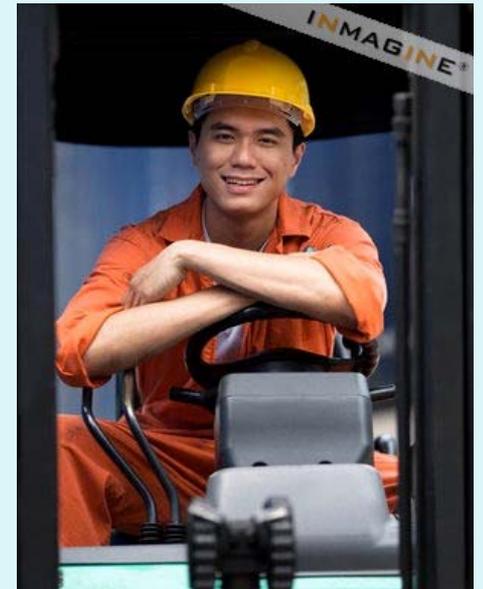
- ◆ A goal to maintain professional **competence**.
- ◆ A goal to be **loyal** to interests of employers and clients.
- ◆ A goal to be **honest** to employers, customers and the public.
- ◆ A goal to be **non-discriminatory** to co-workers and clients regarding their race, color, religion, gender, ethnicity, age or disability.
- ◆ A goal to use your skills and knowledge for the **enhancement** of human welfare and the environment.

So let's consider a case.

To pay for your education, you need to find summer work.



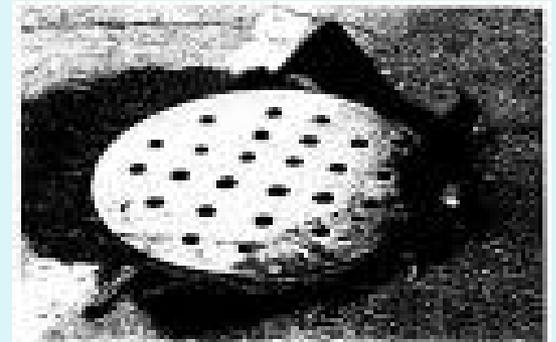
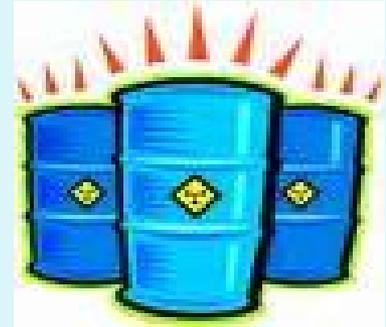
You find a high-paying job as a forklift operator. It helps you to avoid taking out student loans.



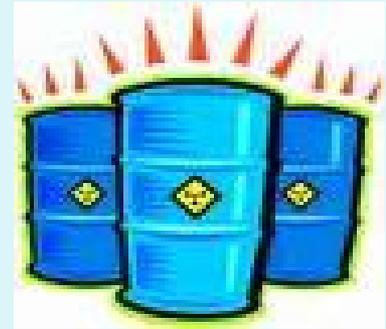
You find yourself staring at a 50-gallon drum filled with used **machine coolant**, wondering what to do.



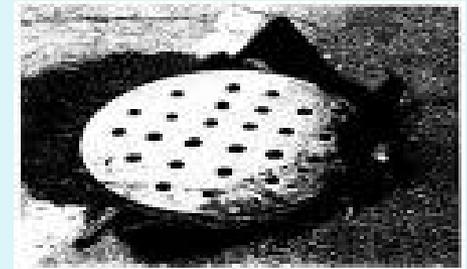
- You know the **coolant is toxic.**
- Your supervisor, **Max**, at Natural Disposal, Inc., tells you to “**Dump half of the coolant down the drain. Then dilute the rest with tap water and pour it out.**”



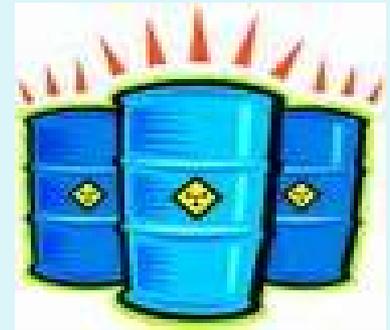
You tell, Max, “The coolant is toxic. It might cause health problems to people who live around here, even birth defects and cancers.”



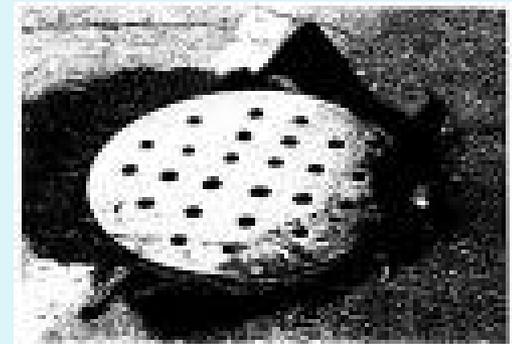
Max says, “The toxic stuff sinks to the bottom of the drum. We’ve been doing this for years and nothing’s happened.”



You tell Max, “You mean no one said anything about it.”



Max says, “You’re aren’t one of those *environmentalists*, are you? It’s time to get real and get on with the job!”¹



Clicker Question

All ethical problems involve a conflict in goals. In the *Fork lifter Case* you would experience a conflict between

- a. your loyalty to Max (your supervisor) as opposed to your professional competence.
- b. your loyalty to Max (your supervisor) as opposed to your duty to not pollute the environment.
- c. Max's professional competence as opposed to Max's honesty to a client.
- d. your professional competence as opposed to Max's professional competence.
- e. your duty not to discriminate as opposed to your professional competence.



Conflicting Goals



Loyalty to Max	Your professional competence.
Loyalty to Max	Your duty to not pollute the environment.
Max's professional competence	Max's honesty to a client.
Your professional competence	Max's professional competence.
Your duty not to discriminate	Your professional competence.

Back to the Forklift Case.

What do you do?

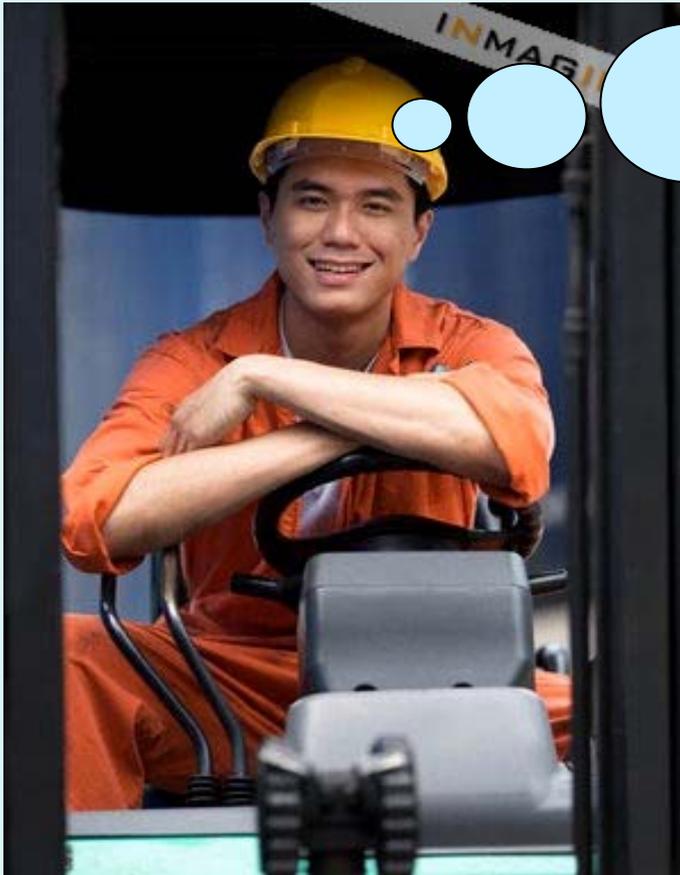
- Do what Max says?

or



- Walk off the job site?





You could say to yourself:

"I'll go along with this jerk for now. I'm out of here in a month anyway, then I'm back to SJSU."

Or maybe you think to yourself:

“Max is just the sort of \$#^&%\$ who’s wrecking the environment. I’m out of here NOW. AND, I’m going to think about reporting Max to the Environmental Protection Agency.”*



This is how we meet most ethical problems, as a choice between two disagreeable alternatives.

In this case, obeying Max or quitting.

They are “**dilemmas**” in the strict sense of the word.

Definition of 'Dilemma':
“a choice between two
equally **unfavorable** or
disagreeable alternatives”.



OR



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Not a pleasant choice

But as pointed out in the first lecture, although sometimes we *are* up against a wall facing a choice between **two undesirable alternatives** and must choose one of them, we usually can find a better solution.

Finding the better solution requires we become **skilled in ethical problem-solving.**

This skill consists in arriving at a **third** alternative that answers **both sides** of the dilemma and resolves the conflict.

In ethical problem solving, we consider *paradigm cases* that would ideally satisfy either side of the goals that bear upon the case.

Next we analyze the features of the *paradigm case*.

Then, by *thinking analogically* about the features of the *paradigm case*, we see if we can develop one that will answer both conflicting goals.

Instead of A or B, find C that combines important features of A and B

So let's apply it to the Forklift Case.

What would **a paradigm case** of disposing of toxic coolants consist in?

1. The removal of toxic substances from the used coolant. The highest toxicities come from the heavy metals **copper**, **lead** and **zinc**.
2. A less toxic substance in engine coolant is *ethylene glycol*. It is treatable at wastewater treatment plants.

So, the 'heavy metal captured' coolant must be disposed of in sewers that connect to wastewater treatment plants and never into surface or storm water collection systems.

You think more about the first feature of the paradigmatic disposal of coolants.

The first feature: “The disposal of engine coolants requires the removal of the heavy metals copper, lead and zinc from the used coolant.”

What if the removal of the copper, lead and zinc would result in recyclable coolant?

- You look more in the recycling of engine coolant.
 - You locate a firm, “**Dawn Recycling Systems**” Inc., that sells a coolant recycling system.
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- The “**Dawn Recycling System**” captures the heavy metal contaminants, copper, zinc and lead, and leaves non-toxic the treated coolant.

 - A “**Dawn Recycling Systems**” manager demonstrates that the system will pay for itself within six to nine months through the sale of recycled ‘tramp oils’, that is, through detoxified engine coolant.

So by considering the paradigm of safe coolant disposal, you've opened up a way to resolve the conflicting goals (*and probably help your own career*).

Here's a possible course of action:

- Inform Max that you've **found a way to detoxify** the 50 gallon drums and to also make money for Natural Disposal Inc.

Ask him to accompany you to discuss the matter with his supervisor at the Natural Disposal Inc. main offices in Hayward , CA.

- There, you explain to Natural Disposal Inc. main management how Natural Disposal Inc. can avoid likely lawsuits coming from toxic dumping, make money on the recycled coolant in the long-run, *and* -- **last but not least** -- **do the ecologically right thing.**



Looking more deeply into the basis of ethical theory



We have assumed that ethics is about finding creative solutions to conflicts between professional goals.

But how can we decide and which goals are worth pursuing, whether professional or personal?

Deciding on the **virtues of goals of life** well-lived have long been a subject in Western philosophy.

In the West, the goals of a good life were mapped out in detail by the philosopher Aristotle (384-322 BC).



In the East, Confucius (551 - 479 BC) proposed a no less influential virtue ethics approach.



Virtue ethics begins with establishing certain truths regarding the human condition.

For example:

Ordinary experience will lead us to feel certain emotions such as fear or anger.

Our subsistence will require satisfying needs for food and shelter.

It is then taken as a given that these emotions and material goods that satisfy human needs may occur either deficiently or excessively.

Not enough  **Too much**



Consider Aristotle's version of this approach

Take the case sensual desire:

Sensuous desire is part of the human condition



The proper middle way:

*Not enjoying
sensuous desires
enough:
Insensitivity
Deficiency.*

Knowing how to control your sensuous desires so you enjoy the desire, but not too much to harm your health. You arrive at the

Virtue of Self-Control

*Enjoying
sensuous desire
too much:
Wantonness
Excess.*

Take the case of fear.

Being afraid sometimes is part of the human condition



The proper middle way:

**Being not fearful
enough:
Recklessness
Deficiency.**

**Knowing how to control your fear
so that it makes you more alert but
does not overwhelm you. Knowing
with whom to overcome fear and in
what way:**

Virtue of Courage

**Being too
fearful:
Cowardice
Excess.**

Some Human Virtues According to Aristotle

Issue	Excess	Middle=Virtue	Deficiency
Fear	Δ ε ι λ ί α	COURAGE	Α π ε ρ ι σ κ ε ψ ί α
Pleasure of touch & taste	Α σ έ λ γ ε ι α	SELF - RESTRAINT	Α ν α ι σ θ η σ ί α
Fame, Reputation	Overly Ambitious	SELF RESPECT	Lacking in self respect

Further Human Virtues According to Aristotle

Issue	Excess	Middle=Virtue	Deficiency
Telling the truth about oneself	Κομπασμός	ΦΙΛΑΛΗΘΕΙΑ	Αυτο-υποβάθμιση
Attitude toward the achievement Of others	Ζηλεία	ADMIRATION	Αυτο-εγκανόπιοίηση
Social relations (in general)	Δουλοπρέπεια	FRIENDLINESS	Κατσούφιλασμα

But why seek virtues, such as self-control, courage, fairness and wisdom, etc.?

The answer is most important
for a life well-lived.

The active pursuit of these goals and an increased understanding of how to obtain them leads to happiness.

**But what does this have to do with
the engineer's professional goals?**

Just as the basic human virtues ensure a person's happiness,

.... the engineers' professional goals or professional virtues ensure the success and flourishing of the engineering profession.

In the first case we looked at the fundamental principles in the Code of Ethics of the American Society of Civil Engineers. (ASCE)

In fact this code condenses the professional virtues of civil engineering.

The Code declares:

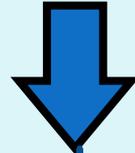
Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:

- 1. using their knowledge and skill for the enhancement of human welfare and the environment; [**social virtues**]
- 2. being honest and impartial and serving with fidelity the public, their employers and clients; [**self-directed virtues**]
- 3. striving to increase the competence and prestige of the engineering profession; [**proficiency virtues**] and
- 4. supporting the professional and technical societies of their disciplines. [**team-work virtues**]

And notice how the professional virtues of the code of civil engineering is also subject to, excesses, deficiencies and finding the middle way.

Take the virtue of being loyal to an employer.

Loyalty to an employer



The proper middle way:

**Being not loyal
enough:
Gross
Insubordination
Deficiency.**

**Knowing that teamwork requires
cooperation and leadership.
Following the a fair employer's
leadership is a condition of
successful group effort: *Virtue
of Employee Loyalty***

**Being too
loyal:
Blind
obedience
Excess.**